N. C. AGRICULTURAL EXTENSION SERVICE

N. C. State College of Agriculture and Engineering, and U. S. Dept. of Agriculture Cooperating

Pauline E. Gordon, Specialist in Home Management and House Furnishings
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HOME MANAGEMENT PLAN OF WORK - 1940

Throughout North Carolina there are families planning to make structural changes in their homes, and many others, who, if interested, could rearrange the work centers of their homes so as to eliminate time-consuming and fatigue-producing conditions.

To meet the needs in counties desiring a program of this type the following monthly method demonstrations are available:

1. Kitchen Improvement

   a. Arrangement of kitchens, laundries, and other work areas to save time, energy, and money.

   b. Planning and building of adequate and satisfying storage.
      (1) Kitchen storage.
      (2) Canned goods storage.
      (3) Clothing storage.
      (4) Bedding storage.

   c. Color and finishes for the farm kitchen.

   d. Sanitation.
      (1) Screening, ventilation.
      (2) Household Pests.
      (3) Minor repairs in the home.

   e. The farm home water supply.

2. Electricity.

Hundreds of miles of electric lines are built, or are being built, in rural North Carolina. It is suggested that special interest meetings on good wiring be held in communities where lines are being built or are to be built.

Suggested method demonstrations:

a. Planning for adequate lights, both artificial and daylight.

b. Selection of electrical equipment.

c. Care of electrical equipment (special interest on refrigerator).

d. Care and repair of extension cords, etc.

3. Family Financial Planning.

The exchange of money, time, and energy for goods for living is one of the most important of family activities. Families use their resources for purposes that result in satisfaction or dissatisfaction. Farm people are faced with the problem of decreased incomes. Changes in spending habits as well as qualities of goods offered face them. Assistance in this field may be given in:

a. Farm Family Outlook.

b. Income Management (need of keeping farm and home record and methods of keeping records).

c. The Farm Home Business Center.

d. Business Interests of Women.

e. Guides in Buying.
(1) Small equipment for the kitchen.
(2) Household linens.
(3) Rugs.

4. Household Skills.

Time and energy may be saved by improved household practices:

a. Good Standards for Housekeeping (cleaning metals, rugs, upholstery; bed-making, dish washing, cleaning windows, cleaning woodwork).

b. Soap making.

c. Laundrying of Household Fabrics.

d. Stain Removals.

5. Community Activities.

Community groups may be interested in:

a. Farm and Family Outlook Meeting.
b. Group Discussion on Family Money Management.

HOUSE FURNISHINGS PLAN OF WORK - 1940

Many farm families in North Carolina may be interested in improving the arrangement of the home in order to have a more satisfactory and happy family life. It is suggested that the program in house furnishings be centered around the living room one year and the bedroom one year.

1. The Living Room Improvement.

   a. Color and Design.
      (1) The Properties of Color.
      (2) General Plan for Building a Color Scheme in the Home.
      (3) Color Schemes for a Living Room.
      (4) Use of Design in the Livable Living Room.

   b. Treatment of Walls and Woodwork.
   c. Floor Finishes.
   d. Care and Repair of Floors and Woodwork.

2. Furniture.

   a. Arrangement of Furniture.
   b. Selection of Furniture.
   c. Refinishing Furniture.
   d. Reupholstery.
   e. Chair Caning.
   f. Slip Covers.
   g. Furniture We Can Make.

3. Rugs.

   a. Selection of Commercial Rugs.
   b. Hooked Rugs.
   c. Crocheted Rugs.
   d. Braided Rugs.

4. Windows.

   a. Curtains.
      (1) Purpose.
      (2) Material.
      (3) Treatment for Different Kinds of Windows.
      (4) Methods of Making Curtains.

   b. Draperies.
      (1) Purpose.
      (2) Colors.
      (3) Materials.
      (4) Construction.

   c. Shades
      Kinds, home-made shades, turning shades, painting shades.

5. The Bedroom.

   a. Arrangement of Bedroom Furniture.
   b. Bedding.
   c. Mattress Making: Cotton, Feather.
   d. Clothing Storage.

6. Decorative Objects.

a. Pictures in the Home.
(1) How to Choose a Picture.
(2) Picture Frames.
(3) Hanging of Pictures.

b. Mantel: Arrangement of Mantel.
c. Accessories for the Home: Selection and Use of Decorative Objects.
d. Selection of Vases and Flower Arrangement.
e. Storage of Books in the Farm Home.

7. Porches.

Selection and Arrangement of Porch Furniture.

Tourist Home.

Present conditions indicate that thousands of tourists will come to North Carolina in 1940. In counties where farm women are interested in tourist houses it is suggested that a county meeting on this subject be held.

Farm and Home Demonstrations

Farm and home demonstrations are to be continued in 1940. In counties where this work has not been started, the home agent is asked to consult with the farm agent, the Farm and Home Management specialists, and plan to begin this work in 1940.

HOME MANAGEMENT_____ HOUSE FURNISHINGS_____

Approx. No. Lesson Sheets to be sent_____ Current year_____

County_____ No. Women's Clubs_____

Home Dem. Agent_____ Enrollment_____

Subject	Given by	Demonstration	Home Assignment
Jan.			
Feb.			
March			
April			
May			
June			
July			

Subject	Given by	Demonstration	Home Assignment
Aug.			
Sept.			
Oct.			
Nov.			
Dec.			

Goals for Home Management or House Furnishing Project:

OUTLOOK FOR FARM FAMILY LIVING OF NORTH CAROLINA

"A planned course for using resources will yield a better living than will hit-or-miss spending of money, time and strength."

Farm Family Income

Farm families probably will have a higher net income in 1940 than they had in 1939. Total receipts for marketing of farm products are expected to increase due to the improvement in industrial activities and in consumer incomes. Income from government payments will probably be about the same. Non-farm earnings of family members may increase, with greater opportunities for employment. Despite the improvement in economic conditions, a large percent of the farm families of North Carolina will be faced with the problem of stretching incomes of less than $500 to provide for all their household needs.

With improvement in industrial activities and an increase in tourist trade, due to curtailment of foreign travel, there is a probability of an increase in the income being supplemented by home makers. There are indications of an increased trade in the Farm Womens' Market and roadside markets.

Increased income may be expected from tourist trade in 1940, especially in the mountain and coastal sections of the state.

The non-money income -- food, fuel and housing -- can seldom make purchases and pay obligations. However, home produced food and fuel do have a definite money value and when produced at home can free money for other necessities as well as contribute to better living.

FOODS AND NUTRITION OUTLOOK 1940

The Family's Food

Prices for food will likely be a little higher in 1940 than in 1939. Costs of producing food for household use increase less than do retail food prices, hence farm families can offset a rise in the cost of their food by planning to produce a larger than usual share of their total food supplies. Such plans, if made with nutritional as well as financial goals in mind, may also yield returns in the form of improved family diets and in better health. Farm families need not fear any shortages of the commonly purchased foods in 1940.

North Carolina diets as a whole are lacking in certain important foods. The lack of milk is greatest but there is also a lack of sufficient fruits, lean meats, poultry, eggs, whole grains and at certain seasons fresh vegetables.

Farm families should make every effort to produce the essential foods needed for the good nutrition of the family. They should arrange to have a sufficient supply of milk, and meat animals as well as a year-round garden, a succession of fruits (both small and tree fruits), a food preservation program, an adequate supply of poultry and eggs, grain, and some source for sweets as honey or syrup. At least one cow for each family should be the first consideration.

Health

Nurtitional diseases, particularly pellagra, are not so prevalent in North Carolina as they once were, but far too many people are still below par physically due to insufficient and inadequate foods. Undernourishment and poor condition of teeth among children and adults is all too evident. Such physical conditions cause untold economic loss as well as loss of comfort and happiness.

Farm families should plan for the production of an adequate food supply for the family; obtain more information regarding food values, meal planning, and better methods of food preparation, and assist in forwarding all programs that will improve the health conditions of your community.

FARM HOUSING

Many farm houses were improved in 1939 through provision of better lights, running water, and improved kitchens. The increased interest in housing has been influenced by the extension of power lines.

The outlook for 1940 is for a continuation of improved housing in North Carolina. The Agricultural Extension Service will put on a program designed to help farm families plan, repair and modernize their homes. There is need, too, for improved facilities for heating and lighting.

Electricity

From the standpoint of new electric line extensions in rural territory, there is every reason to believe that progress will not be as rapid in the coming year as it has been in the immediate past. Uncertainty of business conditions, due to the excitement created by the European War, will undoubtedly be reflected in curtailment of extensions on the part of the private utilities. The Rural Electrification Administration in Washington is centering its activities largely on consolidating the gains already made by strenghtening their cooperatives through increased membership, increased use, and better understanding of what cooperative action may mean to the consumer. If additional appropriations are made to this administration, undoubtedly line extensions will again be actively promoted.

From the standpoint of increased usage on the part of existing customers for the coming year, there should be great progress. Slightly decreased prices of appliances together with new uses will bring large numbers of rural customers to using electricity for purposes which they have not done in the past. Efforts of both private and public groups to promote increased use undoubtedly will bear fruit during the coming year.

With the extension of electric lines in rural communities, there has been an increase in cash expenditure for wiring, current, light fixtures, and electric appliances. For the majority of farm families, therefore, purchases of electrical equipment and payment for current mean economizing on other parts of the budget or incurring debts to be paid over a period of time.

CLOTHING

Prices of spring lines of ready to wear clothing may be somewhat higher in 1940 than in 1939 owing to the increase in consumer incomes and in manufacturing costs. Retail prices of cotton yard goods may not change appreciably. It is expected that there will be an increase in the cost of woolens, silks, and rayons. Prices of shoes are also expected to increase in 1940.

Facing this anticipated increase in the price of clothing now, and doing some good planning will do much to offset the rise in prices.

An understanding of the family income is necessary. Twelve to twenty per cent of the income is the amount economists allot to clothing. An understanding of the clothing needs of each member of the family is another necessity in making a good clothing plan. Know what clothing is on hand and the condition it is in, which garments may be remodeled, and which should be made over. Know which members of the family have to have new garments. Can any of these needed garments be made from material on hand? Can most of the garments needed be made at home?

A clothing plan will help the family get the most from their clothing money in 1940. More clothes made at home; better care of clothing, this means cleaning, pressing, mending, storage; more study of consumer information and more thought to purchases to be made, will all be means of off setting increased prices of clothing in 1940.

1. Do you know definitely what was spent for clothing for your family last year?
2. Do you know the difference in the cost of garments made at home and the same garments bought ready made?
3. Have you provided storage space for clothing of each member of your family? A place to hang clothes, and drawer space for laundered, folded clothes?
4. Are you watching your buying practices? Do you let novelties tempt you?
5. Do you realize the importance of care of clothing? Its importance in the appearance of your family, and its importance in stretching your clothing dollars?

CREDIT

No detailed figures are available to indicate the extent to which farm families use credit to purchase goods and service for family living. Many living in one-crop farming areas find it necessary to use short-term credit to finance not only the current production but the purchase of basic necessities for family living as well. Dealer credit is the prevailing kind but cash loans also are made for this purpose. Frequently the budgets set up for borrowers from the production-credit associations and other cash-lending agencies show that a portion of the loan is for the purpose of paying current living expenses.

Information from a number of sources indicates that many farm families are using installment credit to finance the installation of electricity and the purchase of electrical equipment.

Automobiles

Any marked improvement in the buying power of farm families will be reflected in their purchases and their use of automobiles. Wholesale prices for rubber and petroleum products have recently advanced sharply. Should these advances be maintained, they probably will be reflected in higher transportation cost for farm families.

Consumer Education

Farm families in growing numbers are studying their roles as consumer. Education, governmental, and business groups are giving more assistance than beretofore to consumers who wish to become more effective buyers.

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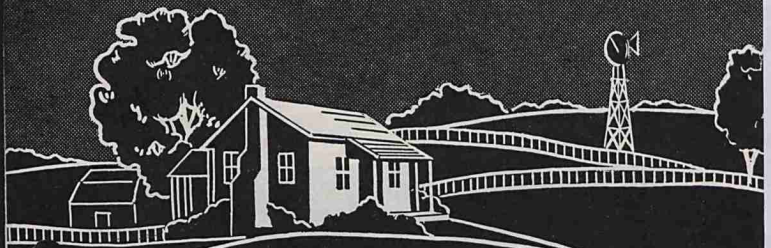
I. O. Schaub, Director.

OUTLOOK for Farm Family Living

1940



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Farm Family Income, 1939

Incomes of farm families for the year 1939 will be a little higher than for 1938. The advance in prices of farm products in the early autumn of 1939, reflecting the marked improvement in business activity, served to bring gross national income from agriculture to a level somewhat above that anticipated in midsummer.

North Atlantic States.—For this region as a whole, the combined income from farm marketings and Government payments during the first 9 months of 1939 was nearly 3 percent below that for the same period of 1938. With an advance in milk and potato prices income during the latter part of 1939 and early 1940 may be as large as, or slightly larger than for the same months of the year before.

East North Central States.—Income from sales of farm products in the first 8 months of 1939 was 8 percent lower than in the comparable period in 1938, while Government payments were somewhat higher. The combined income from both sources was 6 percent lower. Price advances in the early fall will partly offset the usual seasonal decline in receipts, and income in the latter part of 1939 may exceed that of these months of 1938.

West North Central States.—From January through August 1939 income from farm marketings showed a 2-percent increase over that for the same months of the year before. A rise in prices of grain, livestock, and dairy products brought a sharp increase in September, and it is likely that income in the last 3 months of the year will be higher than in the same months of 1938. Government payments also are substantially larger than in 1938.

South Atlantic States.—The marked decline in cotton sales during the first 9 months of 1939 depressed income. The larger cotton crop of 1939 and higher prices for the portion so far marketed, indicate that farm income in the last 3 months will be somewhat larger than in this period of 1938. Larger tobacco sales about offset lower prices in the first 8 months of 1939 as compared with those for this period a year earlier. Payments for cotton price adjustment and soil conservation also helped to maintain income so that the total for 1939 probably will exceed that for 1938.

South Central States.—Reduction in cotton sales depressed income during the first 7 months of 1939. However, in August and September income rose and probably will exceed that of 1938 during the remainder of the year. Farm income for the whole of 1939 may not be much below that of 1938. Government payments during 1939 were relatively large.

Western States.—Farm marketings from January through September 1939 were 1 percent lower than in these months of 1938 in the far Western States; but Government payments brought total income 2 percent higher. Income in the Northwestern States and California during the latter part of 1939 probably will be somewhat larger than a year earlier. In the range States, increases due to heavy sales of livestock may be offset by higher expenditures for feed.

Planning Farm Family Living, 1940

Wise management of resources by farm families will be even more difficult than usual in the troubled days of 1940, but difficulties and uncertainties should not lessen the number of families making farm- and home-management plans. Income, land, time, and other resources will yield greater satisfactions if a family plans for their use than if they are spent in hit-or-miss fashion.

The purchasing power of the dollars spent for family living may be somewhat less in 1940 than in 1939 as a whole. Retail prices of many of the commodities bought for household use rose sharply in August 1939. Whether such increases will be maintained, or whether some prices will go even higher in 1940 depends upon business conditions. However, any increased cost of living due to higher retail prices probably would be more than offset by a rise in farm income, so that the total buying power of farm families would be greater than in 1939.

If costs of living rise, farm families as a group may feel the pinch less than city families. Most farm families can partly offset a rise in the general retail-price level by producing a larger-than-usual share of their total food supplies. In some sections fuel production may be increased also, thus lessening the family's bill for coal.

With the great uncertainty as to what may come after a war boom (should one materialize), farm families will want to consider carefully how they may set their financial affairs in order. Reduction of existing debts may be a sounder policy for many than an overexpansion of farm enterprises which might bring disastrous consequences such as those of the post-war slump of the twenties.

Many farm families need short-time credit for family living as well as for farm operation. Dealer credit is the type most commonly used; but part of a cash loan made primarily for production may be spent for current living. Installation of electricity and purchases of electrical equipment have increased the use of installment credit. Whether credit is obtained for only a short period, as for current expenses, or for a long period, as for land purchase, the family should investigate both the interest rates and the terms for loan amortization before making commitments. Wise use of credit is an important aspect of family financial management.

Efficient buying is another major phase of the job of managing family funds. Farm homemakers are increasing their effectiveness as buyers. The Food, Drug, and Cosmetic Act of 1938 and the Wheeler-Lea amendment to the Federal Trade Commission Act have given consumers increased protection over an enlarged field. State laws are being revised to harmonize with these Federal measures.

Well-balanced plans for family living should provide for using some resources for recreational and social activities, such as club memberships or a radio, and for education of all family members. The prime objective of all planning should be to improve family living, not merely in terms of money but in a broad cultural sense.

Food for the Family

Farm families with well-planned year-round supplies of food can have better diets than their village and city neighbors, because many of the protective foods, such as milk, eggs, and green leafy vegetables, can be farm-furnished. These foods, expensive to buy, are also expensive to produce. But by carefully planned production, many farm families now enjoy these foods, which they might not be able to afford if they lived solely in a money economy. The proportion of the family food supply that is home-produced differs from one farming area to another. It was as high as 83 percent of the total in one group of counties in the Southeast and as low as 21 percent in a fruit-growing section of California, according to a recent study.

Canning and preservation of foods have been greatly stimulated in the past few years by educational agencies. An increasing number of families own pressure cookers, necessary for canning most vegetables and all meats. Canning by plan, better facilities for storing fruits and vegetables, and the wider distribution of freezer lockers for the preservation of meats and other foods for family use are contributing to a greater variety in menus throughout the year. The year-round gardens in some parts of the country are a further help to this end, and serve also to reduce vegetable canning.

Although farm families produce much of the food they consume, nevertheless the largest share of every dollar spent for living goes for the food they purchase. As consumers, therefore, the outlook for food—both the prospective supply and price—is important to them.

In spite of world conditions all evidence points to an ample supply of food for the Nation's table in the 1939–40 season. Meat supplies will be larger than for any year since 1934. Pork provides most of this increase. Poultry supplies are expected to be about 8 percent larger in 1939–40 than in 1938–39; and supplies of eggs, about 2 percent larger. Butter production, while it may be somewhat below the high level of 1938–39, will be about as high as in other recent years. Quantities of milk and cheese are expected to be adequate.

Fresh fruits are more abundant than usual. Crops of oranges and grapefruit will be about the same as the large crop of 1938–39; pears and grapes may be a little less. Fresh vegetables are plentiful, although perhaps slightly below the unusual production of 1938. There will be generous stocks of dried fruits and of canned vegetables. The supply of potatoes may be a little below normal, but sweetpotatoes are exceptionally abundant. Prospective supplies of sugar are more than enough to meet domestic needs. There will be plenty of wheat both for domestic and possible export needs.

Retail prices of food in the first 7 months of 1939 were below those of 1938, but in the early autumn they rose appreciably. If the anticipated improvements in consumer incomes materialize, food prices paid in late 1939 and in the early part of 1940 will average somewhat above the relatively low levels of the months of 1939 preceding the declaration of the European war.

Communication and Transportation

The telephone, the radio, the rural mail service bringing daily papers, the automobile, the rural bus line, hard-surfaced roads—all serve to bring farm families into closer contact with neighborhood and world events. Low money incomes rather than lack of interest have kept many families and communities from making greater use of these services. Any increase in income in 1940 may be reflected in a higher proportion of families using them.

Fewer than half of the farm families in the country have telephones. The proportion differs greatly from one farm area to another, but there has been no marked increase in recent years.

The number of farm homes with radios increased by more than 3 percent during 1938. In 1939 over three-fifths of all farm families in this country were able to tune in on world news. Contributing to the rapid spread in radio ownership is the extension of electricity to farm areas together with the lowered prices and improved efficiency of radios, made possible by quantity production and technological improvements. Developments responsible for the downward movement in prices of the last few years may help to offset any tendency toward price rises in 1940, especially for the smaller sets.

Prices quoted on the 1940 automobile models are about the same as or a little higher than those of a year earlier. They may change, however, without notice. Automobile operating expenses may increase. Wholesale prices of rubber and of petroleum products advanced sharply in the fall of 1939.

If farm income improves markedly in 1940, it seems safe to say that farm families owning cars will use them for more miles of travel. Also, more families will buy cars, and more of the purchased cars will be new. Among farm families with incomes below $1,000 in the central region, only one out of every six families purchasing automobiles bought a new car, according to recent studies, but among families with incomes of $3,000 or more, half of those purchasing bought new and half bought used cars.

Clothing

Clothing expenditures take a smaller share of the money spent for living by farm families than by those in cities. Outlays are none the less large enough to justify interest in price trends. Present indications are that prices of ready-to-wear clothing, especially wool and worsted garments, this coming spring may be somewhat higher than those of similar articles in the spring of 1939. Wholesale prices of wool and worsted goods advanced sharply in the early fall of 1939.

Shoes may cost more in 1940 because of the rise in prices of skins and hides in the autumn of 1939. Fortunately, work shoes, which bulk large in the farm family's bill for footwear, are usually slower to take on the higher price tag than dress shoes.

Housing, Equipment, and Household Operation

Adequate housing for the Nation's farm families would be an unattained goal at the close of 1940 even if that year brought an appreciable income increase. About one-sixth of the farm homes should be replaced, according to estimates based on the 1934 Federal housing survey. About one-third need major repairs; only about one-half would be rated as structurally sound, perhaps needing minor repairs. Fewer than one-fifth of the homes surveyed had water piped to the dwelling; a much smaller proportion had both hot and cold running water for kitchen and bath. Only about 18 percent were lighted by electricity.

During the period since 1934 the number of farm homes served by electric-power lines has markedly increased. By the close of 1940 more than one-fourth of the Nation's farms will be using electricity.

No comparable increase has been made in the proportion of farm homes having running water and sewage systems. The cost of providing such sanitary facilities to all farm homes lacking them has been estimated at $650,000,000 if new materials and hired labor were used. To provide needed repairs and alterations and to replace the houses which should be torn down would cost about $3,250,000,000 more. Obviously, no such outlay for housing can be made in 1940.

Furnishings and equipment ordinarily take but a small part of the outlay for family living. Such expenditures averaged only $39 for more than 2,000 families recently surveyed in the central region. Replacements of dishes, household textiles, and equipment for cooking and cleaning were the major purchases. Furniture prices in 1940 may be about the same as or a little higher than in 1939. They tended to remain stationary in 1939 when prices of many commodities were declining and may react less if production costs increase.

A washing machine is the first of the more expensive articles of electric equipment bought by most farm families except in the Southeast. There, the warm climate and the plentiful supply of labor for laundry work tend to place the refrigerator above the washing machine on the buying list. The 1939 prices of most electric devices have been about the same as in 1938, but there may be some advances in 1940.

Money outlays for household operation may increase in 1940 for families installing electricity. The efficient manager will seek ways in which electricity may reduce other operating costs, or may free time and energy for increasing money or nonmoney income. The anticipated rise in coal prices in 1940 may bring higher fuel bills for some families; but some may be able to offset such an increase by using farm-furnished fuel. Thus the farm family that makes a joint farm-home plan can often adjust its use of resources so that greater money expenditures for some items are offset by increases in nonmoney income. Through such adjustments and other wise management practices, the family may draw nearer its goal of more wholesome living and greater financial security in 1940.

Home Demonstration Division
Agricultural Extension Service
N. C. State College, Raleigh.

Pauline E. Gordon, Specialist in Home Management and House Furnishings.
Mamie N. Whisnant, Assistant Specialist.

REQUIREMENTS FOR AWARD OF MERIT IN HOME MANAGEMENT

1. Kitchen
   a. An adequate supply of safe water. Good well with curbing. Preferably water piped into house.
   b. Sanitary drainage of waste water.
   c. Convenient arrangement of working units in kitchen.
      (1) Storage unit
      (2) Preparation units
      (3) Serving "
      (4) Clearing away"
   d. Correct heights of working surfaces (tables, sinks, laundry equipment, etc.)

2. Business of the Home
   a. Buying
      (1) Three well selected pieces of small equipment for the kitchen.
      (2) Three other examples of good technique in buying.
   b. Keep record of family expenditures during a period of 2 years.
   c. A well arranged business center in the home.

3. Skill in Good Standards of Housekeeping
   a. To develop good technique in 5 or more of the following:
      (1) Cleaning of rugs
      (2) Cleaning of upholstery
      (3) Cleaning of windows
      (4) Cleaning of metals
      (5) Soap making
      (6) Removal of stains
      (7) Laundering
      (8) Dish washing
      (9) Repair of electrical equipment
      (10) Or any others

4. Family Relationships
   a. Celebration of 2 family anniversaries each year.
   b. Participation of members of family in home and community activities.

5. Storage
   Good arrangement of 3 of the following:
   a. Clothing closet
   b. Linen closet
   c. Bedding storage
   d. Cleaning closet
   e. Seasonal clothing storage
   f. Storage of medical supplies

6. Sanitation
   a. Windows and doors well screened
   b. Sanitary toilet
   c. Home free of insects, mice, etc.
   d. Sanitary disposal of garbage

7. Attendance at 6 Home Management meetings a year for 2 years.

Home Demonstration Division
Agricultural Extension Service
N. C. State College, Raleigh

Pauline E. Gordon, Extension Specialist
Home Management & House Furnishings.
Mamie N. Whisnant, Assistant Specialist
Home Management Leaflet #49

APPLICATION FOR AWARD OF MERIT IN HOME MANAGEMENT

1. Kitchen
   a. Type of water supply?_____
   b. Type of water disposal?_____
   c. Arrangement of kitchen? Give drawing on back of this sheet.
   d. Height of tables_____, laundry equipment_____, other working surfaces_____

2. Business of the Home
   a. Buying
      (1) List pieces of small equipment bought for the kitchen_____
      (2) List 3 examples of technique in buying:_____
   b. Attach record of family expenditures during a period of 2 years.
   c. Give location and type of business center in the home._____

3. List skill in good standards of housekeeping which you have developed.

4. Family Relationships
   a. List family anniversaries celebrated each year._____
   b. List participation of members of family in home and community activities._____

5. Storage
   Attach description of drawing of storage spaces improved.

6. Sanitation.
   a. Are your windows and doors well screened?_____
   b. Do you have sanitary toilet?_____
   c. Is your home free of insects, mice, etc.?_____
   d. Is your system of garbage disposal a sanitary one?_____

7. Attendance at Home Management meetings.
   Have you attended 6 Home Management meetings a year for 2 years?_____

Signed by:_____
(Applicant)

_____
(Home Demonstration Agent)

NORTH CAROLINA STATE COLLEGE AGRICULTURE AND ENGINEERING

AGRICULTURAL EXTENSION SERVICE
HOME DEMONSTRATION WORK

AWARD OF MERIT

This is to Certify that

*Name*_____ *of* _____ *Club*

*in*_____ *County*

has satisfactorily completed the required work

*in*_____

_____
Specialist.

_____
County Home Demonstration Agent.

_____
State Home Demonstration Agent.

*Date*_____

OWEN G. DUNN 26758

NORTH CAROLINA

FARM HOME ACCOUNT BOOK

NAME_____

POST OFFICE_____

COUNTY _____

YEAR BEGINNING_____

NORTH CAROLINA STATE COLLEGE OF AGRICULTURE AND ENGINEERING
OF THE
UNIVERSITY OF NORTH CAROLINA
AND
U. S. DEPARTMENT OF AGRICULTURE, CO-OPERATING
N. C. AGRICULTURAL EXTENSION SERVICE

I. O. SCHAUB, DIRECTOR
STATE COLLEGE STATION
RALEIGH

DISTRIBUTED IN FURTHERANCE OF THE ACTS OF CONGRESS OF MAY 8 AND JUNE 30, 1914

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PERSONS LIVING IN THE HOME

Men _____ Women _____

Children: Boys _____ Ages _____

Girls _____ Ages _____

PERSONS LIVING PART-TIME IN THE HOME

	Number	*No. Months*	*No. Meals Per Day*
Men	_____	_____	_____
Women	_____	_____	_____
Boys—Ages _____	_____	_____	_____
Girls—Ages _____	_____	_____	_____

MAIN SOURCE OF INCOME: _____

_____

GENERAL INSTRUCTIONS

1. Plan a definite time in your schedule for keeping your account up-to-date.

2. Have a definite place to keep your account book, pencils, etc., such as a business center.

3. Enter record of expenditures at least once a week.

4. Interest all members of family in keeping the account book. The family council and cooperation is of real value. A small Personal Cash Allowance affords excellent business training for children.

5. When entering the items which have been purchased, record:

   a. What

   b. How much

   c. Amount paid

   d. For whom—if the expenditure is solely for one member of the family

   If shoes are bought for Mary which cost $2.50, enter in the following manner:
   Shoes—Mary—$2.50.

6. Record figures correctly in columns designated for dollars and cents. Leave off the dollar mark.

7. When in doubt as to the correct column in which an item should be entered, refer to the Explanation of Items, page 2.

8. Use the column Miscellaneous *only* when the purchase cannot be recorded elsewhere.

9. Total all items entered in each column for each month.

10. Cash expenditures for each month should be kept separate.

11. This is a cash book. If a purchase is charged, no entry should be made on the monthly record until the bill is paid.

12. Do not worry if your records do not balance to the exact penny. Your primary purpose is not bookkeeping but money management.

13. Total each column at end of the month and enter in the proper column for that month in the Annual Summary of Cash Expenditures.

14. Record only those purchases pertaining to the home and family living.

15. The Home Net-Worth Statement, page 38, would be filled in only twice during the year—January 1 and December 31 of the same year.

16. It is advisable to keep a Farm Account Book in conjunction with this Home Account Book.

17. All production costs should be entered in the Farm Account Book.

18. When in need of assistance in keeping your account book, consult your county home demonstration agent.

EXPLANATION OF ITEMS TO BE ENTERED ON PAGES 4 THROUGH 29

1. FOOD: All food purchased, cost of meals away from home, cost of lunches purchased at school.

2. HOUSING—FURNISHINGS AND EQUIPMENT: House repair and improvements, rent, fire insurance on furnishings and house, taxes on furnishings; furniture, rugs, window shades, curtains, pictures, dishes, silverware, household linens, refrigerators, stoves, kitchen equipment, washing machines, repairs on furniture, etc.

3. HOUSEHOLD OPERATION: Telephone, telegrams, postage, stationery, ink, kerosene, coal, wood, electricity; water, ice; soap, laundry supplies, laundry sent out; brooms, wax, bathroom supplies, supplies for canning, services for hired help for housework, etc.

4. CLOTHING: Outer garments, shoes, clothing, accessories, such as gloves, handkerchiefs, etc., undergarments, nightwear, paid labor for sewing; cleaning, dyeing, sewing supplies, etc.

5. PERSONAL: Barber and beauty shop services, cosmetics, perfumes; candy, drinks at drug stores, cigarettes, watches, watch repair, jewelry; all personal allowance to children, and other members of family, etc.

6. EDUCATION: School supplies, school tuition and fees, music lessons, board and lodging of child away at school, newspapers, magazines, books, plays, concerts, lectures, dues to educational organizations.

7. RECREATION: Movies, fairs, parties; games, toys, athletic supplies, pets, cameras, films; radio supplies, victrola, dues to social organizations, vacation expenses.

8. MEDICAL CARE: Fees to doctor, surgeon, dentist, oculist, nurse; hospital care, eyeglasses, medicine; health and accident insurance.

9. GIFTS, CHURCH, AND WELFARE: Gifts purchased for persons outside the family, contributions to Church, Sunday School, etc., family events, such as weddings, funerals, etc.

10. TRANSPORTATION—AUTO AND OTHER: Gasoline, oil, tires, repairing, license, taxes, bridge tolls, insurance, parking charges, payment on car; railroad, bus, etc. Charge the percentage of automobile expense used for family activities to the Home Account. Then charge the remainder of the total cost of the automobile to the Farm Account.

11. SAVINGS: Life insurance premiums, annuity payments, investments, payment on principal of mortgages and notes.

12. GARDEN, POULTRY, ETC.: Garden seed, baby chicks, feed, etc. When these items are entered in the Farm Record book omit this column.

13. MISCELLANEOUS: Only those purchases that cannot be listed under one of the previous columns.

FARM PRODUCTS USED IN THE HOME

(Products may be estimated monthly or yearly.)

ITEMS		Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total for Year	Estimated Value
Milk	Qts.														
Butter	Lbs.														
Eggs	Doz.														
Poultry	Lbs.														
Pork	Lbs.														
Lard	Lbs.														
Beef, Veal, Mutton	Lbs.														
Corn meal	Lbs.														
Wheat flour	Lbs.														
Potatoes, sweet	Bu.														
Potatoes, white	Bu.														
Canned vegetables	Qts.														
Dried vegetables	Lbs.														
Stored vegetables	Lbs.														
Fresh vegetables	Lbs.														
Canned fruits	Qts.														
Dried fruits	Lbs.														
Stored fruits	Lbs.														
Fresh fruits	Lbs.														
Jelly, jams, preserves	Qts.														
Pickles	Qts.														
Syrup, Honey	Qts.														
Nuts	Lbs.														
Wood															
Other															

CASH EXPENDITURES Month........................19........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 FOOD	2 HOUSING AND FURNISHING	3 HOUSEHOLD OPERATION	4 CLOTHING
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 PERSONAL	6 EDUCATION	7 RECREATION	8 MEDICAL CARE	9 GIFTS, CHURCH WELFARE	10 TRANSPORTATION	11 SAVINGS	12 GARDEN AND POULTRY	13 MISCELLANEOUS
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month................................19..........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month.................................19..........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 FOOD	2 HOUSING AND FURNISHING	3 HOUSEHOLD OPERATION	4 CLOTHING
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 PERSONAL	6 EDUCATION	7 RECREATION	8 MEDICAL CARE	9 GIFTS, CHURCH WELFARE	10 TRANSPORTATION	11 SAVINGS	12 GARDEN AND POULTRY	13 MISCELLANEOUS
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES

Month..................................19........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month__________19____

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month...19...........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 FOOD	2 HOUSING AND FURNISHING	3 HOUSEHOLD OPERATION	4 CLOTHING
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 PERSONAL	6 EDUCATION	7 RECREATION	8 MEDICAL CARE	9 GIFTS, CHURCH WELFARE	10 TRANSPORTATION	11 SAVINGS	12 GARDEN AND POULTRY	13 MISCELLANEOUS
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month.................................19..........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month.................19.......

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month.................................19...........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 FOOD	2 HOUSING AND FURNISHING	3 HOUSEHOLD OPERATION	4 CLOTHING
		$	$	$	$
TOTAL					

5 PERSONAL	6 EDUCATION	7 RECREATION	8 MEDICAL CARE	9 GIFTS, CHURCH WELFARE	10 TRANSPORTATION	11 SAVINGS	12 GARDEN AND POULTRY	13 MISCELLANEOUS
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES

Month ______________ 19____

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 FOOD	2 HOUSING AND FURNISHING	3 HOUSEHOLD OPERATION	4 CLOTHING
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 PERSONAL	6 EDUCATION	7 RECREATION	8 MEDICAL CARE	9 GIFTS, CHURCH WELFARE	10 TRANSPORTATION	11 SAVINGS	12 GARDEN AND POULTRY	13 MISCELLANEOUS
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES Month ______ 19____

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH EXPENDITURES

Month..................................19........

NOTE: When in doubt as to the correct column in which an item should be entered, refer to page 2.

DATE	ITEM	1 Food	2 Housing and Furnishing	3 Household Operation	4 Clothing
		$	$	$	$
TOTAL					

CASH EXPENDITURES

5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gifts, Church Welfare	10 Transportation	11 Savings	12 Garden and Poultry	13 Miscellaneous
$	$	$	$	$	$	$	$	$

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month.......................................19...........

This should include:
1. Sale of home grown products—Example, Dairy, poultry, garden products.
2. Sale of home made products—Example, Rugs, cakes, etc.
3. Income received from services rendered—Examples, Boarders, sewing, outside employment, etc.
4. Cash contributions by husband and other members of family for family living.

DATE	ITEM	VALUE	
		$	
TOTALS		$	

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month...19............

Date	Item	Value	
		$	
TOTALS		$	

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month.......................................19...........

DATE	ITEM	VALUE	
		$	
Month.......19.......			
TOTALS		$	

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month..................................19...........

DATE	ITEM	VALUE
		$
TOTALS		$

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month..19............

Date	Item	Value	
		$	
Month..................19..........			
TOTALS		$	

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month..19............

DATE	ITEM	VALUE	
		$	
TOTALS		$	

CASH INCOME FROM SALES OF HOME PRODUCTS AND SERVICES

Month..... 19.....

DATE	ITEM	VALUE	
		$	
TOTALS		$	

ANNUAL SUMMARY OF CASH INCOME FROM SALE OF HOME PRODUCTS AND SERVICES

MONTH	VALUE
January	$
February	
March	
April	
May	
June	
July	
August	
September	
October	
November	
December	
TOTAL	$

ANNUAL SUMMARY OF CASH EXPENDITURES

Totals of each classification to be transferred from monthly record, pages 3 through 29.

Month	1 Food	2 Housing	3 Household Operations	4 Clothing	5 Personal	6 Education	7 Recreation	8 Medical Care	9 Gift Church	10 Auto Transp.	11 Saving	12 Garden Poultry	13 Miscellaneous	Total
January														
February														
March														
April														
May														
June														
July														
August														
September														
October														
November														
December														
Total														

Total home cash income for year (summary of page 36) ..... $ _____

Total value of farm products used in home for year (summary of page 3) ..... $ _____

Total income for year ..... $ _____

Total home income ..... $ _____

Total expense ..... $ _____

Balance ..... $ _____

NET-WORTH STATEMENT

The net worth statement at end of current year, December 31, will be the same as the net worth statement of January 1 of the following year, to be entered in the new account book.

Assets include everything of material value. *Liabilities include mortgages, installments, debts, etc.*

ASSETS (What we own)	Beginning of Year Jan. 1	End of Year Dec. 31	LIABILITIES (What we owe)	Beginning of Year Jan. 1	End of Year Dec. 31
Land and buildings (Include dwelling)			Land and building		
House Furnishings and Equipment			House Furnishings and Equipment		
Value paid on real estate other than farm land			Debts owing on real estate other than farm land		
Miscellaneous accounts due to family			Miscellaneous accounts due by family		
Life insurance (cash value)			Amount borrowed on life insurance		
Automobile			Automobile		
Balance in bank			Taxes—past due		
Cash on hand			Interest—past due		
Other Assets:			Other Liabilities:		
TOTAL ASSETS			TOTAL LIABILITIES		

Net worth at beginning of year (subtract total liabilities Jan. 1 from total assets Jan. 1).....$_____

New worth at end of year (subtract total liabilites Dec. 31 from total assets Dec. 31).....$_____

Change in Net Worth (subtract net worth at beginning of year from net worth at end of year).....$_____

N. C. AGRICULTURAL EXTENSION SERVICE

N.C. State College of Agri. & Engineering & U.S. Dept. of Agri. Cooperating

Pauline E. Gordon, Ext. Specialist Home Mgt. and House Furnishings
Elizabeth Williams, Assistant Specialist.

Suggestings for Account Keeping

Benefits of Keeping Home Accounts

Among the possible benefits to be derived from account keeping are:

1. A record of payments made.
2. A reference or a record of brands and quantities purchased.
    a. Records of length of wear of articles, gives indication as to quality of materials.
    b. Show the seasons of year purchases are made.
3. Helps to balance the income with the expenditures.
4. Helps build a saving account.
5. Acts as a means of checking leaks in spending.
6. Serves as a guide in making adjustments.
7. Helps to control family spending in dividions of expenditure.
8. Aids family in distribution of expenditures.
    a. Over various classes of expenditures.
    b. For all members of the family.
9. Encourages the weighing of values of different purchases.
    a. Helps to fit in the infrequent type of purchase.
    b. Helps to meet emergencies.
10. Promotes cooperation of all members of the family.
11. Helps one to buy and feel that she can afford it, and to take advantage of good buys when available.
12. Makes a person more systematic and business-like.
13. Gives a feeling of confidence as a business manager.
    a. Confidence in self.
    b. Confidence of other people in homemaker.
14. Serves as a tool for attaining the goals in life, both short-time and long-time goals.

Guidance in Account Keeping

1. Interest and inspire families

2. Keep personal accounts in order to better be able to help others.

3. Give families the analytical attitude toward their purchases.

4. Stress family council and cooperation.

5. Assist each family in getting started correctly.

    a. Home visits are necessary unless account meeting has been held.
    b. It may be necessary to actually enter several items to be sure the homemaker understands.

6. Urge a definite time, place, and tools for use. Example, business center.

7. If homemakers do not keep all of the classifications, urge them to keep accounts for one classification (as clothing) accurately for one year.

8. Influence their attitude to turn the book in at the end of the year for a summary to be compiled.

9. Always follow-up the families keeping accounts. Methods:

    a. Group meetings.
    b. Conferences.
    c. Newspaper publicity.
    d. Circular letters.

10. It is not necessary that records account for every penny.

    a. Home records are a case of money management--not of bookkeeping.
    b. If 97% (or less) of money can be accounted for, it is a good job.

11. Never criticize the homemaker's purchases.

    a. If asked to, we may advise and comment, but we have no right to criticize.
    b. Too often we do not know all of the conditions relating to the expenditures.

12. Never give exact amounts if they ask how much should be spent for various classifications of expenditures. Answer only in terms of averages.

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HOME MANAGEMENT & HOUSE FURNISHINGS

Home Demonstration Division
N. C. State College, Raleigh.

Pauline E. Gordon, Extension Specialist
Home Management & House Furnishings
Elizabeth Williams, Assistant Specialist

BUSINESS INTERESTS OF WOMEN

The farm wife is a finance partner.

Farm business and farm family living are inseparable. It is essential for the best development of the farm enterprise that the farm woman should not only understand, but also take an active part in the business affairs of the family.

It is not only fair and just that the homemaker take an active part in family business, but it is her duty and responsibility.

Much happiness can be gained, and much sorrow and confusion avoided by the homemaker becoming familiar with general business procedures which affect family living. When a woman knows business methods, the members of her family will have more confidence in her. If people know that a woman is capable and alert in her business dealings, she will receive greater courtesy and consideration in the business world.

Business Responsibilities of the Homemaker

The goal of economic independence requires:

1. That the homemaker should become familiar with the handling of financial problems.
2. That she should inform herself regarding financial institutions.
3. That she shall know the value of money and the value of services.
4. That she shall be able to interpret both money and services in terms of wealth.
5. That she shall develop a system of household finance by which she can safeguard the resources of the family.

Credit

Credit is a power.

The proper use of credit may mean the difference between success and failure. It may make a home, or break it.

Credit - When we buy something, we expect to pay for it. If we pay for it when we get it, it is for cash. If we pay for it later, it is on credit.

Interest - When someone lends us money, he requires us to pay for the use of it. This is called interest.

Farming Needs Special Credit - Because of weather and market conditions, etc., over which the farmer has no control he needs a special kind of agricultural credit. The Farm Credit Administration is one source of agricultural credit for farm families with good credit ratings.

Kinds of farm credit needed:

A. Long-term credit

B. Short-term credit

May be properly used:

1. To provide more production capital - livestock, equipment, seed. Or to repair farm buildings, etc., which will result in high earnings.

2. To pay off a number of short-time debts, provided lower rates of interest can be secured, thus saving money.

3. To pay cash for needed farm or household equipment, thus taking advantage of cash discounts and avoiding high installment interest. rates. Be reasonably sure that the production will be enough to repay.

C. For marketing needs.

May be properly used:

1. To enable cooperative marketing products to a better advantage, or to meet other needs of cooperative associations of farmers in buying farm supplies or in furnishing farm business services.

Credit is dstructive if used improperly. It should never be used:

1. To buy luxuries.
2. To speculate in land.
3. To over-improve a farm beyond its capacity to pay for itself.

Before using credit, your farm family must decide whether its wants and needs are productive or destructive.

Installment Buying

Charge accounts and insfallment buying are the most expensive kinds of credit. A refrigerator or a plow or any piece of equipment on the installment plan may cost up to 40% interest.

Figure your interest rates carefully before you buy on the installment plan.

The Homemaker's Banking

The use of the bank checking account is of great convenience in the handling of household finance.

Without entering into the subject of the principles of banking, we may understand the individual account and its use as a means of safeguarding the wealth of the family, of facilitating business transactions for the woman who is the home manager and who desires to take advantage of all modern business methods to promote her efficiency.

Managing a checking account is not a difficult matter as the bank handles all the complicated part of the work. However, to protect ourselves and those whom we pay by check, it is necessary to do our share of the banking correctly.

Points on the Writing of Checks

1. Checks should be numbered in a series.
2. All checks should be written in ink, to prevent alteration in any respect.
3. No corrections are permissible. If any mistake is made, destroy the check and write another.
4. The name must be signed exactly as on the signature card held at the bank.
5. Fill out the stub when the check is written. This will give you a valuable record.
6. Sunday dates are not valid, nor are holiday dates.
7. Post-date checks are not businesslike.
8. Make checks payable to a specific person or firm.
9. Any unfilled spaces should be protected by drawing lines through them.
10. The signature should be carefully written, and the name should always be signed the same.
11. Make a notation on the left-hand corner of the check as to the purpose for which it is drawn.
12. Checks should not be drawn for a sum less than one dol ar, because this makes their handling unprofitable to the bank.
13. Frequent balancing of the account is desirable. It should be done at least at the end of each month.
14. Check carefully your monthly statement and the canceled checks returned when book is balanced.

15. In endorsing a check sign your name near the top of the torn edge of the check as you turn it over on its face.
16. Endorse the check exactly as your name appears on the face of the check. Or, if the check has been endorsed to you, exactly as it is written in the endorsement. Then in parenthesis beneath this first signature of yours, write your name correctly. This is of importance, particularly if you are sending the check to the bank for deposit or are endorsing it to someone else.

Points On Making A Will

Every person who has more property than he will probably need for sickness and burial should make a will. This is of vital importance if he wishes his property to be disposed of in a different way from that which is required by State law.

The laws of a State tell us just who will inherit our property, and what part of our property each heir will receive, if no will is provided. In such cases, an estate is divided by law.

Wills may be changed by codicil or remade by the maker at any time.

Have your attorney draw your will, because it must be written according to the requirement of the law, in order to be legal.

Here are four points in witnessing a will that must be very carefully carried out in order for the will to be legal:

1. There must be two witnesses, both present at the same time.
2. Both witnesses must see the testator sign the will.
3. Both witnesses must see each other sign as witnesses.
4. Both must sign at the request of the testator.

It is not advisable to have one of the beneficiaries of the will sign as a witness.

A witness of a will may be chosen administrator of the will.

Business Suggestions

1. "Before you invest, investigate."
2. Always read any paper before you sign it.
3. Never sign a check or a note with any person, no matter how good a friend he may be unless you are willing to pay the face value of the check or note.
4. Have a copy of any note you sign, for your convenience.
5. Know when your lease expires and when your property insurance expires.
6. Donot pay at the door for goods to be delivered at some future time.
7. If you subscribe for magazines, send the money to the publishers directly unless you know the person whom you are paying.

Home Demonstration Division
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Desirable Standards for the Farm Homestead and Its Surroundings

Home Management & House Furnishings

	Check Present Condition, Good, Poor or Bad	List Improvements for 1937	List Improvements for 1938
I. Exterior of Homestead			
1. Location, convenient to farm activities and outside communication.			
2. Barns, toilets, hog house, stable lot, garage, chicken house, etc., located to conform to standards of sanitation, convenience and appearance.			
3. House & fences and outbuildings in good repair and painted.			
4. Doors and windows well fitted with screens (16 meshes per inch).			
5. Weather-tight doors, windows, floors, roof & wall.			
6. House underpinned.			
7. One screened porch.			
II. Interior of Home			
1. Room arrangement			
(a) Rear entrance that does not necessitate passage through kitchen.			
(b) Interior finishes easily cleaned and of cheerful color.			
(c) Bathroom convenient to all bedrooms.			
(d) Storage space for household linens and bedding.			
2. Living Room			
(a) Space for entertaining friends.			
(b) Space and equipment well lighted for study, reading and sewing.			
(c) Space in home and yard for children's play.			
(d) A well arranged business center located somewhere in home.			
3. Bedrooms			
(a) A minimum of one bedroom for every two adults. Minimum of one bedroom for boys and one for girls, (allowing 50 square feet per child).			
(b) Cross ventilation in bedrooms.			
(c) Clothes closet space equipped with shelf and rod for hanger.			

	Check Present Condition, Good, Poor or Bad	List Improvements for 1937	List Improvements for 1938
4. Kitchen			
(a) An adequate supply of safe water conveniently located.			
(1) Pitcher pump in kitchen - Sanitary drainage for waste water.			
(2) Piped water supply in kitchen, hot water supply and bathroom to follow as means permit.			
(b) Kitchen 90 to 150 square feet with work units conveniently arranged and of correct height.			
(c) Cupboards and closets for daily and large quantity food supply; equipment storage.			
(d) Wash space for men apart from kitchen work centers.			
(e) Laundry and general service room - (to take "hog-killing" and wash from kitchen).			
(f) Adequate wiring to operate household appliances.			
5. Dining Room			
(a) Space for serving meals attractively.			
III. Heating			
1. Heating equipment which will maintain comfortable temperature in rooms constantly used.			
IV. Lighting			
1. Natural			
(a) Glass area one-fifth of floor area.			
(b) Each room having at least one exposure. Kitchen, living and sleeping areas preferably two.			
(c) Natural light on all work surfaces.			
(d) Passages and stairways lighted.			
2. Artificial			
(c) Safe, easily controlled lights for all rooms, hallways and stairs.			
(b) Adequate and convenient illumination for all work surfaces.			
(c) Adequate light for reading.			
(d) Restful and pleasing lighting throughout the house.			

	Check Present Condition, Good, Poor or Bad	List Improvements for 1937	List Improvements for 1938
V. Sanitation			
1. Sanitary Toilet			
(a) Privy screened to exclude flies, constructed to eliminate odors.			
(b) Septic tank			
Note: No form of sewage deposit should be located where it will contaminate water supply.			
2. Covered garbage cans, emptied daily.			

Extension Division,
N. C. State College,
Raleigh, N. C.

Helen N. Estabrook,
Home Management and House
Furnishing Specialist

HOW TO MAKE A TIME SCHEDULE

I. To determine your present activities and schedule of work
   (a) Make a form like first column on reverse side of this sheet for each day of the week.
   (b) Record in these forms what you actually do for one week.
   (c) Study this record to find (1) Tasks done daily and the preferred time for accomplishing these; (2) Non-essentials which might be eliminated; (3) Distribution of weekly tasks and (4) Number of hours daily spent at active tasks (these should be more than 6 or 8 for six days in the week).

II. To Make a Time Schedule
   (a) Rule large form like one on reverse side.
   (b) Record in first column the tasks preferred each day at the time you think you would prefer to do them.
   (c) Fill in the blank spaces with Monday's special work.

Remember to:

   (1) Keep your active work schedule to not more than 8 hours a day, including inside and outside work.
   (2) Plan a 5 or 10 minute rest or relaxation period after each 2 hours of work.
   (3) Allow 1/2 hour the middle of each morning and afternoon to catch up from the always unavoidable interruptions.
   (d) Indicate opposite these hours on the other days of the week special daily tasks for these days (Leave hours similar to Monday's blank).

III. Make a schedule for work assigned paid helper or other members of the family indicating the tasks to be done, the day and the hour at which it should be completed.

IV. To use your time schedule
   (a) Change your schedule from week to week as you find improvements you can make and time savers you can adopt.
   (b) Study the tasks which are taking more time than you consider them worth and try by better arranged work area or planning to reduce time required.
   (c) Relax every two hours.
   (d) Stop at the end of a good working day whether or not you have completed all the tasks you set for yourself.
   (e) Let your schedule serve you - do not be a slave to it.

V. When you have arrived at the time plan which really fits your situation, use it as a guide until it becomes a habit.

If you are interested in receiving a Home Management award, put this final schedule on the reverse side of this sheet and submit it to your home demonstration agent.

TIME SCHEDULE OF CLUB. CO.

6 A.M.							
6 30							
7							
7 30							
8							
8 30							
9							
9 30							
10							
10 30							
11							
11 30							
12 N.							
12 30							
1 P.M.							
1 30							
2							
2 30							
3							
3 30							
4							
4 30							
5							
5 30							
6							
6 30							
7							
7 30							

Home Demonstration Division
Extension Department
N. C. State College
Raleigh, N. C.

Mamie N. Whisnant,
Assistant Specialist in
Home Management

FARM HOME BUSINESS CENTER

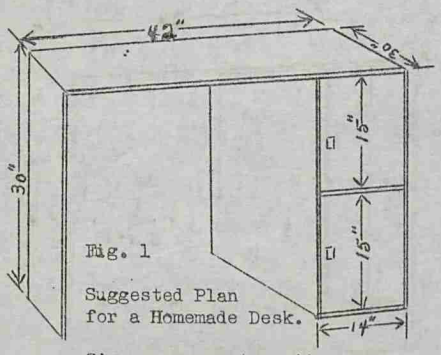

Fig. 1

Suggested Plan
for a Homemade Desk.

Size may vary to suit space where desk is to be used.

Every home should have a place to keep important papers, accounts and records.

I. Where?
- a. A definite and convenient place somewhere in house.
- b. Sufficient clear space for writing with ease.
- c. Sufficient and correct lighting.

II. When?
- a. Time to be determined by individual and family situation.
- b. Based to a great extent on habit which has already been formed or will have to be established.
- c. Determined also by general plan of farm and home activities.

III. How?
- a. Simple filing and bookkeeping.
- b. Determined by:
  1. Individual ability of person responsible.
  2. Educational background.
  3. Business training.
  4. Equipment and space.
  5. General business habits.

IV. What?
- a. Records of all Business transactions:
  1. Insurance.
  2. Loans.
  3. Deeds, A.A.A., etc.
- b. Records of all:
  1. Incomes.
  2. Expenditures.
  3. Savings.
  4. Budgets.
  5. Club activities, etc.
- c. Analysis of Records.

Note: All under IV.a. should be kept in a metal lock box which should be locked in desk.

Below: Same desk as Fig. 1 with top added. This top may be built on to a table about 30" by 40".

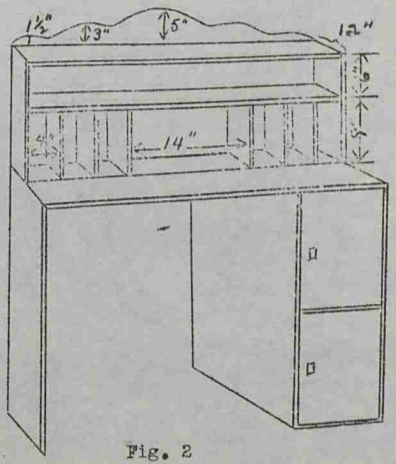

Fig. 2

Extension Department
N. C. State College
Raleigh, N. C.

Pauline E. Gordon,
Specialist in Home
Management and
House Furnishings

GETTING YOUR MONEY'S WORTH

The wise use of money in purchasing the consumer's goods is as important as the earning of money. We lose money when the use of an article we purchase does not return maximum satisfaction for the amount expended. When homemakers know and demand quality goods, then they will appear in the small as well as the large market. It is impossible for the consumer to determine quality in every case without expensive tests; therefore, we must put ourselves behind such movements as are underway to have goods properly labeled. There are:

I. Simplification:

A movement fostered through the Department of Commerce to limit and standardize sizes.

Examples - Bath towels from 93 sizes to 6, thus reducing selling cost.
Colors in plumbing enamels to four.

II. Standardization and Labeling movement:

Standard specifications for household buying are being developed through:

(1) Bureau of Agricultural Economics
(2) Food and Drug administration
(3) Bureau of Standards
(4) Bureau of Home Economics
(5) American Home Economic Association.
(6) American Standards Association, 29 W. 39th St., New York

III. Certification:

Some manufacturers are willing to certify that they will deliver goods up to government (or other) specifications. Some groups are controlled to some extent by their national organization which permits the use of its seal upon goods of a certain standard.

American Medical Association.
Underwriters Laboratories.
Wall Paper Association.

The seals of the manufacturing organization are of value in as far as they maintain a testing and penalizing system. Otherwise they are no better than magazine testing agencies which merely certify that the article is as good as any other in its class, without indicating any standards.

IV. Trade Marks and Brand Names:

This is an easy way of purchasing when one is sure of brand quality and price. Nationally advertised goods run more uniform than others and they also cost relatively more.

Every consumer can become a better buyer by:

1. Asking advertisers, door-to-door canvassers, storekeepers, and dealers to produce the scientific facts upon which their claims are based.

2. Refusing to buy staple articles like cloth and soap powders under a brand name which gives extra scope to the advertiser's fancy.

3. Comparing sales arguments.

4. Refusing to deal with firms making fantastic or misleading claims.

5. Calling attention of editors to misrepresentations either known or apparent in advertising.

6. Checking weights and measures.

7. Reading labels carefully and placing your reliance upon labels rather than sales talk.

8. Looking for weights on package goods.

9. Getting information from the American Medical Association on quality and character of advertised drugs and medical appliances.

10. Reading government bulletins which discuss specific products. Don't depend upon soap manufacturers for your home laundering hints.

11. Laughing heartily when you read a testimonial. They are paid for it

12. Making your own products at home- such as floor waxes, furniture polish, cleaning compounds, insecticides. The government will tell you how.

The consumer should keep her mind on the qualities she is out to buy. Guard against sales talk. For instance, in buying soap, think of the lather, the freedom from alkali, and the price per pound.

Be familiar with general textile values:

1. Know the fibers - cotton, linen, silk, wool, and rayon.
2. Reaction to laundering and other physical characteristics.
3. Yarn strength - fiber, kind, and quantity.
4. Weave - Eveness of yarns
   No. threads per inch
   Plain, twill, satin, etc.
5. Finishes - Sizing, weighting, fastness to color.

CHECK ON BUYING HABITS

Do you buy in (1) Your county _____. (2) In neighboring city ____.

(3) From mail order houses _____.

Number the following items 1 - 2 - 3 depending upon where you purchase.

Clothing

Outer garments
Hats
Shoes
Hose
Undergarments

Yard goods for underwear
Yard goods for dresses
Findings

Operating Goods

Soaps (hand (laundry
Cleaning powders
Brushes
Mops

Brooms
Blueing
Starch

Household Textiles

Drapery materials
Table linen
Sheets - made
Sheeting
Muslin for sheets
Bath towels
Face towels

Blankets wool cotton
Bedspreads
Rugs -fibre linoleum

Equipment

Lighting
Electric
Washing machines
Vacuum Cleaners

Refrigerators
Kitchen knives and forks
Cooking utensils

Personal

Toilet soaps
Tooth brushes

Hair goods
Powder

Food Supplies

What articles do you buy by trade name -

Soap _____ Beauty preparations _____

Sheeting _____ Shoes _____ Hose _____

Towels _____ Blankets _____ Rugs _____

Equipment _____

Do you find articles chosen by yourself after personal inspection more satisfactory than similar articles ordered _____ or purchased by other members of family _____. Star items in the above lists to indicate those in the purchase of which you are not certain that you get the best value for the money spent.

Home Demonstration Division
Extension Department
N. C. State College
Raleigh, N. C.

Specialists in
Home Management

GENERAL POINTS TO CONSIDER IN SELECTING KITCHEN EQUIPMENT

1 - Do I have need for the article?
2 - How often will I use it? — III. - Cream Whip
3 - Is it right size for my needs? — III. - Extremely large roaster
4 - Will it serve more than one purpose?
5 - Is it durable?
6 - Is it easily cleaned? — III. - Sink Strainer
7 - Is it easy to handle? — III. - Balanced dishes
8 - Is it comfortable to hold? — III. - Handles
9 - Is the price right?

KETTLES AND SAUCEPANS

1 - Are they balanced? Kettle hung even on bail - Sauce pan set level
Handle not too heavy

2 - Does sauce pan handle cut the hand? Will it get over hot?
Does kettle have ring for tipping?

3 - Is the equipment right or left handed or both?

4 - Are there seams or edges hard to wash?

5 - Does it shape to the stove to get maximum amount of heat?

6 - Do covers fit tight? Good knobs?

WIRE GOODS

Examples: - Dish Drainers - Egg Whips - Frying Baskets - etc.

1 - Frame strong, not easily bent.
2 - Small wires wound around frame as well as soldered.
3 - Mesh close enough so it will not slip.
4 - Mesh wire smooth and strong - when this wire breaks, article is valueless. (Flour sifter types)

MEASURES

CUPS -
1 - Liquid - space above top mark - lip right or left handed or both
2 - Dry - Even full equals 1 standard cup
3 - Avoid seams
4 - All measures clearly marked inside and out.

MEASURING SPOONS -
1 - Nests
2 - Unworn spoons for accurate measure.

SCALES -
Flat topped - adjust as needed

THERMOMETERS -
Oven - mercury (not metal loops) - Base protected from direct heat
Sugar - Mercury ball protected by movable slide for ease in washing -
Catch to hook on side of pan -
Wooden Handle -

EGG BEATERS

1 - Durable - Cogs - Heavy Loops - Durable handles
2 - Efficiency - Number of loops working
3 - Ease of holding - Smooth turning
4 - Ease of care - Freedom from grooves and joints difficult to clean
5 - Size suitable to amount of material beaten
(cup and large cover - small turbine beater)

CUTLERY - KNIVES

1 - Good Steel - (stainless does not hold edge as well)
2 - Handles - Riveted in between two pieces (slight warping)
Riveted in oval rubberized handle (easily cleaned)
Handle fitted to hand
3 - Blades - shaped to task to be done -
Spatula - 1 1/4" wide - 6" to 8" long - limber enough to bend at right angles.
Butcher Knife - 6" to 8" long - blade not too wide and tapering toward the point -
Two Paring Knives - slender, tapering blades - two types of points -
Care - Knife Racks - Do not overheat as it takes the sharpness from knives.
General Utility Knife - 'steak knife' style
Case Knife

HAVE SHORT AND LONG HANDLED FORKS -

MIXING BOWLS

Enamel or Earthern - Enamel may chip - earthern heavy to handle.
Use wooden spoon with Enamel to prevent marking.
Aluminum - darknes easily - otherwise satisfactory.

MEAT CHOPPER

Easily cleaned - Bowl opens for washing
One that does not allow liquids to drop off at back.
Few and Sharp Cutting Knives.

BAKING DISHES

No seams -
Deep Cake Tins -
Baking Sheet -
Muffin Pans -

etc.

Home Demonstration Division
Agricultural Extension Service
N. C. State College, Raleigh

H. M. Leaflet No. 19
Mamie N. Whisnant, Ass't Specialist
in Home Management and House
Furnishings.

HOUSEHOLD TEXTILES

A. Textile Fibers.
Cotton, silk, wool, flax, rayon. Discuss properties of each, also show and identify samples of each.

B. Weaves.

Weaving is the interlacing of yarns to form a fabric. The set of yarns held parallel to each other in the loom is called warp and the yarn woven in by means of a shuttle is known as "the weft" or "the picks". The five main types of weaves are: (1) Plain, (2) Twill, (3) Satin, (4) Pile, and (5) Gauze.

1. Plain Weave. Show samples of cloth made with plain weave: muslin, cretonne, voile.
   Modification: Basket weave, Monks cloth.
   Ribbed weave, Dimity.

2. Twill Weave. Show samples of serge, gabardine.
   Variation: Herringbone.

3. Satin Weave. (Not practical in textiles used for household purposes, except as seen in table damask.)

4. Pile Weave. Show samples of turkish toweling, Brussels carpet, corduroy, and Wilton rug.

5. Gauze Weave. Show sample of Marquisette.

C. Simple Tests for Fabrics.

1. To determine fiber: look and feel, burning for animal or vegetable fiber, moisture and wrinkling for linen, weaver's glass or microscope.

2. For sizing: light, rubbing, tearing, and laundry.
   Light: Hold fabric toward light. Heavy sizing can be seen between the yarns.
   Rubbing: Rub the surface of the fabric with a dark cloth, pressing hard. The sizing will sift out and look like white powder.
   Tearing: Tear the fabric with a quick jerk and the sizing will fly out in white powder form.
   Laundry: Wash sample in hot water rubbing hard. Dry it and compare with original fabric.

3. For weighting: burning in jar. The ash residue roughly represents mineral weighting. If fibers have been excessively coated, the form of the fabric will persist after all of the animal matter has been burned.

4. For quality of weaves: scraping, light, pin test, pulling, and shrinking.
   Scraping: Scrape surface of fabric with finger nail (lengthwise and crosswise). If the yarns are easily pushed apart the weave lacks firmness.
   Light: Hold fabric toward light. Light will show through loose, open weave (gauze and leno weaves not included in this test).
   Pin test: Run a tuck in the fabric with a pin. Pull on each side of the tuck. If the threads separate easily the weave is weak.

Pulling: Hold fabric between thumb and fore finger (both hands) leaving about an inch between. Pull straight and steady (lengthwise and crosswise). If easily torn, it is weak.

Shrinking: Place a good sized piece of fabric on plain paper, mark around it carefully, remove and wash. Dry, iron, and pin on same paper, mark around it carefully and measure difference between first and second markings (lengthwise and crosswise).

D. Color in Fabrics.

1. Yarn dyed. The yarn is dyed before it is woven into cloth. Example: striped or checked gingham.

2. Piece dyed. Dying is done after cloth has been woven. Example: colored broadcloth.

3. Printed fabrics. Similar to newspaper printing. Fabric is run between copper rollers of a printing press on which the pattern is engraved. Examples: percale, calico, cretonne, drapery, linens, and crash, etc.

4. Testing for color.

(a) Tub. Secure sample and wash. Use plain water and watch carefully for "bleeding". Another method is to plait a piece of white fabric with the colored fabric, wash in the usual way and watch for stains on the white piece. Always compare the washed piece with the original sample.

(b) Light. Curtain, drapery, slip cover, and upholstery materials especially should be tested for fastness to light. Place a sample in a closed book leaving half the sample exposed. Place in direct sunlight. After a week or ten days compare the exposed half with the unexposed half. The objection to this test is the time needed, but it is well worth trying where much expense is involved. Four weeks without fading is considered fast; three weeks with slight fading is moderately fast; noticeable fading in a week or two is not to be considered as sunfast to a worthwhile degree.

E. Information on labels.

Up to the present time there has been little or no information available for helping the consumer to buy wisely. Housewives are becoming more label-minded and as a result much more accurate and desirable information is to be found on labels than formerly. On a lot of bed linens now the following information may be secured on labels: thread count, tensile strength, weight, evenness of thread, maximum per cent of sizing, and first or seconds in quality. Similar information can be found on labels of other household textiles.

IT PAYS TO READ LABELS CAREFULLY.

LEAFLET NUMBER 111
U.S. DEPARTMENT OF AGRICULTURE

QUALITY GUIDES *in* BUYING HOUSEHOLD BLANKETS

By BESS M. VIEMONT, *assistant specialist in textiles, and* MARGARET B. HAYS, *assistant textile physicist, Division of Textiles and Clothing,*
BUREAU OF HOME ECONOMICS

Warmth and durability without too much weight are the qualities a practical woman desires most in the blankets she buys. She is looking for those that will keep out cold drafts and are strong enough to hold together in laundering and to resist wear by rubbing. At the same time, they must not be so heavy that they are uncomfortable as a bed covering, nor so expensively made that the average consumer cannot afford them.

Heat transmission, air permeability, tensile strength, thread count, weight, and resistance to abrasion are terms the textile experts use to describe these properties. Machines for measuring all of them are found in most mills and textile-testing laboratories.

When the Federal Government and many other large agencies buy blankets they write up detailed descriptions, or specifications. The seller furnishes samples for testing, and before the blankets are purchased the results of these laboratory analyses must show that the merchandise comes up to the requirements set by the specifications. If consumers had this kind of definite information on the labels of all blankets sold on the retail market, much of the guesswork would disappear from blanket buying. The purchaser could then compare accurately different blankets in regard to warmth, weight, and service to be expected.

Recently a test was made by the Bureau of Home Economics of 22 household blankets, representative of the various kinds sold in the retail stores and by mail-order houses. The results (p. 7 to 8) emphasize the need for stating the properties of each blanket clearly on the label. As yet definite information is rarely, if ever, available to the homemaker. Until it is, the following general guides may help her to avoid the most inferior products and choose instead blankets of good quality that will prove satisfactory in warmth, durability, and weight.

PROPERTIES OF A GOOD BLANKET

WARMTH

Warmth is the chief quality of a good bed blanket and depends upon the ability of the fabric to act as an insulator. The still air enmeshed in the cloth protects the person from cold drafts and keeps the heat generated by the body from escaping too rapidly for comfort. The kind of fiber, the nap, and the closeness of weave all contribute to warmth.

Kind of fiber

Most household blankets are made entirely of wool or cotton or a combination of the two. In practically all the mixed blankets the warp is cotton, though a few with silk warp have appeared recently on the market.

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ISSUED APRIL 1935

The filling of most blankets is either all wool or wool and cotton combined. Most authorities agree that 25 percent of wool is necessary to make an appreciable difference in warmth and to give the characteristic properties of wool, such as fluffiness, elasticity of nap, and ability to absorb moisture without making the blanket itself feel damp.

Late in 1932 a group of blanket manufacturers agreed to certain rules for labeling all-wool and part-wool blankets. These rules were issued by the National Bureau of Standards, of the United States Department of Commerce, as so-called "Commercial Standards" and became effective August 15, 1933. Under this agreement blankets must contain at least 5 percent of wool before the word "wool" can be used on the label. Those having less than this amount cannot be labeled "Part wool." Manufacturers accepting this trade practice further agreed that blankets containing 5 to 25 percent of wool shall be labeled "Part wool, not less than 5 percent", and those having more than 25 percent of wool shall be labeled with the guaranteed (minimum) wool content given in percentage. Blankets containing more than 98 percent of wool shall be labeled "All wool." All these percentages refer to the wool content of the entire blanket and not to the amount of wool in the filling alone. Although the manufacturer may agree to the standards, labeling is not at all compulsory. He may make several qualities of blankets and label some without labeling others, or he may label all or none. The plan simply means that if he does label his blankets he shall designate the amount of wool they contain in accordance with the rules set up.

Cotton and wool blankets containing 80 to 85 percent of wool usually have an all-wool filling. When the wool content is between 5 and 80 percent the two kinds of fibers may be blended before the filling yarns are spun. Another way to combine wool and cotton for the filling, particularly in blankets having 5 to 25 percent of wool, is to use a so-called core yarn. This has a small cotton yarn in the center to increase strength. The wool is wrapped around the cotton core in such a manner as to put all of it on the outside where it can go into the nap and make for greater warmth.

Certain characteristics of the fibers themselves influence the warmth of the blanket. The crimp and the scaly surface of wool permit it to enmesh air in the cloth. Also wool is naturally elastic. This prevents the fibers in a wool blanket from packing, and if properly laundered, enables it to keep much of its original fluffiness. On the other hand, cotton fibers are straight, smooth, non-resilient, and shorter than wool. Therefore, laundering or weighting down a cotton blanket with other bed covers squeezes out the air and reduces its warmth. Because cotton lacks the elasticity of wool it cannot spring back to its original condition readily or completely. After washing, a cotton blanket has to be renapped to restore its fluffiness and air-retaining ability.

When buying blankets for warmth, look for those with the highest percentage of good-quality wool within the price range you desire. Be sure to read carefully the label on blankets of mixed fibers and learn how much of each fiber has been used. The percentage of wool is some indication of the warmth of a blanket.

Napping

Napping increases the number of air pockets in a blanket fabric. It is a finishing process that pulls to the surface the loose ends of fibers from the soft, loosely twisted filling yarns in the foundation cloth. Briefly the method is this: After the foundation cloth is woven, it goes through a napping machine in which rollers covered with tiny wire claws revolve in one direction while the cloth travels in the opposite. The claws catch in the filling yarns and gently lift the free ends of the fibers. Sometimes the hook-covered burs of the teasel plant are used instead of the wire claws. The nap raised may be very thick or so thin

that only the surface fibers are rubbed up. Naturally the more the fabric is napped, the weaker the filling yarns become. Also the weave becomes less distinct. That is why the weave of a napped blanket looks blurred when you hold it up to the light.

While napping makes a blanket a better insulator in one respect, it may also lower its power to resist wind or, in other words, may increase its air permeability. However, household blankets are generally used indoors and with sheets and comfortables which help to hold still air around the body. For this reason they can be more loosely woven and heavily napped than blankets that are used out of doors and without other covers.

Weave

Hold the blanket up to the light to examine the closeness and evenness of the weave. If the cloth seems sleazy and thin in places it is probably too loosely and openly woven to be very warm. At the same time notice also the kind of weave. Most household blankets have either a simple twill weave or some modification of it, because a twill throws more filling to the surface than does a plain weave. Most of the reversible blankets have a modified twill weave which gives a great deal of filling on each side. Because there are more yarns to be napped this permits a thick blanket without so much injury to the foundation cloth.

DURABILITY

Durability comes next to warmth when selecting a blanket. It depends upon the quality of the fiber used in the yarns, the amount of napping, and to some extent upon its original size as well as on the way the blanket is washed.

The blanket fabric

If long, strong fibers are used in the foundation fabric of a blanket, the napping process merely pulls up the ends of the fiber while the rest remain anchored in the yarn. But if the fibers are very short and weak, the chances are that they are pulled entirely out of the yarn or broken so that they are merely caught in the nap. These loose fibers soon lose their grip and roll up in little balls of lint that shake off when the blanket is used. The sleazy foundation that remains is weak and has scanty nap.

When buying blankets you can get some idea of the durability of the nap by pulling gently on it. Does it hold firmly in the fabric, or does it come out easily? Also rub the surface of the blanket briskly with the palm of your hand. Does the nap fuzz up and rub off readily? If not, you may safely conclude that fibers of good length were used in the yarns and that napping had little, if any, injurious effect upon them. But if much lint comes off you may be sure that short fibers were used in the first place or else long ones were broken during napping, and in that case the blanket will soon lose its warmth.

Hold the blanket up to the light to examine the weave as well as to see whether the nap is distributed uniformly over the entire surface. There should be no thick or thin spots. At the same time compare the closeness of the yarns and their regularity in size. Smooth, even yarns, regularly spaced indicate better quality than yarns that are uneven, lumpy, and irregularly woven.

Unfortunately, there is no satisfactory test the consumer can apply to blankets in the store to estimate their strength. So until the label gives definite facts on durability, this important property must be judged solely by appearance and feel—both inaccurate guides. If the blankets are of adequate length, however, they wear better. When a blanket is too short the sleeper pulls and stretches it to make it come up over his shoulders and neck. Unless a blanket is long enough, if it is tucked in securely at the foot of the bed, the strain put on the yarns weakens them and in time causes holes.

In textile laboratories the durability of blankets is judged by their resistance to rubbing and by their breaking strength. The blanket is rubbed with an abrasive material and then calculations are made to determine the loss in weight due to wearing away the nap and the loss in breaking strength of the filling yarns.

Two methods—the grab and strip—are used to determine the breaking or tensile strength. For the grab method the samples of cloth are cut 4 inches wide and 6 inches long, but only a section 1 inch wide through the center is broken. In the strip method, the pieces of cloth are only 1 inch wide. The grab method, generally used in commercial testing and in some laboratories, gives higher values than does the strip method. This is due to the support given by the extra yarns on either side of the 1-inch section.

In practically no blanket of sufficient length need concern be felt over the durability of the warp yarns. During weaving they are stretched tautly in the loom and subjected to the wear of inserting the filling. They have to be strong to withstand this wear; otherwise they would break and cause trouble in the loom. Even thought the warp yarns are smaller than the filling (fig. 1), they are more tightly twisted, and in the finished blanket they are nearly always the stronger.

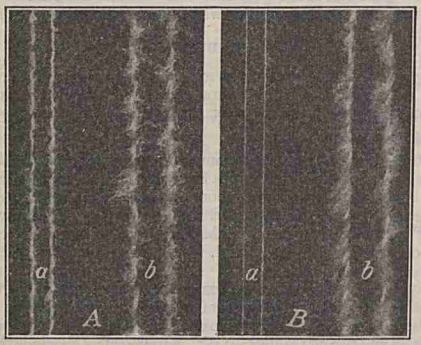

FIGURE 1.—Warp (*a*) and filling (*b*) yarns: *A*, both yarns of all-wool blanket; *B*, cotton warp and core yarn filling in a part-wool blanket.

The filling has less wear on it during weaving so that it is possible to use weaker yarns. In order to permit heavy napping with the least damage to the cloth the filling yarns in many cases are so soft and loosely twisted that they pull apart especially during washing. The wool takes up so much water that the added weight puts more strain on the filling than it can stand unless the blanket is handled very carefully.

Oftentimes blankets are damaged when they are washed. Warm, soft water, mild soap, the least possible handling, and no sudden changes in temperature are essential for good results when washing wool blankets. Hot water suddenly changed to cool, strong soaps, and rubbing cause the scales on the surface of wool fibers to lock into each other. This is called felting and always results in shrinkage. Attempts to restore the blanket to its original size and shape break the fibers into short pieces so that they soon work out of the yarns. Also the scales are stripped off and the power of the fibres to hold in air is destroyed. Besides making the blanket less durable it is no longer so warm as it was when new.

End finishes and bindings

Blanket bindings (fig. 2, *C*, and *D*) of silk and rayon in a satin weave or of cotton sateen are the most common nowadays, although some of the lightweight cotton blankets have a lock-stitch edge that wears well if the ends of the thread are securely fastened. Sateen is durable but usually fades some in washing. Silk or rayon bindings often wear out more quickly and have to be replaced sooner than the cotton, but generally hold their color, catch the soil less easily, and match the blanket fabric more closely than the cotton bindings. Since both edges of sateen bindings are raw, there should be at least two rows

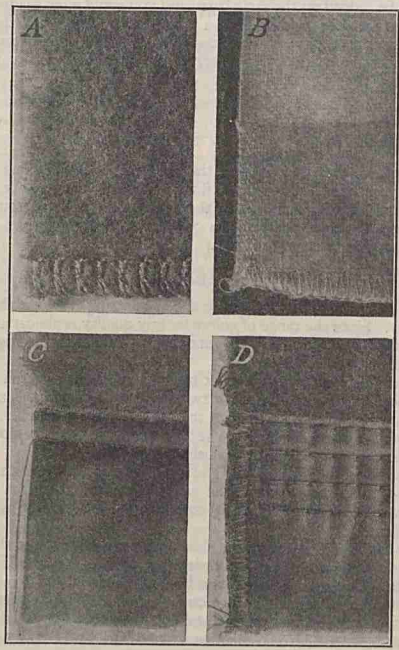

FIGURE 2.—Types of end finishes: A and *B*, blanket stitch; *C*, sateen binding; *D*, silk-satin binding.

of stitching on bindings of this kind, one very close to the edge to prevent raveling and the other farther back to hold the binding securely in place.

Examine the way in which the ends of the binding are finished. On the better quality blankets the binding is boxed at the corner; that is, folded back an inch or more at the end (fig. 2, *C*). This makes a very neat finish which wears well. Sateen bindings also are often finished in this way or are cut off flush with the side of the blanket, leaving a raw edge that is covered with an

overlocking stitch (fig. 2, *D*). Although it never looks so neat as the boxed corner, this finish may wear satisfactorily if the ends of the thread are well-fastened. Pull gently on the threads to see that the stitching does not unravel.

WEIGHT

The finished weight of a blanket is sometimes designated on the label. This is helpful if you are comparing blankets of exactly the same size and fiber content. However, a much better method would be to state the number of ounces that a square yard of the blanket weighs. Then blankets of different widths and lengths could be judged on the same basis, and you could more easily choose the one suited to your needs. Until such a plan is put into practice, the following figures calculated by weighing and measuring a number of blankets may serve as a rough guide. They are not, however, to be considered as standard weights.

For a blanket 72 by 84 inches:

Total weight:	*Ounces per square yard*
4½ pounds	15
3½ pounds	12½
3 pounds	10½

In comparing weights, be sure that the blankets are of the same material as well as of the same size. For example, if two all-wool blankets alike in size and price are different in weight, naturally the heavier one will give you more wool for the money. If one of the blankets contains some fiber besides wool, then you cannot compare them in this way.

APPEARANCE

Generally, color is of less importance when selecting blankets than warmth and durability. Since the range of colors for any quality is almost always large enough to permit a choice that will harmonize with other furnishings, it is well to select first on quality, then on color.

Blankets may be plaid; or one color on both sides, either with or without contrasting borders across the ends; or two-tone reversible, that is, a plain color on one side and a contrasting color on the other. Some of the more luxurious reversibles have shaded borders. In recent years the trend has been toward solid-color blankets even in the inexpensive cotton ones.

Before deciding on the color, unfold and look at the entire blanket to make sure that it is an even tone all over. Some wools dye differently from others, and while this occasionally produces special color effects, it may result in undesirable shadings.

While you have the blanket unfolded, examine the ends to see that they are cut straight. If there are stripes or borders use them as guides. If the blanket is a plain color, hold it up to the light and see whether the end is cut parallel to the filling threads. Blankets that are cut crooked may be finished to appear straight but with use and washing will take on their true shape. If you should attempt to straighten such a blanket you would probably end with one too short for comfort.

Be sure also that contrasting borders, stripes, and plaids are of the same fiber and woven in the same way as the rest of the blanket. A difference in the kinds of fibers or yarns or in the weave may cause a blanket to shrink unevenly when washed and leave ripples and puckers that you cannot smooth out. Notice stripes and borders especially. They should look the same as the rest of the blanket. If they seem taut or full, then they were woven under a different tension from the body of the blanket, and this difference will be even more conspicuous after the blanket is washed.

SIZE

Length and width of a blanket can be determined with reasonable accuracy in the store. Generally these figures are stated on the label. However, the Bureau of Home Economics found that actual measurements tallied with the claims in only 3 of the 22 blankets studied. If the size is not stated, the blanket can be easily and quickly measured.

Blankets should be long enough to tuck in at the foot of the bed and to come up well over a person's shoulders, and also wide enough to hang down over the sides of the mattress. To estimate the length of blankets to buy, measure the length and thickness of the mattress, then add at least 6 inches for a tuck-in at the foot. For the width, measure the width of the mattress and add the depth of the two sides. This gives the minimum size. It is better to allow a few extra inches each way for shrinkage and for take-up by the body. Sometimes novelty-weave blankets, for instance those that resemble homespuns, are made shorter than the regular household sizes. They are intended for slumber throws, so that a tuck-in is unnecessary.

Both price and weight, of course, vary with size. When buying blankets on the bargain counter or at special sales, be sure to examine them to see that they are the same size as those selling at regular prices. A difference in price may be due to difference in size.

Blankets range from 54 to 80 inches wide and from 76 to 90 inches long. Some years ago each manufacturer made blankets according to his own set of measurements. This, of course, resulted in a great many different sizes. In 1924 a group of manufacturers under the sponsorship of the Division of Simplified Practice of the National Bureau of Standards decided to limit the blanket sizes to the widths and lengths shown in table 1.

TABLE 1.—*Sizes of blankets*

For single beds	For twin beds	For double beds
Inches	*Inches*	*Inches*
54 by 76	66 by 76	68 by 80
60 by 76	66 by 80	70 by 80
60 by 80	66 by 84	72 by 84
60 by 84	66 by 90	80 by 90

Now practically all qualities of blankets come in any of these sizes. However, the small sizes usually prove poor economy because every blanket shrinks some in laundering. During recent years when the price of raw wool was low, larger blankets appeared on the market until now the 80 by 90 inch size, sometimes called a luxury size, is found commonly. A blanket of these measurements is sufficiently large to tuck in well and to cover even a very large person.

The length and width given for blankets always refer to a single thickness. For example, if a pair of double blankets is woven in one continuous piece 72 inches wide and 168 inches long it will be labeled 72 by 84 inches. The same is true if a pair is cut in the middle, each bound separately and the two sold as a pair.

COMPARISON OF HOUSEHOLD BLANKETS

Many reasons for the consumer's difficulties in selecting blankets were brought out by a study made at the Bureau of Home Economics. The following comparison of blankets based on the analysis of 22 such blankets varying in price and fiber content shows how difficult it is to judge quality by appearance and the scanty information given on labels.

Among the all-wool blankets one was outstanding. It had a filling strength of 50 pounds (grab method) which, with but one exception, was twice that of any other in the same group. This blanket was very warm and also showed the most resistance when tested for wear, but it was the heaviest of all examined (15 ounces per square yard). At the other extreme was a relatively inexpensive all-wool blanket, light in weight (8.6 ounces per square yard), but its filling strength (18 pounds, grab method) was only fair and it was unsatisfactory in wear and warmth.

Among the 11 all-wool blankets analyzed was a blanket of medium price with filling strength (26 pounds, grab method) and weight (12 ounces per square yard) that lay about half-way between the highest and lowest for this group. It lost 30 percent in weight when tested for rubbing, whereas another lost 75 percent and one at the other extreme only 8 percent. When tested for air permeability, 94 cubic feet of air under a certain pressure passed through 1 square foot of this blanket per minute in contrast to the extremes of 173 and 69 cubic feet for the others. In heat transmission this blanket ranked sixth. While not unusually good in any of these properties, it may prove as satisfactory as some of those higher in filling strength, weight, or warmth, but low in other qualities.

One of the blankets in the all-wool group showed the effects of too much napping. It was soft, fluffy, warm, and of medium weight, but its filling strength was only 11 pounds (grab method) to the inch. That, together with the preponderance of short fibers found in the yarns, made it a very unsatisfactory purchase.

The wool-cotton blankets gave similar results. A mixed blanket containing 80 percent of wool proved to be stronger in the filling (60 pounds, grab method) than the best all-wool one. In warmth and resistance to wear it ranked next to the top for the wool-and-cotton-mixed blankets, but it was heavy (15 ounces to the square yard). The cotton-and-wool blanket most uniform in all respects, contained only 25 percent of wool. For warmth and resistance to wear it came about midway between the extremes, and the weight (12 ounces to the square yard) was satisfactory. The strength of the filling was sufficiently high (38 pounds, grab method) and was probably due the core yarns (fig. 1, *b*).

LABELS

It would be to the mutual advantage of both the manufacturer and the consumer if the labels attached to blankets gave definite information about their warmth and wearing qualities. For example, many manufacturers make several grades of all-wool and wool-mixed blankets, but the only difference the average homemaker can detect is that in price and possibly in thickness and feel. She has no way of knowing which is the best buy for the money. An ideal label for a blanket would state:

Length and width in inches.

Fiber content in percent.

Weight in number of ounces per square yard.

Tensile strength of the fabric, especially fillingwise, and whether determined by strip or grab method.

A measure of warmth, either heat transmission or air permeability or both.

In wool-mixed blankets, type of yarn construction; that is, whether the warp is all cotton and the filling all-wool, a core yarn, or a blended yarn.

U. S. GOVERNMENT PRINTING OFFICE: 1935

For sale by the Superintendent of Documents, Washington, D. C. - - - - - - Price 5 cents

SUCCESS IN FINE LAUNDERING

General Methods: (1) Soak in cool water 5-10 minutes.
(2) Agitate in lukewarm suds for 15 minutes. Hot water may be used for cotton and linens. Shorten the washing time for delicate colors or fabrics.
(3) Rinse in water of same temperature as wash water.
(4) Follow by one or two cooler rinse waters.

Whiteness: Results from proper laundry methods. All bleaching is harmful to fabrics. If necessary to whiten clothes made gray by poor washing methods do this once as a separate step then keep white. Among less injurious bleaches are:
(1) Soak in water containing 2 cups white vinegar per tub, or
(2) Boil for 15 minutes in water containing 1 or 2 ounce citric acid (or juice 1 or 2 lemons), or
(3) Week hydrogen peroxide may be used as bleach for white silk.

REAGENTS: Water: Soft water is essential to good laundry work. If water is hard it should be softened as a preliminary step, using care not to have excess of softening agent.

Soaps: Fine articles should be washed with a live suds of neutral white soap. White articles should be washed with white soap. Resin soaps aid in cleansing heavily soiled articles. Washing powders are at least 40% alkali builder and should not be used as soap in laundry processes.

Stiffening Agents: Home stiffening agents have as their purpose replacing the finish given the fabric by the manufacturer. This finish not only stiffens the fabric but leaves it smooth and pliable and gives it a certain attractive feed. Home dressings should produce all these results when possible. Use commercial starches as directed.

(1) Starch paste: 2 -- 6 tablespoons cornstarch
1/3 cup cold water
1 quart boiling water
1/2 teaspoon lard, paraffine, or any white wax.
Cook paste 15-20 minutes in double boiler.
Dilute with hot water as used.

(2) Rice or Potato waterm carefully strained thru cloth, may be used as a stiffening agent.

(3) Special dressings are sometimes desirable for silk or fine cottons. Gelatine or gum arabic may be used. The stock solution is made by dissolving 1 ounce of gelatine or gum in 1 pint of water. Add a small amount of borax if solution is to be kept long.

For use dilute using:
1 part of gelatine solution in 8 to 15 parts of hot water or
1 part of gum arabic solution in 5 to 10 parts of hot water.

Points to Consider in Cleaning Delicate Fabrics

1 - Carefully cut and made textiles launder better than carelessly made ones.
2 - Practically all fabrics, except glazed ones, may be cleaned with soap and water if time of exposure to moisture is short.
3 - Prepare a tepid bath of lukewarm (90 to to 120 o F) suds made with neutral white soap. Prepare also a series of two rinse waters of same temperature as wash water and one cooler rinse water.
4 - Wash with pressure-suction metthod only. Carry each article thru the wash water, successive rinse waters and dry immediately.

5. Dry by holding between soft absorbent white cloth. (Pile fabrics are hung dripping wet. Knit materials are stretched into size and shape and dried flat.)
6. Press when slightly damp.

Knit material is pressed adding a weight during the drying process, i.e. while stretched flat between two absorbent pads of cloth.

Cottons are ironed on right side except those of coarse texture as tweeds, unbleached, etc. Iron should be sufficiently hot to glaze the starch in first contact.

Woolens are pressed. Pressing is forcing steam into the fibers. Place a slightly damp cloth on right side and iron with moderate iron.

Silks are ironed on wrong side when dry or very slightly damp. Test iron on tissue paper. It should not smell or smoke. Iron in one direction only. Iron pongee when thoroughly dry.

Synthetic Fibers: Some are sensitive to heat and so a very moderately heated iron is best. They may be ironed dry or slightly damp. Size and shape of article cannot be changed in ironing the same may be stretched into desired shape while drying.

Suggestion: The laundering of fine textiles requires thoughtful care rather than muscle power. It is always best to wash an article before it becomes too soiled as frequent sudsings are not as injurious as a hard scrubbing.

Washing Woolens:

Suds made from the following solution and lukewarm water are found to give good results.

Wool-Wash Solution: Shave one bar of neutral white soap into a quart of water and bring to the boiling point. When thoroughly dissolved and cold, add two tablespoons of borax and one-half cupful of denatured alcohol.

Points to consider in laundering woolens:

1. Use plenty of warm soap suds. Change suds when it becomes soiled.
2. Use plenty of water of same temperature as suds for rinsing. Rinse in successive waters until the rinse bath is perfectly clear.
3. Use pressure-suction type of cleaning. May be secured with washing machine, hand plunger, or the squeezing motion when work is done by hand.
4. To dry, put article through the wringer flat or press out all possible moisture. Do not twist.
5. Fluffiness is increased by drying on a breezy day, by changing position of article and shaking it during drying. (Garments are stretched into shape and size and dried flat). Napped materials are brushed after drying.

SOAPS AND SOAP PREPARATIONS FOR HOUSE CARE

SOAP MAKING

Ingredients: 6 lbs. clarified fat, 4 cups water, 1 can lye.
Note: If hard fat, ei. beef or mutton, is used use 6 cups water.

To clarify fat: Waste fats may be used for soap making. Place fat, a sliced raw potato in a large quantity of water and bring to a boil (take precaution of using a large container.) Strain through a muslin cloth and cool. When cold remove fat from water. Repeat if fat had been salted. Then heat fat until it stops crackling, indicating that it is free from moisture. Allow to become cold but not to solidify before combining with lye.

Lye Mixture: Pour lye into water and stir occasionally until dissolved. Allow to become cold. Caution: Use enamelware or iron utensils.

To Make Soap: Pour lye into grease slowly stirring constantly. Beat until of consistency of strained honey. Sufficient air stirred into soap makes it float.

To Mold: Pour into pans or boxes lined with waxed paper. When set score with knife for cutting. At end of 18 to 24 hours remove from container and cut with pliable wire or strong cord. Set away for 5 or 6 weeks before using. This allows complete union of fat and alkali. An alkali free soap should result.

To Test Soap for Free Alkali: Place a piece of red litmus paper against a freshly cut edge of soap. If free alkali is present it will immediately turn blue.

To Make Strong Laundry Soap: Add ½ cup of ammonia and ¼ cup of borax to fat and mix well before adding lye. These alkalies are not harmful to hands and fabrics but are to delicate colors.

To Scent Soap: Add a few drops of oil of lavender or any oil scent while beating soap.

SOAP FLAKES: Flakes may be made by shaving dry bar soap or vegetable cutter or putting through food chopper.

SOAP JELLY: Dissolve one large cake of neutral soap (8 oz.) into one gallon of hot water or use one part of soap flakes to 4 parts of water.

PORCELAIN CLEANER: Before soap jelly coagulates add 2 tablespoons of kerosene to one cup of the mixture and store for cleaning enamel and porcelain sinks and basins.

SCOURING SOAP: Mix one part of soap jelly with 4 parts of whiting. Store in wide mouthed container. This makes a scouring mixture of a fineness which will not injure most surfaces.

Liquid wax for refinishing and polishing

¼ lb. paraffin
¼ " beeswax
1 qt. turpentine

Melt the paraffin and beeswax together, heat turpentine by putting it in a vessel large enough to mix the polish in and set it in a vessel of hot water (it should not be set directly on the stove as there is a great danger of it catching fire). When hot, stir in melted paraffin and beeswax; stir until cold.

Floor Wax

¼ lb. beeswax
1 " paraffin
¼ pt. raw linseed oil
1¼ pts. turpentine

First melt the beeswax and the paraffin, add the linseed oil and turpentine, and stir the mixture well. Turpentine is inflammable.

Water Stain for Floors

1 gallon of water
1 peck green walnut hulls.

Let the water remain over the hulls 48 hours. Strain off and apply to the clean, dry, floor. Test the stain on pieces of board like the floor on which it is to be applied. If the color is darker than you desire, add water to it; if it is lighter than you like, add one or more teaspoons of permangenate of potash.

Mixture to remove water and heat spots on varnish

1 tsp. vinegar
½ " turpentine
3 " oil

Mix. Shake well before using. Put a few drops on stain, let stand for 5 minutes, then rub briskly with soft cloth, rubbing with the grain of the wood. Go over entire surface with oiled cloth when stain is removed.

Note: Preventing spots is the best policy, as in many finishes they cannot be removed.

Laundry STAIN REMOVAL

REAGENTS FOR STAIN REMOVAL CABINET

1. 10 percent Ammonium hydroxide solution. Dilute as necessary.
2. Oxalic acid solution - 1 tsp. crystals to 1 cup water.
3. Small bottle hydrogen peroxide (deteriorates on standing).
4. Javelle Water - To Make: Mix 1 lb. washing soda and 1 qt. boiling water in one bowl. (earthen or enamelware)
   Mix ½ lb. chloride of lime and 2 qts. cold water in second bowl. Combine mixtures and allow to settle. Bottle only the clear liquid for use.
5. Pure soap flakes., 6. Magnesia. 7. Absorbent cloth.
8. Denatured alcohol. 9. Carbon Tetrachloride.

FABRICS:

The proper treatment for stains is dependent upon the fiber from which material is made and upon the stain itself. Cottons and linens are not easily injured by applications of either mild acid or alkali if well rinsed following the treatment. Wool and silk are weakened and may be dissolved in alkali. Acids, alkalis, and chemicals should be avoided on synthetic (artificial) fibers.

METHOD OF WORK:

1. If garment is to be laundered, stretch stained place over a bowl, moistem with water and proceed with reagents. Use medicine dropper to apply reagents.
2. If garment is not to be laundered place stain over pad of white cloth or blotter and apply reagent with blunt end of match. Change pad frequently.

Cautions:
1. Rinse or wash all reagents out of the material immediately. Use warm water.
2. Remove the stain before it dries if possible.
3. Wash any unknown stain in cold water first.
4. Always begin with simplest reagents first ei. absordent, solvents, thin chemicals.

TO REMOVE STAINS

Stains may be Classified as
I. Fatty and greasy substances
II. Sugars
III. Albumenous stains
IV. Dye-like stains
V. Paint, etc.

1. For all fats and greases. Use:
   1. Grease solvent for materials which are not washable; ei. gasoline (inflammable) or carbon tetrachloride (non-inflammable). Sponge spot with clear water to remove any stain.
   2. Hot water and soap for wash materials. (Traces of stains left as from chocolate, etc., may be bleached with hydrogen peroxide). Water rings are removed by gentle rubbing with a rough cloth.
   3. For combination of substances, as in ice cream, remove sugar and color matter with cold water and then cleanse with grease solvent.

Home Management and House Furnishings Specialist

II. For sugar, candy, etc.
1. Sponge with clear cool water. Remove water spot by rubbing together after dry or rubbing with rough cloth before pressing.
2. For combinations of sugar and dye as in punch treat for both, removing sugar first.

III. For albumenous stains, as egg, cheese, blood, nuccus, milk:
Wash or sponge with cold water.
Rinse with clean, cold water.

IV. Dye-like stains.
Fruits and berry stains:
1. Pour boiling water through strain on wash materials.
2. Sponge delicate fabrics with warm water.
3. Bleach old stains with hydrogen peroxide.
Grass and Iodine Stains:
1. Soap and hot water for wash fabrics. Kerosene a solvent.
2. Denatured alcohol for silk and wool.
Ink - Clear warm water applied immediately and in quantity where possible.
Ink eradicator. Wash thoroughly.
Sour in milk after washing while fresh.

Iron Rust - Lemon juice and salt.
For both ink and iron rust, hot oxalic acid (poison) solution may be applied to cotton and linens where color is not a consideration.

Tea - Moisten with glycerine, wash in hot water.

V. For paint, varnish, glue, fly paper, etc., use:
1. Warm water and soap.
2. Kerosene and warm suds water.
3. Carbon tetrachloride.

VI. Miscellaneous:

Mildew - 1. Soap and water
2. Bleach with Javelle water or hydrogen peroxide.

Scorch - 1. Water and sunlight for wash materials.
2. Hydrogen peroxide bleach for white goods.

Perspiration Stains:
1. Sponge out immediately with clear water.
2. Warm suds (with the addition of one tablespoon of hydrogen peroxide to each basin) may remove dye stains carried into the fabric.
If color will stand it, boiling increases the effectiveness.
3. Very diluted hydrochloric acid solution. (5-10 drops dilute in glass water).
Rinse well with clear water.

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Pauline E. Gordon, Ext. Spec. in Home Mgt. and House Furnishings
H.M. Leaflet #61

Laundry Equipment

"The woman who washes without equipment is twice tired."

Laundry methods take a heavy toll in time and energy. If human conservation is worth the trouble, modernizing the home laundry is one place to start.

A separate laundry room is desirable. The family laundry should not be done in the kitchen because odors, steam and heat from laundry work are disagreeable. The handling of soiled clothing in any room in which food is prepared is highly objectionable. If clothes must be washed in the kitchen, the sorting should be done elsewhere.

The Laundry Room

The laundry should be located on the ground floor. If it is in the basement an incline should be built so that the laundry can be taken to the line on a laundry wagon. It should be well lighted and heated. Equipment should be arranged to save steps and stoops. Equipment should be in logical sequence.

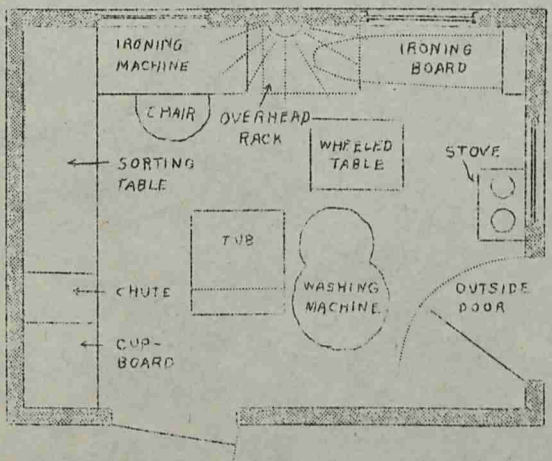


Fig. 1.--A laundry room (10½ by 8 feet) with modern equipment placed for good routing of the work.

Equipment

Washing machine: Requirements of a good washing machine are:

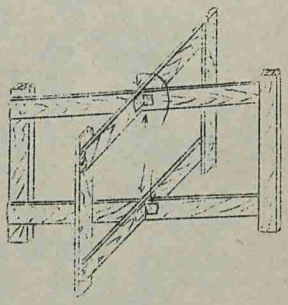
a. Washes clothes without wearing them out.
b. Washes enough clothes at a time.

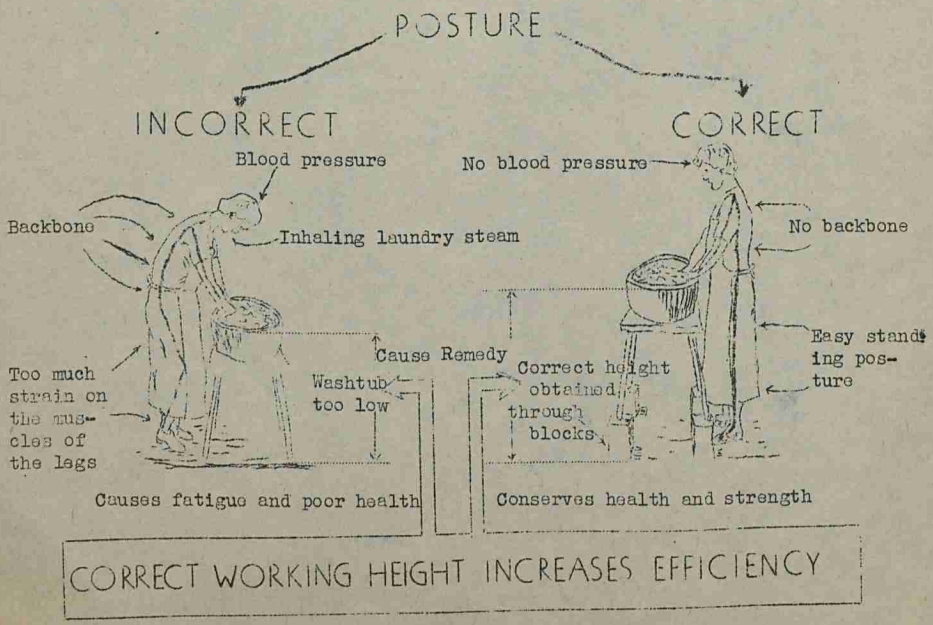
Weight of your weekly wash determines size of washing machine needed. Overloading is bad on clothes and equipment. Frame work should be of good steel, welded and braced. Electric machines should be well insulated.

Wash tubs should be of material that is durable and easily cleaned. Set tub so that bending is necessary only from hip. Tub should be set high enough to minimize the amount of bending.

STAND FOR WASH TUBS

It Folds Up After Use: This substantial support for the family wash tub can be folded up and shoved into a corner when not in actual use. Dimensions of the main frame and hinged legs are not given as this depends on the size of the tub and height of the worker.





Stationary tubs or tubs on standing casters should be placed where the light will not fall into the workers' eyes.

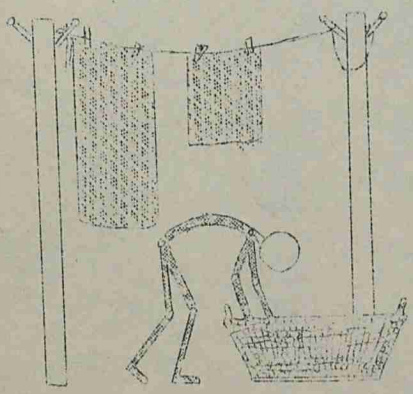
If possible hot and cold water faucets should be installed. If this is not possible, connect rubber hose to nearest faucet.

Washboard of tin or iron or rustproof stainless metal or glass. It should come above top of tub and should be free of rough edges or sharp points.

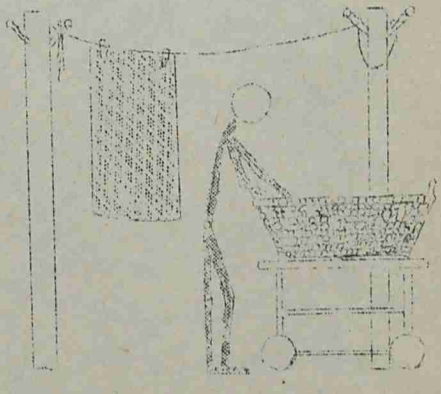
Wringers save energy. "Ballon" type of rollers prevent injury to buckles and buttons. Do not subject to fabrics to as much wear as the hard rubber types.

Laundry Stove. Stoves for boiling clothes, making starch and other purposes should be installed. Combination stoves may be had and can be used for water heaters also.

Starching Utensils: Sauce pan, spoon, measuring cup, strainer and large pan.



Constant bending causes fatigue



Correct placement of basket makes work easier

POSTURE WHEN HANGING LAUNDRY

Clothes Lines: Hemp rope; galvanized copper line; wooden frame good for rainy days. Boil a new rope in soap water for a few minutes to soften it. It also gives a longer life.

Clothes Pins: Smooth wood serves long and well. Those with springs corrode easily.

Bag or Basket for Clothes Pins: Use bag or basket that can be hooked on line to hold clothes pins.

Curtain Stretchers: Standard frame type or make one by winding strips of wood with heavy cloth to which the curtains are pinned.

Containers for Soiled Clothes: Enameled hampers.

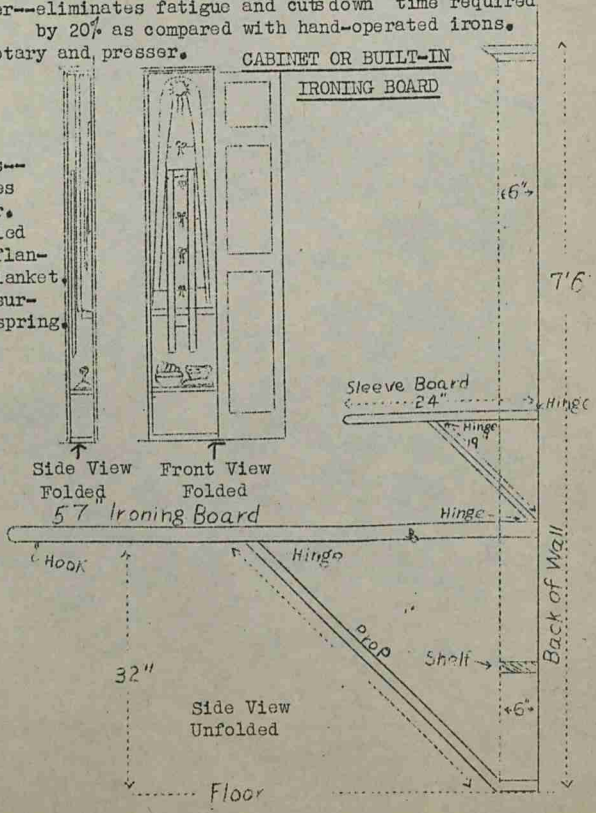
Basket to Take Clothes to Line: Lined with washable oil cloth or heavy paper.

Equipment for Ironing:

a. Electric ironer---eliminates fatigue and cuts down time required by 20% as compared with hand-operated irons. Two types---Rotary and presser.

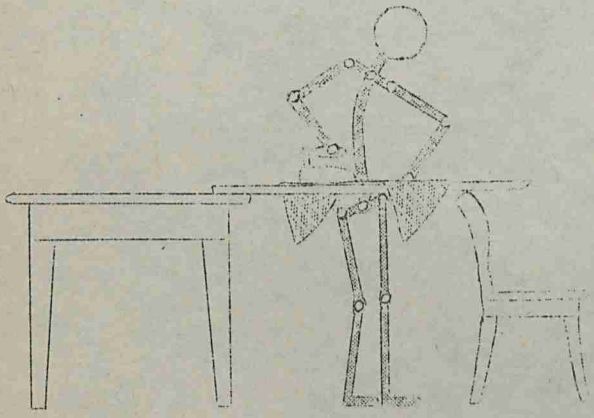
b. Electric hand iron.

c. Ironing boards--- 31 to 32 inches from the floor. Pad with doubled faced cotton flannel, or old blanket. Allow enough surface to give spring.

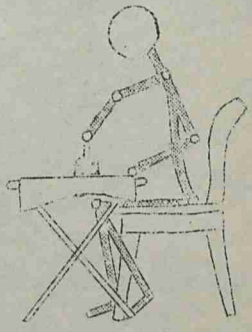


Detailed construction of a folding ironing board and its wall case.

POSTURE FOR IRONING



Standing is fatiguing



Sitting is more comfortable

Time Study Task WINDOW WASHING

To void being bankrupt for Time, study your business to see
if - There are needless jobs
if - There are needless repetitions
if - The equipment is labor saving
if - The equipment is well arranged
if - The best methods of work are used
if - The schedule is well planned
if - The results are satisfactory.

The Best Methods of Work

Every Task has three elements of time -
The get ready time
The do it time
The clean up time

In the best method of work the get ready and clean up times are the shortest possible.

Possible Methods of Window Cleaning

Needless repetitions of the task may be saved by frequent dusting.

Steps in task - (1) Cleansing - (2) Drying - (3) Polishing.

(1) Means of cleansing - Liquid cleaners or dry cleaners.
(a) Clean warm water.
(b) Warm water containing either borax, washing soda, ammonia, (1 tbsp. per qt.) kerosene or alcohol.
(c) Light soap suds (d) Alcohol
(e) Whiting or commercial powder moistened with water or alcohol. Method selected influenced by amount of soil on the glass, availability and cost of reagent, time required for drying and polishing, any necessary clean-up following the process, and individual choice.

(2) Drying -
(a) For ease in drying use a lintless cloth, paper, or chamois wrung from warm water. A little alcohol poured into cloth wrung from warm water facilities speed of drying. A squeezee may be used when an abundance of moisture is used.
(b) Considerations which prevent streaking -
Do not wash windows while sun is shining on them.
Dry with even overlapping strokes.

(3) Polishing -
A method which depends upon extra rubbing for its luster should be avoided.
(a) Chamois, squeezee and alcohol polish as they dry, while other methods require rubbing with soft cloth or paper.
(b) Whiting results in good polish but makes dust on other furnishings.
(c) Soap method of cleansing may result in a film on glass which requires much rubbing to remove.
(d) If the liquid dries without rubbing, streaking results.

Method of work influences results. Dip cloth in the liquid cleaners; wring as dry as possible; clean glass with this cloth, using even overlapping strokes. (Large rather than small strokes use large rather than small muscles); dry by rubbing briskly.

Time Study QUESTIONNAIRE.

What are your time Problems?

1. Do you wish more time_____? For Housekeeping_____?
   For Personal_____?
2. Are you habitually overtired_____, hurried_____,
   confused_____?
3. What percent of your time do you spend in your kitchen_____?
4. Are your house and kitchen arranged to require the minimum
   number of steps_____?
5. Are your tools efficient_____, in good working order_____
   conveniently stored_____?

Effect of Method of Work Upon Individual and Family: -

6. Are you satisfied you are using the shortest and best methods
   of work_____?
7. What task do you enjoy most_____? What task do you dis-
   like most_____? What task tires you most_____?
8. Are you cheerful_____? enthusiastic_____? Free from
   worry_____?

Family Cooperation: -

9. Do you plan daily or weekly with each child their apportionment
   of household and yard tasks_____?
10. Does your family enjoy working and paying together_____?
11. Do people enjoy coming to your home_____?

Personal Development: -

12. Do you ever really play_____?
13. Do you take at least 1/2 day each week for something entirely
    different_____?
14. Do you read something worthwhile at least once a month_____?
15. Are you interested in music_____, birds_____,
    flowers_____, a hobby_____.

HOUSE CARE PRACTICES

Making the Dustless Duster -

Use a yard square of soft cloth as cheese-cloth, or use outing or sheeting and overcast or hem the edges. Treat in one of the following ways:

1. Moisten with a mixture of denatured alcohol and citronella in the proportion of 3 tablespoons of denatured alcohol to 2 tablespoons of citronella, and wring as dry as possible.

11. Moisten slightly with kerosene and hang out in the air for three hours.

111. Place 2 tablespoons of either of the following: paraffin oil, lemon oil, boiled linseed oil, or kerosene, in a quart jar or covered container and turn it about until the oil or kerosene is evenly spread over the entire interior surface. Pour out any surplus. Place cloth in jar or can, close tightly and leave over night before using. For waxed furniture or surfaces use liquid wax in place of oil or kerosene.

Why not have one for each area of the home? They may be washed and reoiled as necessary.

"A good dusting stroke is one that wipes and at the same time gathers the dust into the cloth".

Washing of Window Glass -

A few drops of ammonia, kerosene, or 1 tablespoon of washing (sal) soda to a pail of warm water may be used for cleaning windows. Soft paper or lintless cloth are used for washing and wiping.

A Cloth dampened with wood alcohol makes a most efficient cleaner but is more expensive.

Note: Whiting or some prepared cleaning paste may be used, if the washing is done before the room is cleaned as much dust results where this dried powder is wiped from the window.

Soap is less satisfactory as a cleaner as it leaves a film on the glass.

Clean windows when sun is not shining in them as this causes uneven evaporation of moisture which produces a streaked effect.

Piano Keys - These should be cleaned with wood alcohol or clear warm water. Soap is liable to turn the ivories yellow.

To Remove Soot from Carpet -

Cover with table salt and brush out.

Care and Cleaning of Leather Upholstery -

Leather is liable to parch and crack from indoor heat. To keep in good condition it should be rubbed occassionally with a light oil (paraffin or lemon) remembering to remove carefully any not absorbed by the leather. Imitation leather may be brightened in this way but much less oil will be absorbed.

Soiled leather may best be cleaned with the preparation made for cleaning shoe leather or the following cleaner may be made:

1 bar white soap dissolved in 1 cup water,
Add 1 cup alcohol and 2 cups light oil.

Cleaning Painted Walls.-

Sponge off with a mild soap and water. Beginning at the bottom working toward the top of the wall, using a downward motion on the section being washed prevents streaking. Covering with starch after cleaning keeps them clean longer and makes the next cleaning easier. Thin laundry starch made as for starching is applied with a wide brush as in painting. Care must be taken not to spread too thick.

House Care

Cleaning Metals

Daily Care - Washing in hot soap suds, rinsing in boiling water and drying (polishing) with soft dish towel eliminates the necessity for much periodic cleaning.

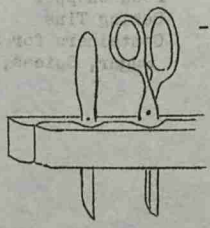
Fine Metals - in polishing all fine surfaces - silver, nickel, porcelain, brass, etc., only the finest of scouring powder (whiting) should be used. Following is a simple rule for polishing:

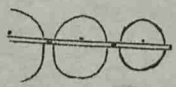
Silver, gold	- Whiting and denatured alcohol
Nickel	- Whiting and ammonia
Brass, Copper	- Whiting and soap jelly and few drops diluted oxalic acid (poison)
Pewter	- Whiting and rottenstone (half and half) and oil.
Porcelain, Zinc	- Whiting and kerosene.

In all cases the whiting is moistened with other ingredient mentioned to make a thick paster.

Kitchen Utensils

Aluminum	- Scour with alkali free soap and 00 steel wool. Boil in a dilute acid solution.
Enamel and Iron Ware	- Boil in water containing two tablespoons of washing soda per quart.
Tin	- Do not scour nor boil in alkali which destroys the tin coating on vessel.





Special Silver Cleaning Methods

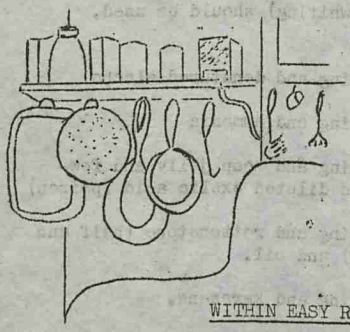
By Electrolysis - Place silver in large enamel kettle containing a piece of light aluminum. Place silver in contact with same. Heat, when water is hot, add 1 teaspoon of soda and $\frac{1}{2}$ teaspoon of salt to each quart of water. Electrolysis is rapid so that silver should be left in solution only three or four minutes. Remove, wash thoroughly, and dry carefully. Caution: Do not use this method on designs containing oxidized portions.

Homemade Silver Polish: Make paste of 5 ounces pure white soap dissolved in one quart hot water. Remove from heat and stir in one-half pound of whiting and one tablespoon ammonia. Stir occasionally until cold.

Home Demonstration Division
Extension Service
N. C. State College, Raleigh

Specialists in Home Management

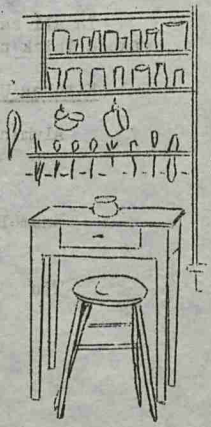
WITHIN EASY REACH OF THE SINK

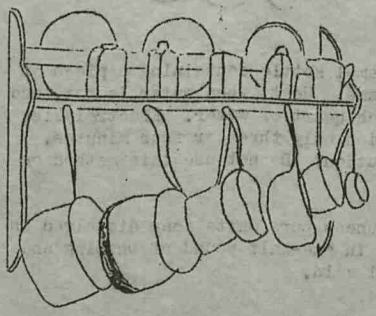


- Dish Pans
- Dish Drainer
- Covered Garbage Pail
- High Stool
- Coffee Pot
- Tea Pot
- Tea and Coffee
- Double Boiler
- Colander
- Sink Strainer
- Dish Towels
- Soap Shaker
- Dish Mop
- Copper Mit
- Vegetable Brushes
- Scissors
- Can Opener
- Paring Knife
- Sink Brush
- Measuring Cup
- Hand Towels
- Drinking Cups

WITHIN EASY REACH OF THE WORKING SURFACE

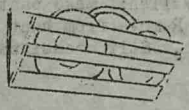
- 2 Measuring Cups
- Biscuit Cutter
- 2 Tablespoons
- 2 Teaspoons
- 1 Wooden Spoon
- 2 Case Knives
- 1 Butcher Knife
- 1 Bread Knife
- 2 Paring Knives
- 1 Spatula
- 2 Case Forks
- 1 Meat Fork
- 1 Grater
- 1 Egg Beater
- 1 Egg Whip
- Rolling Pin
- Bread Board
- Suace Pans and Covers
- Set Mixing Bowls
- Casserole
- Knife Sharpener
- Lemon Squeezer
- Funnel and Can Filler
- Jelly Thermometer
- Pressure Cooker
- Food Chopper
- Baking Tins
- Containers for Salt, Sugar, Spices, etc.





NEAR THE STOVE

- High Woodbox
- Tea Kettle
- Salt and Pepper
- Flour Dredger
- Hot Pan Lifter
- Matches
- Oven Thermometer
- Pot Covers
- Potato Masher
- Long-handled Spoon
- " " Fork
- Toaster
- Skillet
- Griddle



N. C. AGRICULTURAL EXTENSION SERVICE

N. C. State College of Agril & Engineering & U.S. Dept. of Agri. Cooperating

Extension Specialists in Home Management & House Furnishings

H.M. Leaflet #31

House Care Practices

Care of Household Fabrics

I. Upholstered Furniture

General Care: Brush thoroughly, especially in seamings, once a week. Use vacuum cleaner on all except down filled cushions. Remove slip covers occasionally, brush thoroughly, and spray with good insecticide. Keep upholstery as clean as possible by the use of harmonious, inconspicuous antimacassars.

Special Cleaning: If possible have done by an experienced cleaner. If not, the fabric may be cleaned with dry lather (see below) unless color texture is very delicate.

II. Rugs

General Care: Fabric rugs are worn by the presence of dirt in the pile. Every rug should be cleaned once a week with vacuum cleaner (there are good no electric ones) or removed to grass and beaten gently with a rattan beater. Wire beaters break the fibers of rugs.

Special Cleaning: Send to cleaner if possible. Otherwise, scrub with dry lather. Cleaning a rug by this method is tedious and need not be done all in one day. Place rug on flat surface. Keep flat while drying and do not get back of rug damp. (See directions below);

To Besize a fabric rug: Place rug with face to floor. Sprinkle the back generously with a solution made of 2 oz. of pulverized glue dissolved in one quart of water. (An old whisk broom is good for sprinkling.) Allow to dry at least 24 hours. If necessary, weight or tack the corners to keep them flat.

III. To clean with dry lather: - (Have article free from all loose dirt)

a. Shave one-half cake of neutral soap into one quart of warm water and allow it to thoroughly dissolve.

b. Mix some of the above solution with a very small amount of cold water and beat vigorously until a dry suds is obtained.

c. With a soft bristled brush scrub a small section of the fabric with the suds. Use a circular motion covering a section not over 8" inches in diameter and use a quantity of suds to prevent uneven cleaning.

d. When the cleaning of each portion is finished scrape off as much of the lather as possible. (Use a dull knife edge and scrape with the pile), taking up remaining moisture with vacuum cleaner where possible.

e. Rinse the cleaned portion with a weak salt solution. Apply the rinse with a sponge which has been squeezed until it is merely damp. Wipe with the nap of the goods. Repeat this wiping till all soap has been removed.

Note: If soap remains on fibers, the article will soil quickly again for dirt will stick to the soap.

f. Repeat c, d and e until entire article is done.

IV. Washing Woolens

Suds made from the following solution and luke warm water are found to give good results.

Wool-wash Solution: Shave one bar of neutral white soap into a quart of water and bring to the boiling point. When thoroughly dissolved and cold, add two tablespoons of borax and one-half cupful of denatured alcohol.
Points to consider in laundering woolens:

1. Use plenty of warm soap suds. Change suds when it becomes soiled.
2. Use plenty of water of same temperature as suds for rinsing. Rinse in successive waters until the rinse bath is perfectly clear.
3. Use pressure-suction type of cleaning. May be secured with washing machine, hand plunger, or the squeezing motion when work is done by hand.
4. To dry out article through the wringer flat or press out all possible moisture. Do not twist.
5. Fuffiness is increased by drying on a breezy day, and by changing position of article and shaking it during drying. Garments are stretched into shape and size and dried flat). Napped materials are brushed after drying. Directions for specific articles are found elsewhere.

V. Points to consider in cleaning delicate Fabrics:

1. Carefully cut and made textiles launder better than carelessly made ones.
2. Practically all fabrics, except glazed ones, may be cleaned with soap and water if time of exposure to moisture is short.
3. Use plenty of lukewarm suds, use only pressure suction motion in cleaning, rinse thoroughly in succession of lukewarm water.
4. Dry in single folds quickly, but avoiding heat or sunshine. Keep article in shape while drying. Hang pile fabrics while dripping wet.
   Roll colored articles between heavy white cloth until dry enough to iron. Iron with warm iron on wrong side.
5. Press, never iron, woolen materials.
6. Quilts respond well when soaked in succession of suds without any rubbing. Wring from one suds to the next by putting flat through the wringer. Rinse in same way. (Use quilt protectors.)
7. Sheer curtains respond best to soaking before laundering. (Fold carefully to handle). Place in a pillow slip (flat) and clean with pressure suction method.

Suggestion: - The laundering of household textiles requires thoughtful care rather than muscle power. It is always best to wash an article before it becomes too soiled as frequent sudsings are not as injurious as a hard scrubbing.

April, 1937 Extension Folder No. 37

SIMPLE WATER SYSTEMS FOR THE FARM HOME

NORTH CAROLINA STATE COLLEGE OF AGRICULTURE AND ENGINEERING
OF THE
UNIVERSITY OF NORTH CAROLINA
AND
UNITED STATES DEPARTMENT OF AGRICULTURE, COOPERATING
NORTH CAROLINA AGRICULTURAL EXTENSION SERVICE
I. O. SCHAUB, DIRECTOR
STATE COLLEGE STATION
RALEIGH

DISTRIBUTED IN FURTHERANCE OF THE ACTS OF CONGRESS OF MAY 8 AND JUNE 30, 1914

SIMPLE WATER SYSTEMS FOR THE FARM HOME

By David S. Weaver,
Extension Agricultural Engineer.

This leaflet is prepared in order to take care of the requests for information on the very simplest and most inexpensive water systems suitable for the farm home. The systems shown are not recommended where money is available for more complete ones, but are given in an effort to assist the farmer in installing as satisfactory a system as his means will permit.

Generally speaking, there are three sources of water suitable for household use. They are the spring, the well, and the cistern. Of these, the well is usually considered the safest, and is recommended wherever possible. Regardless of the source, water should never be used for drinking until it has been analyzed by competent analysts and the users assured of its freedom from polution. There are many sources of water contamination, and the clear water bubbling from a well-protected spring may be very dangerous. Privies, barn yards, manure piles, drains, seepage water, surface water, and many other sources of contamination are to be found on every farm, and every precaution humanly possible should be taken to insure a safe water supply.

Pumps may be classified roughly on two separate basis: **Shallow well pumps** are used to lift water a distance of not over 22 feet. **Deep well pumps** may be used to lift water any reasonable height. A second classification, also in two divisions, is as follows: **Lift pumps** are pumps which raise the water only to the height of the cylinder, usually in the standard of the pump. **Force pumps**, on the other hand, not only can lift water to the height of the standard, but can force it to a still greater elevation. In the following diagrams, both of these classifications and both

of these types of pumps are simply illustrated.

GRAVITY SYSTEM

The first drawing illustrates a simple gravity system in which no pump is used. Water flows by gravity from a spring which is located higher than the point of delivery, in this case, the kitchen sink or the bathtub. In the mountain section of North Carolina as well as to some extent in the Piedmont, situations will frequently be found where this simple system may be used to advantage. The most important item of cost is sufficient length of pipe to run from the spring to the house. This pipe, as well as all others used in connection with water systems of any kind, should be galvanized and not plain iron pipe because iron pipes rust badly. The spring should be protected in some such manner as shown, a strainer placed over the end of the pipe, and the pipe buried below freezing level. If large enough pipe is used, there is practically no limit to the distance which may exist between the house and the spring. The greater the distance, the larger the pipe. It is possible with an adequate flow of water at the spring, to connect this pipe to a hot water system, and thus have a complete hot and cold water supply in the house. Properly installed, this is the simplest system which will give satisfaction and is very economical, as no pump or power for pumping is required.

SHALLOW WELL SYSTEM

The second illustration shows a condition found in the Coastal Plain section of North Carolina, as well as in parts of the Piedmont. It represents a shallow well which may be a dug well or the customary driven well. The pipe from the well is laid under-ground below freezing and brought up through the kitchen floor so that the pump is convenient to the sink. The pump illustrated is a simple shallow well lift pump. A shallow well force pump could be used to force water to an overhead tank in somewhat a similar manner to that illustrated in the third diagram. It is to be noticed that the distance from the elevation of the pump cylinder to the low water level should not exceed 22 feet. If a foot valve is substituted for a strainer at the bottom of the well pipe, it will not be necessary to prime the pump very often. Priming a pump is often a source of contamination.

It is not necessary that the galvanized one and one-quarter inch pipe run straight from the well to a point under the sink, but it is better if it can do so, as a straight pipe is shorter than one laid along a curve and also the friction in the pipe is reduced. In a well of this type, adequate surface drainage must be provided to prevent surface water from entering the well. As shown, a concrete cap is placed over the well and the surface is graded so as to cause surface water to move away from the top of the well.

DEEP WELL SYSTEM

The third diagram illustrates the conditions under which a deep well force pump can be used. If this system is installed and it is later found possible to operate the pump with a gasoline engine and pump jack, these additions can be made with little change in the existing system. It would also be possible to substitute an electrically driven pump for the hand pump and still use the balance of the system. In this type of installation, it is necessary that the pump be placed over the deep well, as a deep well pump cannot operate at a distance horizontally from the well. It is also to be noted that the cylinder is placed below the water level so as to keep the pump plunger leathers moist at all times. The operation of this pump forces the water horizontally and then vertically into some type of overhead tank. This tank may be a purchased tank either galvanized iron or wood, or a homemade tank, or one or more water tight barrels joined by pipes may form the reservoir. It should be remembered that water weighs 62.5 pounds per cubic foot and too much should not be concentrated without adequate support. The tank may be placed in the attic as shown or on a tower or platform outside the house or in the loft of the barn. It may also be possible in some instances to place the tank in the side of a nearby hill. Once having water stored in a reservoir, conditions are then similar to any water system under pressure. The water will flow to any portion of the house or outbuildings provided the outlet and pipes are lower than the stored supply.

If a check valve is used below the faucet at the sink, the same pipe may be used to deliver water at the sink that is used to put the water into the tank. An overflow pipe placed so that its opening is visible to a person oper-

ating the hand pump should be placed near the top of the tank. This is to insure that the tank is not overflowed by excessive pumping.

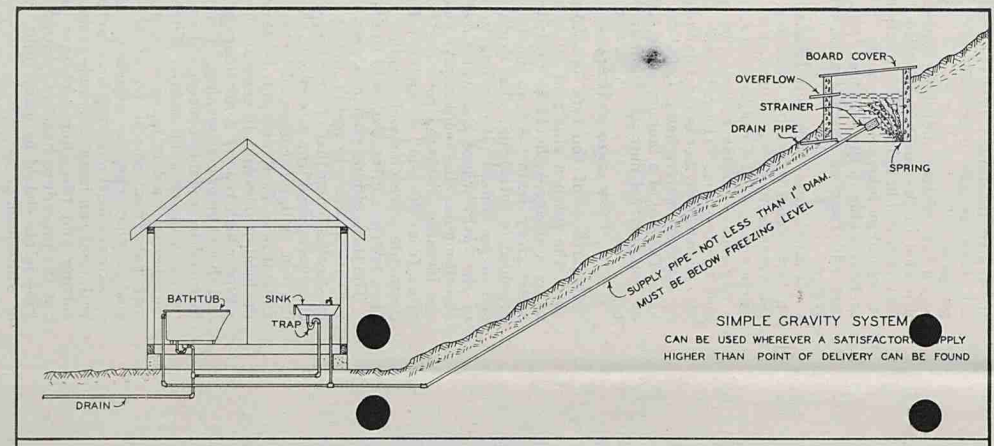
In this system additional outlets may be provided in the bathroom for the tub, lavatory, and inside toilet. A connection to a hot water range may also be made. As long as there is water in the overhead tank, the system will function exactly as a city water system.

If a hot water tank is to be added, it may be connected for heating purposes to either the water front or water back of an ordinary kitchen range. If a range is not so provided, a homemade heating coil may be placed inside the fire box. The hot water tank may also be heated by kerosene, a number of kerosene water heaters being found on the market. The use of a laundry stove, using wood or coal for fuel may also be found satisfactory.

USE GOOD MATERIALS

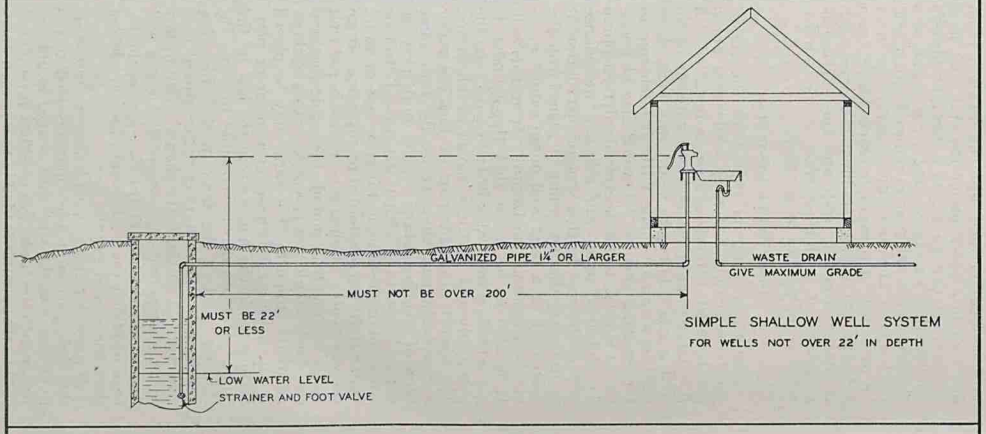
Regardless of the type of water supply used, the kitchen sink and all other water using appliances should be provided with a satisfactory drain. A trap should always be provided in this drain. The drain may consist of galvanized pipe leading to a portion of the farm where the water will not be objectionable. It should always be carried a considerable distance from the house and away from the well, or spring. The use of drain tile is recommended rather than iron pipe, which is often too small in diameter.

The three simple systems shown above are very inexpensive to install, the chief cost in most cases being that of the pipe. Only first class galvanized iron pipe should be used, and its cost will, of course, depend upon the amount needed. Pumps may be secured from the local dealers and, in general, should be of a type which require a minimum of priming and should be of good quality. Pumps manufactured by reliable concerns are to be preferred to the cheaper makes. Kitchen sinks may be obtained in many sizes, styles, and materials, and should be of the highest quality that can be afforded. Generally speaking, a local mechanic or a farmer handy with tools can install a simple system. Pipe-cutting and threading tools are necessary, but the procedure itself is relatively simple. Pipe joints should be made tight by the use of white lead.



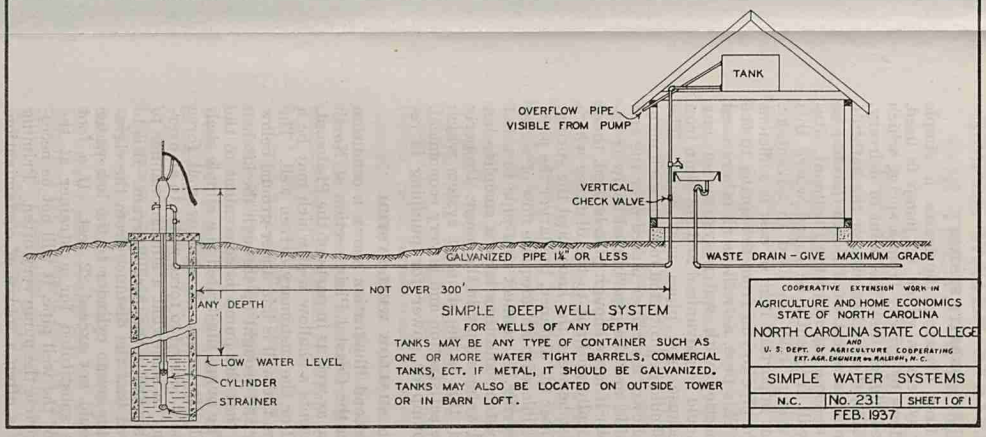
SIMPLE GRAVITY SYSTEM

CAN BE USED WHEREVER A SATISFACTOR[illegible]PPLY HIGHER THAN POINT OF DELIVERY CAN BE FOUND



SIMPLE SHALLOW WELL SYSTEM

FOR WELLS NOT OVER 22' IN DEPTH



SIMPLE DEEP WELL SYSTEM

FOR WELLS OF ANY DEPTH

TANKS MAY BE ANY TYPE OF CONTAINER SUCH AS ONE OR MORE WATER TIGHT BARRELS, COMMERCIAL TANKS, ECT. IF METAL, IT SHOULD BE GALVANIZED. TANKS MAY ALSO BE LOCATED ON OUTSIDE TOWER OR IN BARN LOFT.

COOPERATIVE EXTENSION WORK IN
AGRICULTURE AND HOME ECONOMICS
STATE OF NORTH CAROLINA
NORTH CAROLINA STATE COLLEGE
AND
U. S. DEPT. OF AGRICULTURE COOPERATING
EXT. AGR. ENGINEER AT RALEIGH, N. C.

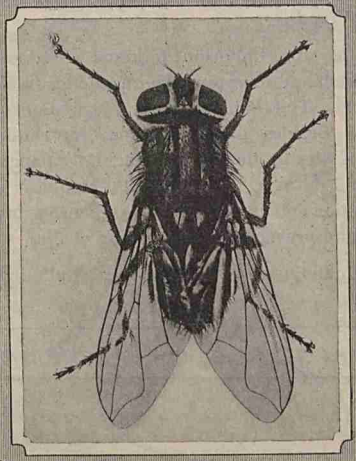
SIMPLE WATER SYSTEMS

N.C. | No. 231 | SHEET 1 OF 1
FEB. 1937

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1408

The HOUSE FLY AND HOW TO SUPPRESS IT



THE PRESENCE of flies is an indication of uncleanliness, insanitary conditions, and improper disposal of substances in which they breed. They are not only annoying; they are actually dangerous to health, because they may carry disease germs to exposed foods.

It is therefore important to know where and how they breed, and to apply such knowledge in combating them. This bulletin gives information on this subject. Besides giving directions for ridding the house of flies by the use of screens, fly papers, poisons, and flytraps, it lays especial emphasis on the explanation of methods of eliminating breeding places and preventing the breeding of flies.

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THE HOUSE FLY[1] AND HOW TO SUPPRESS IT.

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KINDS OF FLIES FOUND IN HOUSES.

SEVERAL species of flies are found commonly in houses. Some of them so closely resemble the true house fly that it requires very careful observation to distinguish them from it.

One of these is the biting stable fly[2] (fig. 1). It occurs frequently in houses and differs from the house fly in the important particular that its mouth parts are formed for piercing the skin. This fly is so often mistaken for the house fly that most people think that the house fly can bite.

Another frequent visitant of houses, particularly in the spring and fall, is the cluster fly.[3] It is somewhat larger than the house fly, and is distinguished by its covering of fine yellowish hairs. Occasionally this fly occurs in houses in such numbers as to cause great annoyance. It gets its name of "cluster fly" from its habit of collecting in compact groups or clusters in protected corners during cold periods.

Several species of metallic greenish or bluish flies also are found occasionally in houses. These include a blue-bottle fly,[4] the black blowflies,[5] and the green-bottle (fig. 2) flies.[6] They breed in decaying animal matter.

[1] *Musca domestica* L.
[2] *Stomoxys calcitrans* L.
[3] *Pollenia rudis* Fab.
[4] *Calliphora erythrocephala* Meig.
[5] *Phormia regina* Meig. and *P. terrae-novae* Desv.
[6] *Lucilia caesar* L., *L. sericata* Meig., and other species of the genus.

There is still another species, smaller than any of those so far mentioned, which is sometimes called the "lesser house fly."[7] This insect is distinguished from the ordinary house fly by its paler and more pointed body. The male, which is commoner than the female, has large pale patches at the base of the abdomen, which are translucent when the fly is seen on the window pane. These little

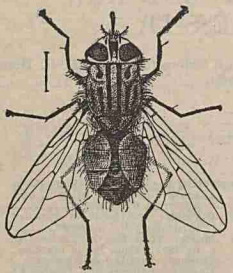

FIG. 1.—The stable fly. Much enlarged.

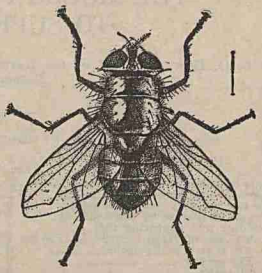

FIG. 2.—One of the green-bottle flies (*Lucilia caesar*). Much enlarged.

flies are not the young of the larger flies. Flies do not grow after the wings have once expanded and dried.

In late summer and autumn many specimens of a small fruit fly, known as the "vinegar fly,"[8] make their appearance, attracted by the odor of overripe fruit.

All of these species, however, are greatly dwarfed in numbers by the common house fly. In 1900 the senior author made collections of the flies in dining rooms in different parts of the country, and found that the true house fly made up 98.8 per cent of the whole number captured. The remainder comprised various species, including those mentioned above.

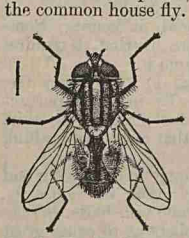

FIG. 3.—The true house fly. Enlarged.

WHERE THE TRUE HOUSE FLY LAYS ITS EGGS.

The true house fly (fig. 3), which is found in nearly all parts of the world, is a medium-sized fly with four black stripes on the back and a sharp elbow in one of the veins of the wings. The house fly can not bite, its mouth parts being spread out at the tip for sucking up liquid substances.

The eggs (figs. 4, 5) are laid upon horse manure. This substance seems to be its favorite larval food. It will breed also in human excrement, and because of this habit it is very dangerous to the health of human beings, carrying as it does the germs of intestinal diseases, such as typhoid fever and cholera, from the

[7] *Fannia canicularis* L.

[8] *Drosophila ampelophila* Loew.

excreta to food supplies. It has also been found to breed freely in hog manure, in considerable numbers in chicken dung, and to

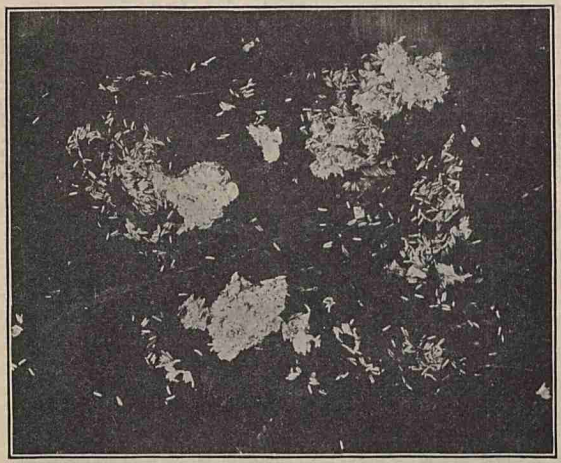

FIG. 4.—Eggs of the house fly. About natural size. (Newstead.)

some extent in cow manure. Indeed, it will lay its eggs on a great variety of decaying vegetable and animal materials, but of the flies that infest dwelling houses, both in cities and on farms, a vast proportion come from horse manure.

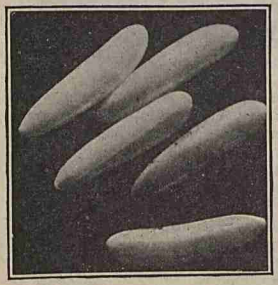

FIG. 5.—Eggs of the house fly. Highly magnified. (Newstead.)

It often happens, however, that this fly is very abundant in localities where little or no horse manure is found, and in such cases it breeds in other manure, such as chicken manure in backyard poultry lots, or in slops or fermenting vegetable material, such as spent hops, moist bran, ensilage, or rotting potatoes. Accumulations of organic material on the dumping grounds of towns and cities often produce flies in great numbers.

The house fly begins laying eggs in from 2½ to 20 days after emerging, the time interval depending to a large extent upon temperature, humidity, and character and abundance of food. The number of eggs laid by an individual fly at one time ranges from 120 to 159

and a single female will usually lay two and sometimes four such batches. Dunn has recently reported that in Panama a fly may deposit as many as 2,367 eggs in 21 batches, and sometimes an interval of only 36 hours may occur between the deposition of large batches of eggs. The enormous numbers in which the insects occur are thus plainly accounted for, especially when the abundance and universal occurrence of appropriate larval food is considered. The eggs are deposited below the surface in the cracks and interstices of the manure, several females usually depositing in one spot, so that the eggs commonly are found in large clusters (fig. 4) in selected places near the top of the pile, where a high degree of heat is maintained by the fermentation below. The second batch of eggs is laid from 8 to 10 days after the first. The eggs usually hatch in less than

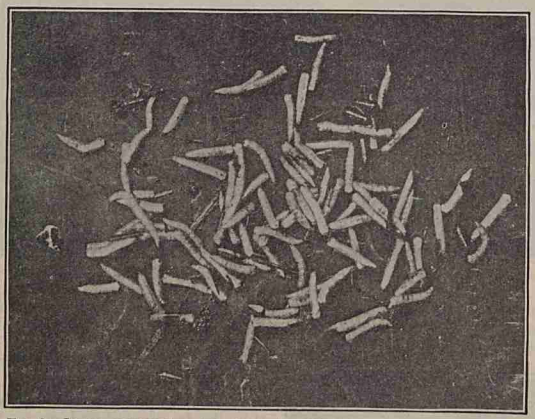

FIG. 6.—Larvæ, or maggots, of the house fly. About natural size. (Newstead.)

24 hours. Under the most favorable conditions of temperature and moisture the egg state may last hardly more than 8 hours. The maggots which issue from the eggs are very small and transparent. They grow rapidly, completing the growth of the larva stage in three days under the most favorable conditions, although this stage usually lasts from 4 to 7 days. The larval period may be prolonged greatly by low temperature or by dryness or scarcity of the larval food. As the larvæ (fig. 6) attain full size they gradually assume a creamy white color. A few hours before pupation they become very restless and migrate from their feeding ground in search of a favorable place in which to pass the pupa stage. They will often congregate at the edges of manure piles near the ground or burrow into the soil beneath, or they may crawl considerable distances away from the pile to pupate in the ground or in loose material under the edges of stones, boards, etc.

The pupæ (fig 7), or "sleepers," are more or less barrel shaped and dark brown in color. In midsummer this stage usually lasts from 3 to 6 days. The pupa stage is easily affected by temperature changes and may be prolonged during hibernation for as long as 4 or 5 months. Numerous rearing experiments in various parts of the country have shown that the shortest time between the deposition of eggs and the emergence of the adult fly is 8 days, and 10 and 12 day records were very common.

The adult fly, upon emerging from the puparium, works its way upward through the soil or manure and upon reaching the air it crawls about while its wings expand and the body hardens and assumes its normal coloration. In from 2½ to 20 days, as previously stated, the female is ready to deposit eggs. As in the case of other

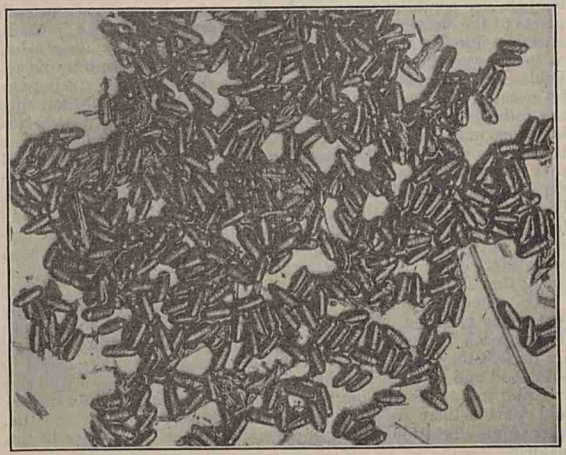

FIG. 7.—Pupæ of the house fly. About natural size. (Newstead.)

periods of its life history, so the preoviposition period is prolonged considerably by the lower temperatures of spring and fall. In midsummer, with a developmental period of from 8 to 10 days from egg to adult, and a preoviposition period of from 3 to 4 days, a new generation would be started every 11 to 14 days. Thus the climate of the District of Columbia allows abundance of time for the development of from 10 to 12 generations every season.

Flies usually remain near their breeding places if they have plenty of food, but experiments recently made at Dallas, Tex., show that they may migrate considerable distances; in fact, house flies, so marked that the particular individuals could be identified, have been recaptured in traps as far as 13 miles from the place where they were liberated.

HOW THE HOUSE FLY PASSES THE WINTER.

The prevailing opinion that the house fly lives through the winter as an adult, hiding in cracks and crevices of buildings, etc., appears to be erroneous. Under outdoor conditions house flies are killed during the first really cold nights, that is, when the temperature falls to about 15° or 10° F. In rooms and similar places protected from winds and partially heated during the winter flies have been kept alive in cages for long periods; but they never lived through the entire winter. In longevity experiments one record of 70 days and another of 91 days was obtained. No uncaged house flies were found during three seasons' observations in unheated and only partially heated attics, stables, unused rooms, etc., where favorable temperature conditions prevailed. The common occurrence in such places of the cluster fly and a few other species, which may be easily mistaken for the house fly, is responsible for the prevailing belief as to the way the house fly overwinters. There is therefore no reliable evidence whatever that adult house flies emerging during October and November pass the winter and are able to deposit their eggs the following spring, although they may continue active in heated buildings until nearly the end of January. On the other hand, there is evidence that house flies pass the winter as larvæ and pupæ, and that they sometimes breed continuously throughout the winter. In experiments at both Dallas, Tex., and Bethesda, Md., house flies have been found emerging during April from heavily infested manure heaps which had been set out and covered with cages during the preceding autumn. In the Southern States, during warm periods in midwinter, house flies may emerge and become somewhat troublesome; they frequently lay eggs on warm days.

The second way in which the house fly may pass the winter is by continuous breeding. House flies congregate in heated rooms with the approach of the winter season. If no food or breeding materials are present they eventually die. However, where they have access to both food and suitable substances for egg laying they will continue breeding just as they do outdoors during the summer. Even in very cold climates there are undoubtedly many places, especially in cities, where house flies would have opportunity to pass the winter in this manner.

CARRIAGE OF DISEASE BY THE HOUSE FLY.

The body of the house fly is covered thickly with hairs and bristles of varying lengths, and this is especially true of the legs. Thus, when it crawls over infected material it readily becomes loaded with germs, and subsequent visits to human foods result in their contamination. Even more dangerous than the transference of germs on the legs and body of the fly is the fact that bacteria are found in greater numbers and live longer in its alimentary canal. These germs are voided, not only in the excrement of the fly, but also in small droplets of regurgitated matter which have been called "vomit spots." When we realize that flies frequent and feed upon the most filthy substances (it may be the excreta of typhoid or dysentery patients or the discharges of one suffering from tuberculosis), and that subsequently they may contaminate human foods with their feet or excreta

or vomit spots, the necessity and importance of house-fly control is clear.

In army camps, in mining camps, and in great public works, where large numbers of men are brought together for a longer or shorter time, there is seldom the proper care of excreta, and the carriage of typhoid germs from the latrines and privies to food by flies is common and often results in epidemics of typhoid fever.

And such carriage of typhoid is by no means confined to great temporary camps. In farmhouses in small communities, and even in badly cared for portions of large cities, typhoid germs are carried from excrement to food by flies, and the proper supervision and treatment of the breeding places of the house fly become most important elements in the prevention of typhoid.

In the same way other intestinal germ diseases, such as Asiatic cholera, dysentery, enteritis (inflammation of the intestine), and infantile diarrhea, are all so carried. There is strong circumstantial evidence also that tuberculosis, anthrax, yaws, ophthalmia, smallpox, tropical sore, and the eggs of parasitic worms may be and are carried in this way. In the case of over 30 different disease organisms and parasitic worms, actual laboratory proof exists, and where lacking is replaced by circumstantial evidence amounting almost to certainty.

EXCLUDING AND CAPTURING FLIES.

The principal effort to control this dangerous insect must be made at the source of supply—its breeding places. Absolute cleanliness and the removal or destruction of anything in which flies may breed are essential; and this is something that can be done even in cities. Perhaps it can be done more easily in the cities than in villages, on account of their greater police power and the lesser insistence on the rights of the individual. Once people are educated to the danger and learn to find the breeding places, the rest will be easy.

In spite of what has just been said, it is often necessary to catch or otherwise destroy adult flies, or to protect food materials from contamination and persons from annoyance or danger; hence the value of fly papers and poisons, flytraps, and insect screens.

THE USE OF INSECT SCREENS.

A careful screening of windows and doors during the summer months, with the supplementary use of sticky fly papers, is a protective measure against house flies known to everyone. As regards screening, it is only necessary here to emphasize the importance of keeping food supplies screened or otherwise covered so that flies can gain no access to them. This applies not only to homes but also to stores, restaurants, milk shops, and the like. Screening, of course, will have no effect in decreasing the number of flies, but at least it has the virtue of lessening the danger of contamination of food.

Insect screens for doors and windows should be well made and must fit tightly, otherwise they will not keep insects out. It is equally important that they be made of good and durable screen cloth. Copper insect screen cloth, although a little higher in price, will prove more economical in the long run, as it lasts many years. If, however, the cost of copper screen cloth is objectionable, steel screen cloth, either painted or galvanized, can be used. Painted steel screen cloth will last one or more years without repainting, its durability depend-

ing upon the climate. In humid regions, of course, it will rust more quickly than it will where the climate is dry. The same may be said of galvanized steel insect screen cloth.

Insect screen cloth made with 16 meshes to the inch is recommended, for 16-mesh screen cloth will keep out flies and most mosquitoes [9] and other small insects which at times are found almost everywhere.

FLY PAPERS AND POISONS.

The use of sticky fly papers to destroy flies that have gained access to houses is well known. Fly-poison preparations also are common.

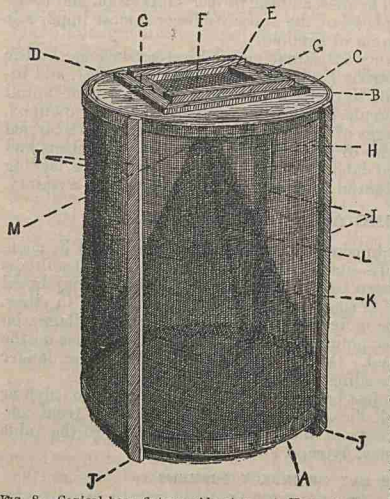

FIG. 8.—Conical hoop flytrap, side view. *A*, Hoops forming frame at bottom. *B*, Hoops forming frame at top. *C*, Top of trap made of barrel head. *D*, Strips around door. *E*, Door frame. *F*, Screen on door. *G*, Buttons holding door. *H*, Screen on outside of trap. *I*, Strips on side of trap between hoops. *J*, Tips of these strips projecting to form legs. *K*, Cone. *L*, United edges of screen forming cone. *M*, Aperture at apex of cone. (Bishopp.)

Many of the commercial fly poisons contain arsenic, and their use in the household is attended with considerable danger, especially to children. This danger is less with the use of a weak solution of formalin. A very effective fly poison is made by adding 3 teaspoonfuls of the commercial formalin to a pint of milk or water sweetened with a little brown sugar. A convenient way of exposing this poison is by partly filling an ordinary drinking glass with the solution. A saucer or plate is then lined with white blotting paper cut the size of the dish and placed bottom up over the glass. The whole is then quickly inverted and a small match stick placed under the edge of the glass. As the solution evaporates from the paper more flows out from the glass and thus the supply is automatically renewed.

FLY SPRAYS.

Sprays designed to destroy or repel house flies fill a certain need in connection with the house-fly problem. No very satisfactory repellent substances for this insect have been found which are at the same time adaptable to general use about the home, or places where foods are handled. Extracts of pyrethrum flowers are now generally

[9] Where the yellow fever or dengue fever mosquito occurs, 18-mesh screen cloth (or 16-mesh screen cloth made from extra heavy wire) should be used.

available commercially, and these give fairly good results in the destruction of house flies in buildings. Most of the sprays of pyrethrum extract contain kerosene oil as a carrier, and undoubtedly the kerosene has much to do with the toxicity of the spray. Such materials are most applicable to buildings which become infested with flies and which can be readily closed up at night and the air within thoroughly saturated with the spray by means of an atomizer. Under such conditions the flies are rather quickly overcome by the spray and if a sufficient quantity is used they will not revive.

FLYTRAPS.

Flytraps may be used to advantage in decreasing the number of flies. Their use has been advocated not only because of the immediate results, but because of the chances that the flies may be caught before they lay eggs, and the number of future generations will be reduced greatly.

Many types of flytraps are on the market. As a rule the larger ones are the more effective. Anyone with a few tools can construct flytraps for a small part of the price of the ready-made ones. A trap (fig. 8) which is very effective in catching flies and is easily made, durable, and cheap, may be made of four barrel hoops, four laths, a few strips of boxing, and 8¼ lineal feet of screening, 24 inches wide. (For greater details see Farmers' Bulletin 734.)

The effectiveness of the traps will depend on the selection of baits. A good bait for catching house flies is 1 part of blackstrap molasses to 3 parts of water, after the mixture has been allowed to ferment for a day or two. Overripe or fermenting bananas crushed and placed in the bait pans give good results, especially with milk added to them. A mixture of equal parts brown sugar and curd of sour milk, thoroughly moistened, gives good results after it has been allowed to stand for three or four days.

PREVENTING THE BREEDING OF FLIES.

As previously stated, fly papers, poisons, and traps are at best only temporary expedients. The most logical method of abating the fly nuisance is the elimination or treatment of all breeding places. It would appear from what is known of the life history and habits of the common house fly that it is perfectly feasible for cities and towns to reduce the numbers of this annoying and dangerous insect so greatly as to render it of comparatively slight account. On farms also, in dairies, and under rural conditions generally, much can and should be done to control the fly, which here, as elsewhere, constitutes a very serious menace to health.

CONSTPUCTION AND CARE OF STABLES.

In formulating rules for the construction and care of stables and the disposal of manure the following points must be taken into consideration. In the first place, the ground of soil-floor stables may offer a suitable place for the development of fly larvæ. The larvæ will migrate from the manure to the soil and continue their growth in the moist ground. This takes place to some extent even when the manure is removed from the stables every day. Even wooden floors

are not entirely satisfactory unless they are perfectly water-tight, since larvæ will crawl through the cracks and continue their development in the moist ground below. Water-tight floors of concrete or masonry, therefore, are desirable. Flies have been found to breed in surprising numbers in small accumulations of material in the corners of feed troughs and mangers, and it is important that such places be kept clean.

FLY-TIGHT MANURE PITS.

The Bureau of Entomology for a number of years has advised that manure from horse stables be kept in fly-tight pits or bins. Such pits can be built in or attached to the stable so that manure can be easily thrown in at the time of cleaning and so constructed that the manure can be readily removed. It is desirable that the manure be placed in these fly-proof receptacles as soon as possible after it is voided. The essential point is that flies be prevented from reaching the manure, and for this reason the pit or bin must be tightly constructed, preferably of concrete, and the lid kept closed except when the manure is being thrown in or removed. The difficulty has been that manure often becomes infested before it is put into the container, and flies frequently breed out before it is emptied and often escape through the cracks. To obviate these difficulties a manure box or pit with a modified tent trap or cone trap attached is desirable.

In order to retain the fertilizing value of manure to the greatest extent it is advisable that air be excluded from it as much as possible and that it be protected from the leaching action of rains. This being the case, there is really no necessity for covering a large portion of the top of the box with a trap, but merely to have holes large enough to attract flies to the light, and to cover these holes with ordinary conical traps, with the legs cut off, so that the bottoms of the traps will fit closely to the box. The same arrangement can be made where manure is kept in a pit. If manure boxes or pits are kept fly tight they are satisfactory under farm or dairy conditions for the storage of manure during the busy season when it can not be hauled out daily.

FREQUENCY WITH WHICH MANURE SHOULD BE REMOVED IN CITIES AND TOWNS.

In deciding the question as to how often manure should be removed in cities and towns, it should be borne in mind that when the larvæ have finished feeding they will often leave the manure and pupate in the ground below or crawl some distance away to pupate in débris under boards or stones and the like. Hence the manure should be removed before the larvæ reach the migratory stage; that is to say, removal is necessary every three days, and certainly not less frequently than twice a week during the summer months. A series of orders issued in 1906 by the health department of the District of Columbia, on the authority of the Commissioners of the District, covers most of these points, and these orders, which may well serve as a model to other communities desiring to undertake similar measures, may be briefly condensed as follows:

HEALTH OFFICE REGULATIONS FOR CONTROL OF HOUSE FLIES IN CITIES.

All stalls in which animals are kept shall have the surface of the ground covered with a water-tight floor. Every person occupying a building where domestic animals are kept shall maintain in connection therewith a bin or pit for the reception of manure and, pending the removal from the premises of the manure from the animal or animals, shall place such manure in said bin or pit. This bin shall be so constructed as to exclude rain water and shall in all other respects be water-tight, except as it may be connected with the public sewer. It shall be provided with a suitable cover and constructed so as to prevent the ingress and egress of flies. No person owning a stable shall keep any manure or permit any manure to be kept in or upon any portion of the premises other than the bin or pit described, nor shall he allow any such bin or pit to be overfilled or needlessly uncovered. Horse manure may be kept tightly rammed into well-covered barrels for the purpose of removal in such barrels. Every person keeping manure in the more densely populated parts of the District shall cause all such manure to be removed from the premises at least twice every week between June 1 and October 31, and at least once every week between November 1 and May 31 of the following year. No person shall remove or transport any manure over any public highway in any of the more densely populated parts of the District except in a tight vehicle, which, if not inclosed, must be effectually covered with canvas, so as to prevent the manure from being dropped. No person shall deposit manure removed from the bins or pits within any of the more densely populated parts of the District without a permit from the health officer. Any person violating any of the provisions shall, upon conviction thereof, be punished by a fine of not more than $40 for each offense.

Not only must horse stables be cared for, but chicken yards, piggeries, and garbage receptacles as well. In cities, with better methods of disposal of garbage and with the lessening of the number of horses and horse stables consequent upon electric street railways, bicycles, and automobiles, the time may come, and before very long, when window screens may be discarded.

DISPOSAL OF MANURE IN RURAL AND SUBURBAN DISTRICTS.

The control of flies in rural and suburban districts offers a much more difficult problem. Here it is often out of the question to remove all manure from the premises twice a week, and the problem is to find some method of disposal or storage which will conserve the fertilizing value of the manure and at the same time prevent all flies from breeding, or destroy such as do breed there.

With this idea in mind, it has been recommended that stable manure be collected every morning and hauled out at once and spread rather thinly on the fields. This procedure is advisable from the point of view of getting the maximum fertilizing value from the manure. Immediate spreading on the fields is said largely to prevent the loss of plant food which occurs when manure is allowed to stand in heaps for a long time. This method will be effective in preventing the breeding of flies only if the manure is hauled out promptly every morning and spread thinly so that it will dry, since it is unfavorable for fly development in desiccated condition. The proper scattering of the manure on the fields is best and most easily and quickly accomplished by the use of a manure spreader, and many dairies, and even farms, are practicing the daily distribution of manure in this way. Removal every three or four days will not be sufficient. Observations have shown that if manure becomes flyblown and the maggots attain a fairly good size before the manure is scattered on the fields, they can continue their development and will pupate in the ground.

CHEMICAL TREATMENT OF MANURE TO DESTROY FLY MAGGOTS.

During the summer months, when fly breeding is going on most actively, the farmer is also busy and often can not spare the time to remove manure regularly. The general practice, therefore, has been to keep the manure in heaps located, as a rule, very near the stables. How can fly breeding be prevented in such accumulations? As a result of recent investigations, it is now possible to point out two methods which are practical and effective.

The first is the treatment of the manure pile with chemical substances which will kill the eggs and maggots of the house fly. The Bureau of Entomology, in cooperation with the Bureau of Chemistry and the Bureau of Plant Industry, has conducted a series of experiments in which a large number of chemicals were applied to infested manure and observations made not only on their efficiency in killing the maggots but also as to their effect on the chemical composition and bacterial flora of the manure. The object was to find some cheap chemical which would be effective in destroying the fly larvæ and at the same time would not reduce the fertilizing value of the manure.

TREATMENT WITH HELLEBORE.

Of the numerous substances tried, the one which seems best to fulfill these conditions is powdered hellebore.[9] For the treatment of manure a water extract of the hellebore is prepared by adding ½ pound of the powder to every 10 gallons of water, and after stirring it is allowed to stand 24 hours. The mixture thus prepared is sprinkled over the manure at the rate of 10 gallons to every 8 bushels (10 cubic feet) of manure. From the result of 12 experiments with manure piles treated under natural conditions it appears that such treatment results in the destruction of from 88 to 99 per cent of the fly larvæ.

Studies of treated manure indicated that its composition and rotting were not interfered with. Furthermore, several field tests showed that there was no apparent injury to growing crops when fertilized with treated manure.

Since the solution is somewhat poisonous it should not be left exposed where it might be drunk by livestock. It is quite safe to say that chickens will not be injured by pecking at hellebore-treated manure. This has been tested carefully. Hellebore can be obtained both in ground and powdered form, but the powder gives the best results in the destruction of fly larvæ.

TREATMENT WITH POWDERED BORAX.

Another chemical found to be even more effective as a larvicide is powdered borax. This substance is available in commercial form in all parts of the country. It has the advantage of being comparatively nonpoisonous and noninflammable and is easily transported and handled. The minimum amount necessary to kill fly larvæ was found to be 0.62 pound per 8 bushels of manure, or about 1 pound per 16 cubic feet. Best results were obtained when the borax was applied in solution, or when water was sprinkled on after the borax had been scattered evenly over the pile. Borax is not only effective in killing the larvæ, but when it comes in contact with the eggs it prevents them from hatching. When applied at the rate of 1 pound to 16 cubic feet it was found to kill about 90 per cent of the larvæ, heavier applications killing from 98 to 99 per cent.

[9] *Veratrum viride* or *V. album.*

Borax has no injurious effect on the chemical composition or rotting of the manure. However, when added in large quantities with manure to the soil it will cause considerable injury to growing plants. A number of experiments have been conducted to determine the effect on crops of the use of manure treated with borax as herein recommended. When applied at the rate of 15 tons per acre it appears that no injury as a rule will follow. Some crops are more sensitive to borax than others, and also the tendency to injury appears to vary on different soils. It is necessary, therefore, to repeat the warning issued in connection with a previous bulletin on this subject, that great care be exercised, in the application of borax, that the manure does not receive more than 1 pound for every 16 cubic feet, and that not more than 15 tons of manure so treated are applied to the acre.

In view of the possible injury from the borax treatment as a result of carelessness in applying it, or from other unforeseen conditions, it is recommended that horse manure and other farmyard manures which are to be used as fertilizer be treated with hellebore. Borax, on the other hand, is such a good larvicide that it can be used with advantage on the ground of soil-floor stables, in privies, on refuse piles, and on any accumulations of fermenting organic matter which are not to be used for fertilizing purposes.

TREATMENT WITH CALCIUM CYANAMID AND ACID PHOSPHATE.

Many experiments with mixtures of commercial fertilizers were tried to determine whether fly larvæ would be killed by any substance the addition of which would increase the fertilizing value of the manure. A mixture of calcium cyanamid and acid phosphate was found to possess considerable larvicidal action. Several experiments showed that ½ pound of calcium cyanamid plus ½ pound of acid phosphate to each bushel of manure gave an apparent larvicidal action of 98 per cent. The mixture in the form of a powder was scattered evenly over the surface and then wet down with water. The use of this mixture adds to the manure two important elements, nitrogen and phosphorus.

MAGGOT TRAP FOR DESTRUCTION OF FLY LARVÆ FROM HORSE MANURE.

The second method of handling manure is one which does not require the application of chemicals. It is based on the fact, mentioned on page 4, that the larvæ of the house fly, a few hours before they are ready to pupate, show a strong tendency to migrate. This migration takes place mostly at night, and the larvæ sometimes crawl considerable distances from the manure pile. Now it is possible by means of a very simple arrangement called a maggot trap to destroy fully 99 per cent of all maggots breeding in a given lot of manure. A successful maggot trap which the Maryland Agricultural College constructed at the college barn is shown in Figure 9. The trap was designed by R. H. Hutchison and constructed under his supervision. The manure, instead of being thrown on the ground, is heaped carefully on a slatted platform, which stands about 1 foot high. This

particular platform measures 10 by 20 feet. There are six 2 by 4 pieces running lengthwise 2 feet apart. Across these are nailed 1-inch strips with ½ to 1 inch spaces between them. The wooden platform stands on a concrete floor, and a rim or wall of concrete 4 inches high surrounds the floor. The floor slopes a little toward one corner, from which a pipe leads to a small cistern near by. This pipe is plugged with a stopper of soft wood, and the concrete floor is filled with water to a depth of 1 inch in the shallowest part. Flies will lay their eggs on the manure as usual, but the maggots, when they have finished feeding and begin to migrate, crawl out of the manure, drop into the water below, and are drowned. Each week the plug is removed from the pipe, and all the maggots are washed into the cistern. The floor is then cleaned of any solid particles by

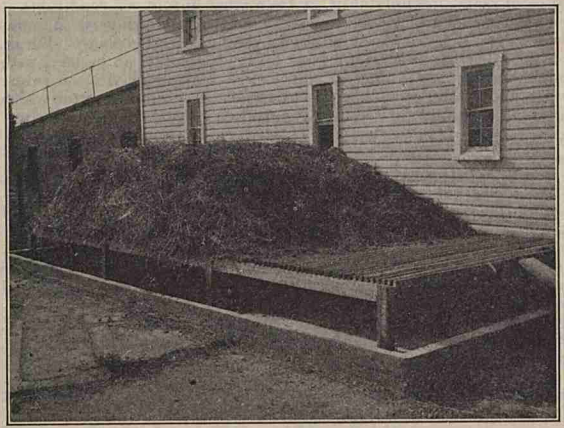

FIG. 9.—A maggot trap for house-fly control. View showing the concrete basin containing water in which larvæ are drowned, and the wooden platform on which manure is heaped. (Hutchison.)

means of a long-handled stable broom or by a strong stream of water from a hose. The pipe being again plugged, the floor is again partly filled with water and the trap is ready for another week's catch. A platform of this size will hold the manure accumulating from four horses during the period of four months, or about 20 days' accumulation from 25 horses, if the heap is well built and made at least 5 feet high.

Experience with this maggot trap clearly indicates that best results can be secured if the manure is compactly heaped on the platform and kept thoroughly moistened. It is best to apply a small amount of water each morning after the stable cleanings have been added to the pile.

It should be borne in mind that in order to make this trap a success the platform beneath the pile must be kept comparatively free of accumulations of manure, and moisture applied regularly to drive the maggots out.

COMPACT HEAPING OF MANURE.

Another method of disposing of manure has been recommended by English writers. The manure is built up in a compact rectangular heap, the sides of which are beaten hard with shovels. The ground around the edges of the heap is made smooth and hard and loose straw is placed in small windrows around the manure pile about 1 foot from the edge. The exclusion of the air, together with the high temperature and gases formed by fermentation, tends to make the heap unfavorable for the development of fly larvæ. Those which do happen to develop in the surface layers will migrate and pupate in the ring of straw around the heap, where they are destroyed by burning.

GARBAGE DISPOSAL AND TREATMENT OF MISCELLANEOUS BREEDING PLACES.

It is just as true under farm conditions as in cities that breeding places other than horse manure must be attended to. Garbage must be disposed of, hog and poultry manure must be cared for, and especially on dairy farms it is extremely important that every precaution be taken to prevent the contamination of milk by flies.

It is very desirable that all refuse possible, accumulated from cities and towns, be burned. Incineration has been practiced successfully by a number of towns and cities with populations of from 10,000 to 15,000 and over. In larger cities provision should be made for burning carcasses as well as garbage and other refuse. If city and town garbage is sold to hog feeders the municipal authorities should have control of the sanitary conditions about the feeding yards, as there is great danger from fly breeding in such places if not kept clean.

SEWAGE DISPOSAL IN RELATION TO THE PREVENTION OF FLY-BORNE DISEASES.

In the consideration of these measures we have not touched upon the remedies for house flies breeding in human excrement. On account of the danger of the carriage of typhoid fever, the dropping of human excrement in the open in cities or towns, either in vacant lots or in dark alleyways, should be made a misdemeanor, and the same care should be taken by the sanitary authorities to remove or cover up such depositions as is taken in the removal of the bodies of dead animals. For modern methods of sewage disposal adapted for farm use one should consult Farmers' Bulletin No. 1227. In the absence of modern methods of sewage disposal, absolutely sanitary privies are prime necessities, whether in towns or on farms. Directions for building and caring for such privies will be found in the above-mentioned Farmers' Bulletin. The box privy is

always a nuisance from many points of view, and is undoubtedly dangerous as a breeder of flies which may carry the germs of intestinal diseases. The dry-earth treatment of privies is unsatisfactory. No box privy should be permitted to exist unless it is thoroughly and regularly treated with some effective larvicide. Since the fecal matter in such privies is seldom used for fertilizing purposes it may well be treated liberally with borax. The powdered borax may be scattered two or three times a week over the exposed surface so as to whiten it.

WHAT COMMUNITIES CAN DO TO ELIMINATE THE HOUSE FLY.

Antifly crusades have been very numerous in recent years, and some have been noteworthy both in methods and in results. However, it will not be amiss here to emphasize the importance of concerted, organized effort on the part of whole communities, not only cities, but suburban and rural neighborhoods as well. By the most painstaking care one may prevent all fly breeding on his premises, but it will avail him little if his neighbors are not equally careful. Some sort of cooperation is necessary. One of the first and most important elements in any antifly crusade is a vigorous and continued educational campaign. It has been the experience of those who have undertaken such crusades that people generally regard the fly as a somewhat harmless nuisance and that the first work of the campaign was to bring the people to a realization of the dangers from flies and the possibility of getting rid of them. In the educational campaign every possible means of publicity can be employed, including newspapers, lectures, moving pictures, posters, handbills, cartoons, instruction in schools, etc.

The antifly crusade is a matter of public interest and should be supported by the community as a whole and engineered by the health officers. But health officers can do little toward the necessary work of inspection and elimination without funds, and therefore the support of the campaign must manifest itself in increased appropriations for public-health work. Very often it is lack of funds which prevents the health officers from taking the initiative in the antifly crusades, and there must necessarily be much agitation and education before they can profitably take up the work. Right here lies a field for civic associations, women's clubs, boards of trade, etc., to exercise their best energy, initiative, and leadership.

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Special Bulletin No. 127 October, 1931

Protection of Private Water Supplies

How to Keep Our Wells and Springs Safe and Pure

Pure water is one of nature's greatest gifts to man. It is a source of life and health. Likewise polluted water is a very great menace to life and health. For the purpose of this leaflet we shall refer to polluted water as water likely to be injurious, or to produce disease in man. Ordinarily the only water likely to produce disease in man is water which has already been polluted by man. Man himself is the great offender. He it is that furnishes most of the pollution that makes his own wells and springs dangerous.

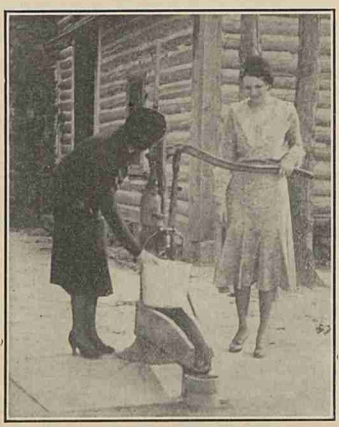


Figure 1. **SAFE PRIVATE WELL SUPPLY**
Note the water tight concrete top, the pump and good drainage.

How Wells Become Polluted

Pollution occurs in this way. Practically the only means by which disease is communicated from one person to another is through organisms called germs. These germs leave sick or infected persons through their body discharges, as for example from the nose or mouth, or in the urine, or bowel discharges, and tiny particles of such material taken into the bodies of well people permit these germs to develop and in due time the well person becomes sick from the same disease, and in turn may become a spreader of disease himself.

In the case of wells and springs the most common mode of pollution is the conveyance of tiny particles of germ-laden bowel discharge from one or many human beings or other animals to the water in the well or spring. This pollution is spread in many ways, but open wells with buckets and chains or ropes is one of the most common ways.

Human hands are nearly always more or less dirty and contaminated, and when such hands touch the well bucket, germs are rinsed off and trans-

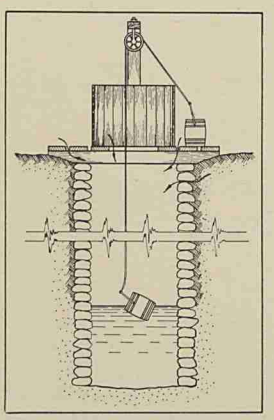


Figure 2. **DANGEROUS OPEN TOP WELL**
Buckets and rope or chain are the worst sources of pollution. Arrows indicate entrance of other pollution.

ferred to the bucket and thence to the water.

Another common means of polluting wells is by carrying filth and fecal matter on our shoes and on the feet of chickens, dogs and other domestic animals to or near the well platform or top. There tiny particles may drop off or be rinsed off in the waste water around a well top and readily find their way down into the well, as shown in Figure 2.

Surface wash is also dangerous, particularly if there is an open back privy nearby or other soil pollution present. In such cases dangerous pollution may be washed into or near a well or so scattered that it readily finds it way into the well. If the well is closed as shown in Figure 4 this cannot happen.

How to Protect Wells

Once it is understood that pollution usually reaches wells and springs through the open tops, from human hands touching buckets and chains or ropes and through surface wash and waste the remedy is self evident. Simply make the well or spring water tight as shown in Figure 4 with a concrete top or cover, use a pump; drain the surface wash away from the well top and remove or abolish potent sources of pollution such as open back privies.

This concrete well cover should be crowned and drain away from the pump in all directions. The surface of the ground should also drain or slope away from the well in all directions at least for a few feet so that any pollution left on or near the well top will be washed away from, rather than into the well by rains or waste water. Waste water from around a pump should be drained away as shown in Figure 1, and not allowed to return to the well. If any surface drainage is toward a well the top of the well in addition to being mounded up should also have a diversion drainage ditch so cut above the well that

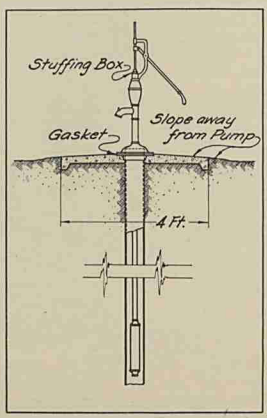


Figure 3. **SAFE DRILLED OR BORED WELL**
Note casing projects 1″ above top of concrete and pump fits down over it.

the surface wash will be carried around and away from the well top.

Remove the Sources of Pollution

No open back privy should ever be used, largely because the fecal matter is so readily scattered by wind, by surface wash, by chickens, hogs, dogs, people, and otherwise that some of it sooner or later finds its way into practicaly all open top wells and springs. All open back privies should be replaced with pit privies or the home connected, either to a sewer system or to a residential sewage disposal plant. No privy or sewage disposal plant should be located nearer than 50 feet from the well, and always on ground lower than the well top with the drainage away from the well.

Protecting Springs

Ordinarily springs are simply wells so shallow that their flow of water comes out at the surface of the ground. Usually springs have been excavated out a sufficient amount by someone to permit dipping buckets, drinking cups, or other sources of contamination directly into this excavation or spring basin through the open unprotected top. For these reasons springs are usually more easily polluted than wells.

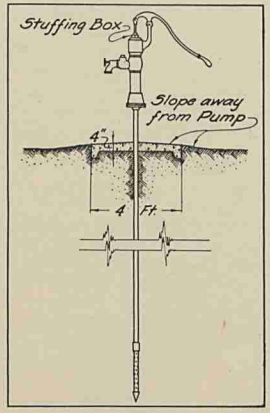


Figure 5. **SAFE DRIVEN WELL**
Water tight joint around pipe. Drainage away from well.

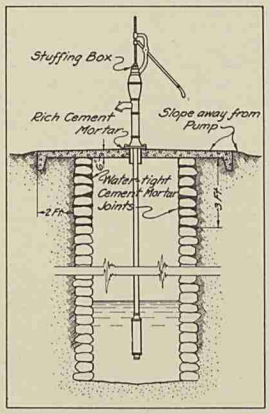


Figure 4. **OPEN TOP WELL MADE SAFE**
Note the pump and water tight concrete top. Drainage is away from well. Upper part of wall cemented water tight.

The remedy is practically the same as in the case of the wells. The spring bowl or basin should be closed in and walled up water tight with concrete or similar material; a water tight removable cover put on and a pipe or drain led out so as to drain the spring flow down hill, to a point where the flow may be caught in buckets or pails. See Figure 6. Where there is sufficient fall and flow a water ram may be installed which will deliver running water to the home even though the house is much higher than the spring.

In addition to enclosing the spring with a water tight wall, covering the top and providing an overflow pipe, at least one open surface drainage ditch

should be dug around the spring from 10 to 30 feet above the spring so that surface water may be drained around and away from the spring. Where there is much surface wash a larger ditch should be dug 50 feet or more above the spring to intercept this polluted surface water.

Live stock or other possible polluting agents should be fenced away from springs and not be allowed access on the watershed immediately above a spring.

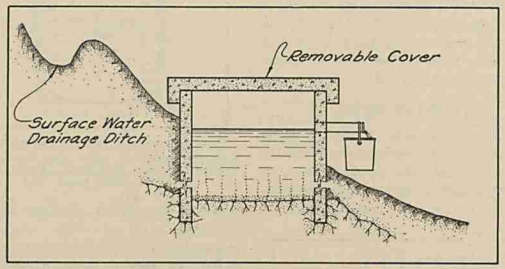


Figure 6. **SAFE SPRING SUPPLY**
Closed in and covered prevents pollution. Overflow pipe prevents dipping. Drainage ditch removes surface wash.

Sterilizing Wells and Springs

In making the change from an open top dangerous well, as shown in Figure 2, to a safe and properly protected well, as shown in Figure 4, or when a new well or spring is first put into service or has become accidentally polluted, the water in the well or spring may be temporarily sterilized by adding a solution of one ounce (one heaping tablespoonful) of calcium hypochlorite, sometimes known as chloride of lime, or sanitary lime, to each 1,000 gallons of water in the well or spring. The entire contents of the well or spring should be thoroughly mixed with the above solution, and allowed to stand for at least thirty minutes. During this time the walls or well curbing should be washed off with the treated water. The water should then be pumped off until little or no taste remains.

The above procedure is of course only a temporary measure. It will sterilize only the water actually in the well or spring at the time the solution is applied. If the change from Figure 2 to Figure 4 is not made at once, or if pollution of any kind is allowed to continue to get into the well or spring, the above treatment will be of no value. Before attempting to sterilize a well or spring, it is advised that the local health officer or the State Board of Health be consulted for detailed directions.

Small amounts of polluted drinking water may be made safe for drinking by boiling briskly for three minutes. To overcome the "flat" taste add a pinch of salt and pour back and forth from one vessel to another a few times.

Similar literature on flies, septic tanks, milk and many other health subjects may be had free of charge by addressing THE STATE BOARD OF HEALTH, RALEIGH, N. C.

Special Bulletin No. 519. June, 1934.

Residential Sewage Disposal Plants

How to Build and Maintain Them

Every private home not accessible to a sewer should have running water and a residential sewage disposal plant similar to that illustrated in this leaflet. Such plants are easy to build. They are out of sight, they cause no odor; they last indefinitely and require comparatively little maintenance or attention. These plants consist essentially of a septic tank and a nitrification bed or a filter trench.

OPERATION

In the septic tank a portion of the solid matter in the sewage settles out and is converted into gas and water. A septic tank does not purify the sewage, it merely prepares it for final disposal. From the septic tank the sewage flows into a nitrification bed from which it is absorbed by the soil and thus disappears. Where the soil is dense clay or has little absorbing power, the sewage from the septic tank flows into a filter trench of clean, coarse sand where it is filtered and discharged into a tile line, ditch, or creek.

LOCATION

Great care should be exercised in the selection of a location for a residential sewage disposal plant. No part of it should be placed within 50 feet of a well or spring and the drainage from the plant should be away from the source of water. When absolutely necessary to locate a sewer line within 50 feet or a well or spring, or where roots of trees or shrubs abound, cast iron soil pipe with caulked and leaded joints should be used.

The nitrification bed or the filter trench should also be so located that there will be no danger of its becoming clogged by roots of trees, shrubs and weeds. The growth of grass above and adjacent to nitrification beds and filter trenches should be encouraged rather than the growth of trees and shrubbery as grass takes up and evaporates more moisture than larger plants.

CONSTRUCTION HELPS

Septic Tank

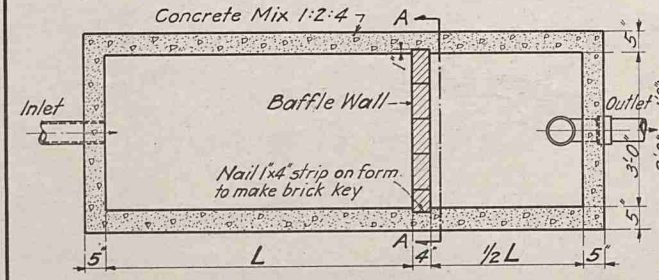
The sand used for construction should be clean, sharp, and free from mud, leaves and other organic matter. In many places by carefully excavating to the exact outside dimensions the earth embankment can be utilized as the outside form for the concrete tank.

Ordinarily 1:2:4 concrete is recommended; that is, one bag (one cubic foot) of cement, two cubic feet of sand, and four cubic feet of gravel or broken stone are used per batch of concrete. Mix the concrete thoroughly in a mixer or by turning it by hand at least six to ten times in a mixing box, or on a platform, but never on the ground. Use barely enough water to make a workable mix, as excess water weakens concrete.

About two to five hours after the concrete bottom of the tank has been poured the inside forms may be placed and the walls poured. Tamp and spade the concrete thoroughly as it is placed.

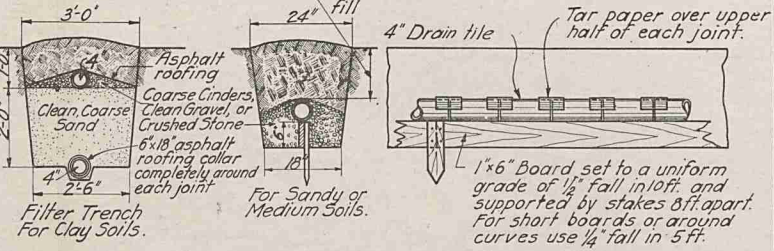
Nitrification Bed

It is important that the drain tile in the nitrification bed have a uniform flat grade without any "humps or hollows." A simple, convenient method of laying the drain tile is illustrated in the drawing. It consists of setting grade boards carefully to grade in the bottom of the trench and placing the cinders, gravel, or broken stone level with the top edge

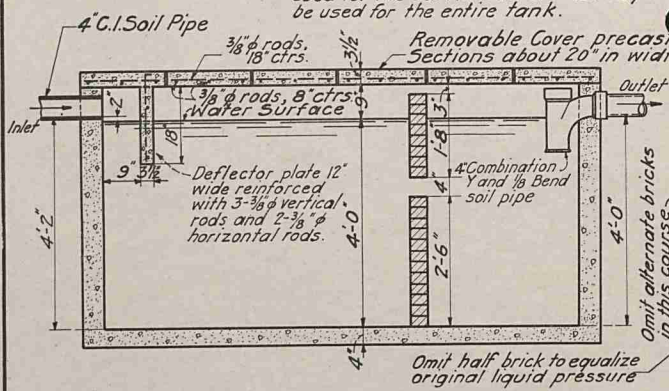


PLAN - COVER REMOVED.

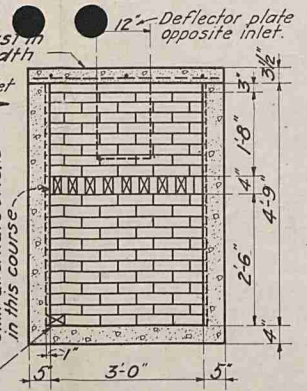
Note: Where preferred concrete may be used for the baffle wall or brick may be used for the entire tank.



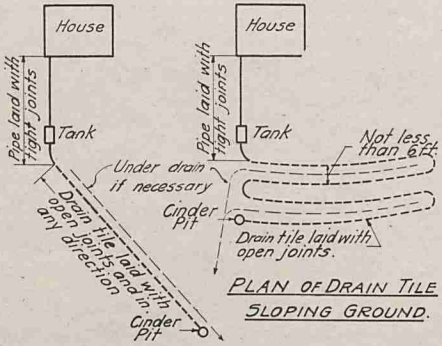
SECTIONS SHOWING DRAIN TILE IN TRENCH.



SECTIONAL VIEW OF SEPTIC TANK.



SECTION A-A.



PLAN OF DRAIN TILE SLOPING GROUND.

PLAN OF DRAIN TILE LEVEL GROUND.

TABLE OF DIMENSIONS & QUANTITIES.

No. of Users	Length L	Length ½L	Length of 4" Drain Sandy Soils	Length of 4" Drain Medium Soils	Length Filter Trench	Bags of Cement	Cu. Yds Sand	Cu. Yds Gravel	3/8" ϕ Reinf. Steel Lin. Ft.	No. of Brick	Forms & Mixing Platform 2"x4"x12'-0" Lin. Ft.	Forms & Mixing Platform 1"x6" T. & G. Sq. Ft.
1-6	6'-0"	3'-0"	120'	240'	60'	20	1.5	2.9	100	100	240	280
7-9	7'-0"	3'-6"	180'	360'	90'	22	1.7	3.3	115	100	252	300
10-12	8'-0"	4'-0"	240'	480'	120'	24	1.8	3.6	130	100	264	320
13-15	9'-0"	4'-6"	300'	600'	150'	27	2.0	4.0	145	100	276	340

RESIDENTIAL SEWAGE DISPOSAL PLANT

APPROVED BY THE STATE BOARD OF HEALTH

RALEIGH, N.C.

of these boards. The 4-inch drain tiles are then laid on top of these boards. Pieces of asphalt roofing, tar paper, or sheet metal, approximately 4" by 8" in size, are then placed over the joints to keep earth out of the tile after which cinders, gravel or broken stones are placed against the tile as shown.

Ordinarily the tile in a nitrification bed should be laid as shallow as possible up to a depth of about 6 inches. A tile line should be so placed that it will not be disturbed by plowing or hauling across it during wet weather. In the last 2 or 3 feet of the nitrification bed the cinders, gravel, or stone should be omitted and the grade of the drain tile raised at least 4 inches. A pit at least 3 feet across by 3 feet deep should be dug at the end of the tile line. Such a pit filled to the surface with cinders aerates the bed and provides additional storage and absorption capacity.

Occasionally during rainy seasons the ground in some sections of the State becomes so saturated with storm water as to leave little opportunity for the sewage to be absorbed in the nitrification bed. In such cases it is necessary to remove the ground water and tile underdrains should be laid as shown in the drawing.

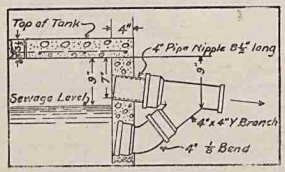
Filter Trench

The construction of the filter trench is clearly shown in the cross section. The bottom 4-inch drain tile in the filter trench should have its joints loosely wrapped with strips of asphalt roofing, tar paper, or sheet metal to exclude the sand. This lower tile should also be laid carefully to a grade of ½ inch fall in 10 feet and about 2 feet 2 inches below the grade of the upper 4-inch tile which leads from the septic tank. After the clean, coarse sand is laid in the filter trench to proper grade, the tile from the septic tank is laid on top of the sand and held in place by coarse cinders, gravel, or broken stone and a 3-foot strip of ordinary asphalt roofing laid over the top of the tile, stone, or cinder to keep the earth from flowing in and stopping up the open spaces in the stone and sand. This is important.

General

In laying out either a nitrification bed or a filter trench, extreme care should be taken to insure a grade of ½" in 10 feet and to avoid "humps or hollows" in the line. To this end it is strongly urged that an engineer's or architect's level be used, rather than a carpenter's level, as the latter is often inaccurate.

It is immaterial whether the filter trench or nitrification bed is laid out straight or curved, just so the required quantity of drain tile is used and carefully laid to grade. The amount of drain tile is determined by the number of people to be accommodated and the character of soil in which it is to be placed.



A 4" Y, an eighth bend, and a short section of pipe as shown above form an even better outlet from the septic tank than the combination Y and 1/8 bend shown in the large drawing. Where the soil pipe fittings are available this alternate is to be preferred.

Roof drains should never be connected to the sewage disposal plant. These disposal plants should always be built according to the dimensions shown, and where there is any question as to the number of users, the next larger size should be constructed, as the additional cost is negligible.

MAINTENANCE

The tank should be inspected and the amount of sludge determined two years after installation, and each year thereafter. When the tank becomes half full of sludge and scum, this material should be removed and buried. A little sludge should always be left in the tank to keep it working.

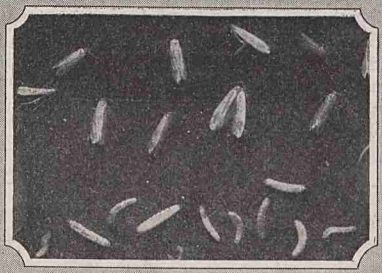
Care should be taken not to allow an undue amount of lye or disinfectants to be discharged into the sewage as such materials defeat the purpose of the tank by interfering with bacterial action.

If any special difficulties are encountered, or unusual conditions or problems are found, the State Board of Health, at Raleigh, N. C., will be glad to assist by correspondence or where practicable an engineer may be able to call and offer advice and assistance.

U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1353

CLOTHES MOTHS AND THEIR CONTROL



COMPLETE elimination of clothes moths from dwellings and other buildings is difficult. These insects breed not only in wearing apparel, carpets, rugs, piano felts, and upholstered furniture, but in the woolen lint lodged in floor cracks and similar places.

Clothes moths can be kept under control, however, by persistent and intelligent use of the measures described in this bulletin.

Women's clubs and neighborhood organizations can greatly reduce expenses in work against moths by pooling their needs and purchasing in quantity from local dealers or manufacturing chemists the insecticides required. Naphthalene or paradichlorobenzene, two of the safest and best materials for protecting fabrics in storage against moth injury, can be obtained in this way.

Washington, D. C. Issued July, 1923; revised May, 1935

CLOTHES MOTHS AND THEIR CONTROL

By E. A. Back, *principal entomologist, Division of Insects Affecting Man and Animals, Bureau of Entomology and Plant Quarantine*

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CLOTHES MOTHS THE CHIEF PESTS OF FABRICS

CLOTHES MOTHS are the prime offenders among fabric pests. The moths or "millers" most common about houses have a wing spread of about half an inch and are yellowish or buff colored. They very seldom fly directly to a light in a room and remain flitting about it, as do so many small and large moths that enter houses from outside. Moths that fly in large numbers about the home light are generally feeders upon outdoor vegetation and will not eat household fabrics. Their presence in the house is accidental—they have merely been lured inside by the lighted lamp.

The common clothes moths are usually seen flying in darkened corners and just beyond range of the brightest rays of the lamp. They prefer darkness. They are frightened when clothing and other objects are suddenly moved, and are then seen running rapidly or flying to conceal themselves in the creases of clothing, cracks, or other dark places.

HARMLESS MOTH MILLER PARENT OF DESTRUCTIVE WORM

The moths, or millers as they are often called, have imperfectly developed mouth parts and could not feed upon fabrics if they desired. Their purpose in life is merely to lay eggs that develop into the worms or larvae, which alone can cause destruction. Nevertheless, every moth killed helps to reduce infestations by preventing more eggs being laid. The moths lay their eggs in and about clothing and other objects subject to attack. From the eggs are hatched

the larvae, or worms. When these become fully grown, they are whitish and about half an inch long. The larvae spin cocoons in which they transform to the pupa or chrysalis stage, and during this stage the insect changes to the adult, or moth. Thus each generation of clothes moths passes through four distinct stages, namely, the egg (fig. 14), the larva or worm (figs. 1, 2, 4, and 7), the pupa or chrysalis, and the adult or moth (figs. 1, 4, 6, and 7). Only the worm or larva of the clothes moth is capable of destroying fabrics.

COMMON SPECIES OF CLOTHES MOTHS

There are two very common species of clothes moths. They are the case-making clothes moth (*Tinea pellionella* L.) and the webbing clothes moth (*Tineola biselliella* Hummel). The tapestry moth (*Trichophaga tapetzella* L.) is less often found, though it may become destructive.

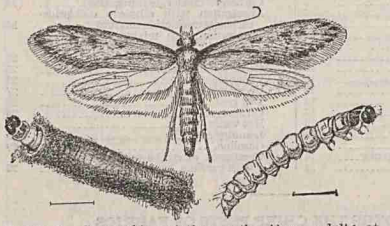

FIGURE 1.—Case-making clothes moth: Above, adult; at right, larva; at left, larva in case. Enlarged. (Riley)

THE CASE-MAKING CLOTHES MOTH

The adult of the case-making clothes moth (*Tinea pellionella* L.) has a wing expanse of about half an inch. Its head and forewings are grayish yellow or buff, with indistinct dark spots on the middle of the outer portions. The hind wings are white or grayish and silky.

The case-making clothes moth (fig. 1) is so named because the larva, for its protection, makes a portable case out of spun silk and fragments of the fabric upon which it feeds. These cases attain a length of from one-quarter to three-eighths of an inch and are shaped as illustrated in Figures 1 at left and 2, *a*, *c*. The larva almost never leaves its case. It withdraws completely into it when resting, but when feeding or moving from place to place it merely protrudes its head and first body segments, as illustrated in Figure 1, at left. The larva spins almost no web on the fabric upon which it feeds, and is more likely to crawl about restlessly, eating small holes here and there. (Fig. 2, *d*, and Fig. 3.)

As the larva grows it enlarges its case from time to time, both in length and in circumference. This enlarging process has been interestingly described as follows:

> Without leaving its case the larva makes a slit halfway down one side and inserts a triangular gore of new material. A similar insertion is made on the opposite side, and the larva reverses itself without leaving the case and makes corresponding slits and additions in the other half. The case is lengthened by successive additions to either end. Exteriorly, the case appears to be a matted mass of small particles of wool; interiorly, it is lined with soft whitish silk. By transferring the larva from time to time to fabrics of different colors the case may be made to assume as varied a pattern as the experimenter desires,

and will illustrate, in its coloring, the peculiar method of making the enlargements and additions described.[1]

On reaching full growth the larva attaches its case by silken threads to the material upon which it has been feeding, or it may crawl, carrying its case, to another part of the room. In either instance, after attaching the case, it seals it with silk, thus making a pupal chamber wherein it transforms from the helpless pupa or chrysalis to the pretty and active moth.

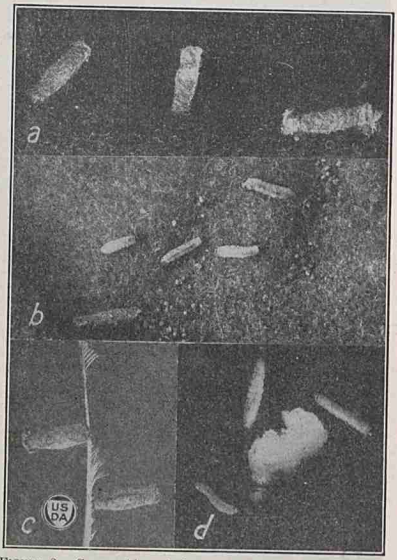

FIGURE 2.—Case-making clothes moth: *a*, Three cases nearly twice natural size; *b*, larva removed from cases, and pellets of excrement; *c*, cases attached to damaged feather, about one and one-third times natural size; *d*, characteristic damage by larva to cloth

THE WEBBING CLOTHES MOTH

The adult (fig. 4, upper half) of the webbing clothes moth (*Tineola biselliella* Hummel) is of about the same size as that of the case-making species, but its color is uniformly pale buff without spots. The moths of both species vary considerably in size; they seldom have a wing expanse of over half an inch, and frequently are very much smaller.

The webbing clothes moth is the most abundant and injurious clothes moth. During the last few years, also, practically all instances of severe clothes-moth damage reported by manufacturing plants throughout the North, including Chicago, Boston, and New York, have been associated with this species. For years it has been the prevailing species in certain houses in western Massachusetts and southeastern Connecticut; hence it can not be said that this webbing clothes moth is typically southern in distribution, although it is often called the "southern" clothes moth.

The larva (fig. 4) of the webbing clothes moth resembles that of the case-making moth. Unlike the latter, however, it makes no portable case, but spins silky transparent tubes or tunnels wherever it goes. (Figs. 5 and 13.) Often it spins a cobwebby mass of

[1] C. L. Marlatt, in Bulletin 4, new series, Division of Entomology, U. S. Department of Agriculture, p. 65. 1896.

silken threads, apparently at random, as it crawls about fabrics, which gives to its food an unsightly appearance. The larvae may be quite restless, and often may be seen crawling over fabrics, or

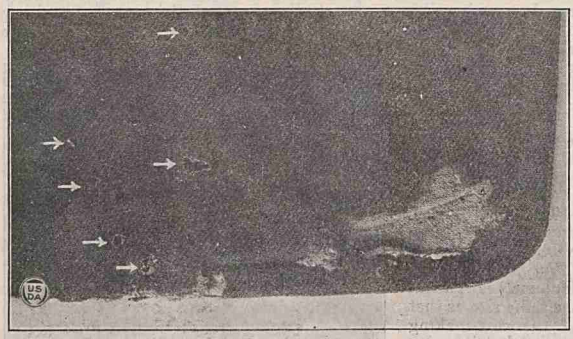

FIGURE 3.—Section of man's coat damaged by case-making clothes moth. Note large eaten area at lower corner and along lower edge and small holes eaten at arrows

upon floors beneath upholstered furniture from which they have dropped. They attain a length of about half an inch and are white. Figure 4 gives a good idea of the relative size of the larvae and moths; the buttons shown are nine-sixteenths of an inch in diameter. When the larva becomes full grown, it spins a cocoon of silk, inter-

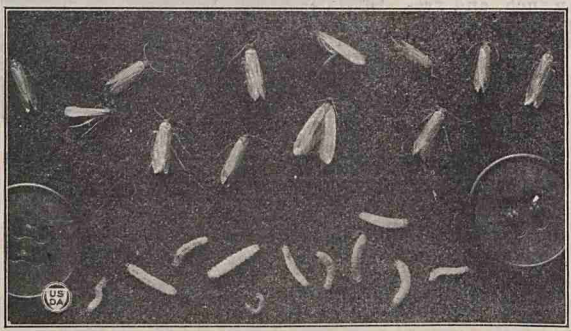

FIGURE 4.—Webbing clothes moth: Adults or moths above and larvae or worms below. Buttons are nine-sixteenths of an inch in diameter

mixed with bits of fabric and excrement, which is quite distinct from the case (fig. 2, *a*, *c*) made by the case-making clothes moth. Within this cocoon the transformation from the larva to the adult

takes place, and, as in the case of the other species, the chrysalis works its way partly out of the cocoon as the moth is about to emerge.

THE TAPESTRY MOTH

The tapestry moth (*Trichophaga tapetzella* L.) (fig. 6) is not so common in the United States as the two foregoing clothes moths. It is larger than either the case-making or the webbing clothes moth, having a wing expanse of about three-fourths of an inch, and is more strikingly colored. Its head and the basal third of its fore-wings are black, while the outer two-thirds of the wings are creamy white, though more or less obscured on the middle with gray. The hind wings are uniformly pale gray.

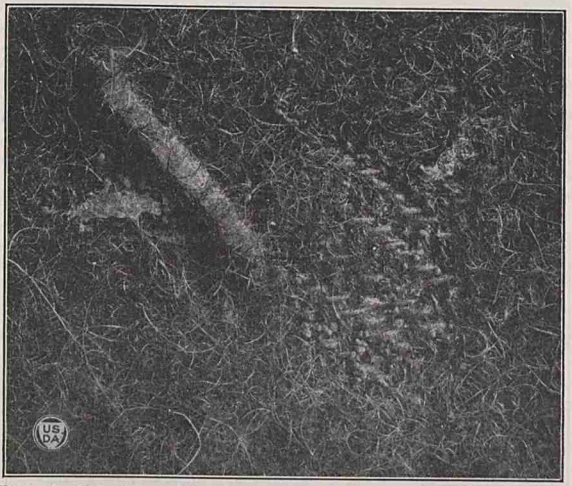

FIGURE 5.—Work of the webbing clothes moth in piece of cloth with heavy nap. Note long, narrow tube in which the larva secretes itself and from which it feeds upon the cloth. To the right of the tube is shown an area over which the larva has eaten off the nap, leaving the warp exposed

The tapestry moth is said to prefer coarser and heavier fabrics than the other two species of moths. It is more likely to occur in carpets, horse blankets, tapestries, felting, furs, and skins. The larvae construct burrows or silk-lined galleries in all directions throughout the infested material, and often cause quite as much injury by these as by the amount of the fabric that is actually eaten. The tapestry moth has been reported as destructive to wall paper.

FOOD OF CLOTHES MOTHS

Clothes moths feed upon wool, fur, hair, feathers, and all fabrics (figs. 7, 8, and 9) manufactured from them. They also relish dried

animal matter such as dead insects, including the dead of their own species, and untreated skins, beef meal, casein, etc. In experimental work clothes moths have thrived best upon a diet of bristles, hair, feathers, fur, or raw wool, and not so well upon ordinary woolen cloth used in the making of wearing apparel. Notwithstanding this, the damage they cause to wearing apparel has given them a well-deserved reputation as pests. There may be some satisfaction, however, in knowing that if the death rate among clothes moths feeding upon dyed woolen fabrics was as low as among those feeding upon raw wool, and their growth as rapid as when they feed upon bristles, fur (figs. 10 and 11), and hair, their capacity for destruction would be increased enormously. When a campaign is waged against clothes moths in the home, it must be remembered that they may be found feeding upon carpets and rugs (figs. 7, 8, and 9), stuffing and covering of upholstered furniture, tapestries, stuffed animals or birds, dust brushes (fig. 12), shaving brushes (fig. 13), the felts in pianos, and a long array of articles often little thought of as being fed upon by clothes moths. Woolen lint, and hair from pet animals which

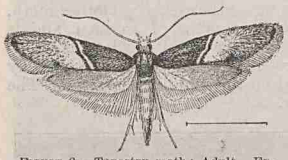

FIGURE 6.—Tapestry moth: Adult. Enlarged. (Riley)

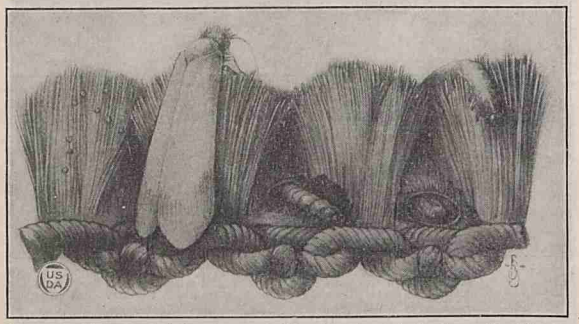

FIGURE 7.—Clothes-moth injury to carpet: Side view of carpet showing moth, with eggs on tuft, to left, larva eating at base of tuft to right, and cocoon with end cut to expose pupa within. Note larva crawling over tuft at extreme right. Greatly enlarged

has become lodged in floor cracks, behind baseboards, and elsewhere can keep moths alive in otherwise scrupulously clean houses. Clothes moths almost never injure household fabrics or wearing apparel in daily or weekly use, or articles that are brushed, cleaned, or beaten once or twice a month. Furniture, on the other hand, may be in constant use and still be badly infested.

BIOLOGY OF CLOTHES MOTHS

It is important in a fight against clothes moths to know something about their biology. Each generation is called a life cycle because the insect keeps passing through a successive round of stages, consisting of the egg, the larva, the pupa, and the moth. The fol-

FIGURE 8.—Clothes-moth injury to rugs. When the injury illustrated above has progressed sufficiently far, whole patches of pile are cut off by the larvae and the warp is left exposed as here shown. Sometimes larvae feed on the underside of carpets and rugs, but they cut the pile there just as in feeding as indicated in Figure 7

lowing facts concerning these stages of the life cycle relate particularly to the webbing clothes moth, but must be taken into consideration in any intelligent campaign against clothes moths of other species as well.

THE ADULT OR MOTH MILLER

The moth, or "miller," which is the adult, seldom lives as long as one month. Moths are more likely to die between the seventh and

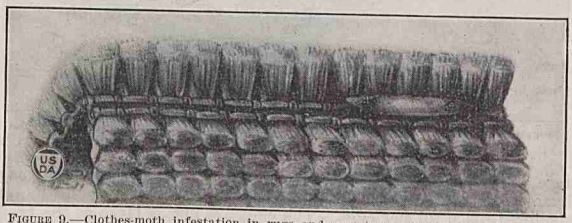

FIGURE 9.—Clothes-moth infestation in rugs and carpets can be detected by bending the fabrics so that the space between the tufts of pile can be examined. Moth webbing and cocoons (as here shown) are thus readily exposed

fourteenth days after they emerge from the pupa. Apparently they take no nourishment, and the female moths begin laying eggs before they are fully 1 day old and usually lay eggs each subsequent day of their lives. When a moth stops laying eggs it is a sign that she will die within a day or two. Few moths have been known to lay over 100 or 150 eggs, and of this number at least one-half

are laid during the first few days of adult life. As many as 59 eggs have been laid during 24 hours by one female moth, but this is an unusual number.

THE EGG

The eggs are laid singly or in groups of as many as 25, either loosely upon or between folds of fabrics. In loosely woven goods, such as yarns, carpets, and rugs with heavy nap, or heavy woolen clothes, the eggs are placed down in the meshes of the fabric, where they are held by the fine threads, as illustrated in Figure 14. On certain closely woven serges they are laid so loosely upon the sur-

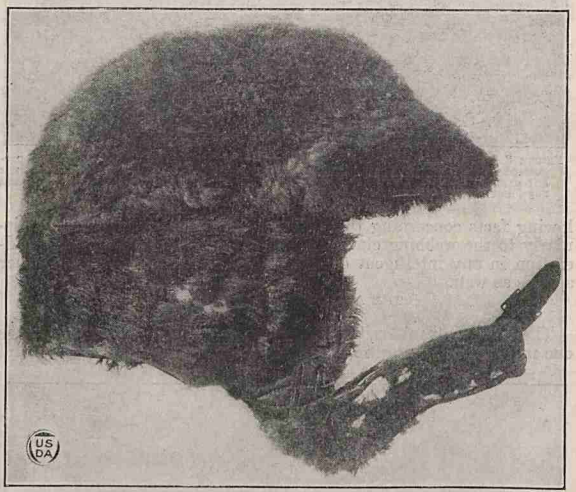

FIGURE 10.—Aviator's helmet slightly damaged by webbing clothes moth larvae. Compare with Figure 11, which shows complete destruction of fur

face that they can be shaken off. In furs, the female moth may burrow down among the hairs to the skin itself in order to find a sheltered place for her eggs. The eggs are not as large as the head of a common pin, but, small as they are, their white color makes it possible to see them without the aid of a magnifying glass, if they are laid upon a dark or black substance. They are very fragile and easily crushed.

Clothes-moth eggs hatch most readily in warm summer weather in from four to eight days. During colder weather hatching may not take place for three weeks, but in steam-heated buildings it does not require a much longer time than it does in warm summer weather.

THE LARVA

Of all the stages, the larva or worm stage—the only stage in which clothes moths damage fabrics—is the most susceptible to outside influences. The nature of its food, the temperature, and the humidity have pronounced effects upon its growth. Sometimes, for no apparent reason, the larva may pass into a period of dormancy lasting as long as 8 to 24 months, during which it will neither feed nor move about appreciably, only later to become active, feed, and continue its growth.

FIGURE 11.—Aviator's helmet with fur completely eaten away by larvae of webbing clothes moth. Note cocoons of moth on upper portion, and that the larvae have even eaten the leather on central lower portion

When first hatched the larva is white, as when full-grown, and is scarcely one-sixteenth of an inch long. When young it is so transparent that the color of its food shows through its alimentary canal as a line extending along the center of the body. When full-grown it may be half an inch long, although its size will vary with its environment and food supply. It is not possible to judge the age of a larva by its size. Some larvae at 15 months of age are very much smaller than others only 2 months old. The shortest definite record for larval development known is about 40 days at 80° F.

Many larvae hatching during the summer do not become fully grown and mature as moths until the following March, April, and May. There even is a considerable variation in the length of time larvae of the same brood require for development. Larvae hatched

on the same day may require as few as 15 weeks or as long as 4 years. Much depends upon their food and environment.

THE PUPA OR CHRYSALIS

The pupa or chrysalis stage requires during warm summer weather about 8 to 10 days. During the winter months from January to March, in a steam-heated building, clothes moths remained in the pupa stage three to four weeks.

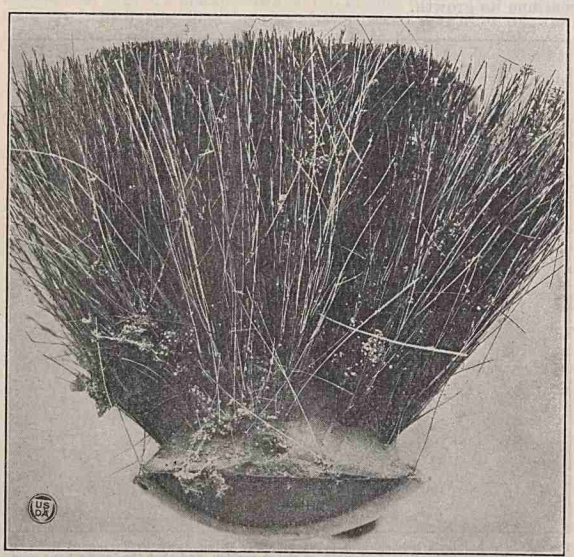

FIGURE 12.—End view of common bristle dust brush, showing sandlike pellets of frass and damaged bristles. Clothes moths can feed upon all articles made of bristles

SEASONAL HISTORY

While moths may be on the wing in steam-heated buildings during almost any month, they are present in greatest abundance the country over from May to July and during September and October. In steam-heated houses moths of the webbing species have been observed as early as late December, January, and February. In northern localities, where only the case-making moth is present, and in houses not continuously heated, the moths are single-brooded and appear during late May, June, and July. The late appearance of moths in such northern houses is greatly to the advantage of the housewife, for by June winter clothing can be stored where it is protected from moth eggs.

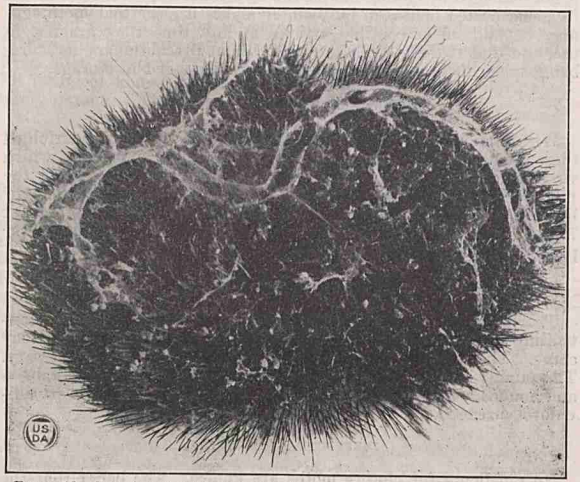

FIGURE 13.—End view of a shaving brush, showing a well-developed larval tube of the southern or webbing clothes moth

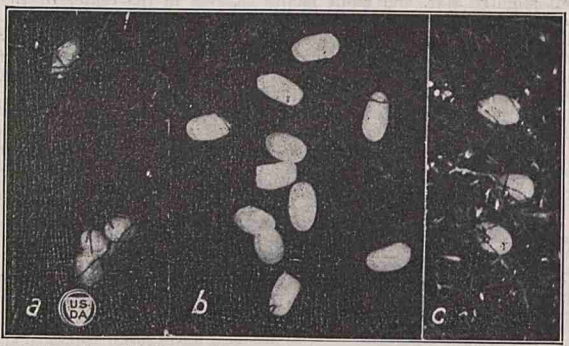

FIGURE 14.—Eggs of webbing clothes moth: At *a* and *c*, laid among the threads of a loosely woven cloth; at *b*, laid upon a closely woven broadcloth. Greatly magnified

While it is true that wearing apparel, if in daily or weekly use, is not damaged by clothes moths, the occasional appearance of moths in steam-heated houses in late winter makes it clear that moth eggs may be laid on susceptible articles at any time they are not in use, and that if these are laid away without precautionary measures being taken to protect them they may be damaged in storage.

EXCREMENT MISTAKEN FOR EGGS

When articles very badly damaged by clothes moths are unfolded there are always seen tiny sandlike particles, hard and gritty, which vary in color according to the color of the food upon which the moth worms have been feeding. These particles are pellets of larval excrement and not eggs. A single moth larva may void about 700 of these pellets during its growth. Fortunately eggs are never present in such numbers (pp. 7 and 8).

CONTROL OF CLOTHES MOTHS

There are effective methods, discussed in this bulletin, for controlling clothes moths and reducing to a minimum the losses they cause. The fumigation of houses is not always feasible or necessary. Thoroughly cleaning, brushing, and, if possible, sunning fabrics and immediately storing them with naphthalene or with paradichlorobenzene is an effective and inexpensive precaution.

INEFFECTIVE MEASURES

No repellents for clothes moths are known. The belief that the mere smell of certain substances keeps or drives moths away has been proved to be incorrect. In Department experiments a room was equipped with a number of closets, the doors of which were left slightly ajar, and adult moths set free in the center of the room entered the closets containing the odor of naphthalene, paradichlorobenzene, cedar, pine, or camphor, as soon as the closets without odors. Clothes hung in the closets containing small quantities of the above-mentioned substances were as badly damaged by the larvae as were the clothes in the other closets. The mere *smell* of a chemical does not drive moths out of clothing nor does it keep them out.

The following substances often recommended for clothes moth control are worthless for this purpose:

Tobacco extracts containing nicotine and tobacco powder when used at reasonable strengths.
Lavender flowers (scattered on).
Cayenne pepper.
Allspice (dusted).
Angelica root (dusted).
Black pepper.
Pyrethrum stems (dusted).
Lime, air-slaked (dusted).
Powdered sulphur (dusted).
Salt (dusted).
Quassia chips (dusted).
Borax (dusted).
Colocynth pulp (dusted).
Eucalyptus leaves (dusted).
Helebore, white (dusted).
Formaldehyde (sprayed 1 to 10).
Sodium bicarbonate (dusted).
Sodium carbonate (dusted).
Lead carbonate (dusted).
Lead oxide (dusted).
Red cedar leaves (dried and placed in clothing).

CONSTANT WATCHFULNESS

Naturally, constant watchfulness must be the watchword for successful control. No treatment to kill clothes moths already in fabrics will have any lasting effect in keeping other clothes moths from later infesting these fabrics if left exposed about the house. No practical known treatment will render wearing apparel absolutely immune to attack.

MOTHPROOFING SOLUTIONS

Numerous mothproofing solutions for which much is claimed by manufacturers are available. In many instances guarantees are issued to the effect that one application will render the treated fabric immune to moth attack for the life of the garment, or until the fabric is washed or drycleaned, depending upon whether the solution is removable by washing in water or by drycleaning fluids. From laboratory tests and the experience of the public, it would seem that no mothproofing solution now available, is capable of imparting a permanent or absolute mothproofness. It would seem, however, that some of the better fluoride, cinchona alkaloid, and rotenone solutions, if so used as to thoroughly impregnate the treated fabric, do impart a moth resistance that is of very considerable value, and when a person applies such a treatment he gets the best protection of this nature available.

Solutions depending for their effectiveness on an arsenic content are not recommended by this Department because of the danger of skin troubles developing as a result of contact with arsenic-treated fabrics or furs.

BRUSHING, BEATING, AND SUNNING

Too much emphasis cannot be placed on the value of frequent brushing, beating, sunning, and cleaning of articles subject to clothes-moth attack, as the eggs of clothes moths are delicate they can usually be crushed or dislodged by brushing and beating. Pay special attention to crevices, seams, and pockets. Sunning is a valuable aid in control work. In articles laid away moths are much more likely to concentrate upon soiled spots if these have not been removed. Brushing and beating usually remove or kill the larvae or worms. If clothing is thoroughly brushed every two weeks, it is doubtful if moths can affect it seriously. Carpets and rugs cleaned by strong vacuum cleaners and thoroughly brushed on both sides, or electrically cleaned, are freed from infestation if the work is properly done. Clothing dry-cleaned is also freed from infestation by the process. Once freed from infestation, clothes should be protected, if they are not to be used during the warm season, by being wrapped in paper or placed in tight chests or treated closets.

PAPER GARMENT BAGS

The public is familiar with "mothproof" paper bags of various types that appear upon the market each summer. These paper bags for the storage of suits and coats are made of heavy paper, paper impregnated with tar, or other substances for which much is claimed.

These bags if not torn and if properly used are excellent for keeping moths from reaching clothing. They are of no value in killing moths that may be in the clothing when it is placed in the bag, and those made of plain paper are just as good as those containing tar or cedar and pine oils.

The value of such bags as protectors against infestation ceases largely as soon as they are torn, even slightly, or if they are left unsealed. Frequently clothing on coat hangers is placed in bags with the hook of the hanger protruding from the bag so that the clothing and bag may be hung in the closet. Unless special attention is given to this method of hanging, the paper bag is not carefully sealed about the hanger, and spaces of one-fourth inch or more are left open. Moths have no difficulty in crawling into such openings, and if they find them the bags are useless.

CAREFUL WRAPPING IN UNBROKEN PAPER

Ordinary firm wrapping paper is satisfactory, or several thicknesses of newspapers will serve when one is wrapping garments or other fabrics. Clothes moths do not eat into paper to reach clothing. For this reason, if woolens and other fabrics subject to moth attack are cleaned and freed from moths by any of the methods mentioned above, they will remain safe if wrapped at once and tightly in several thicknesses of firm wrapping paper or in newspapers. There is a general belief that the print on newspapers keeps moths away. This is not true. Any unbroken paper of moderate thickness will protect clothing. Care must be exercised to bend back the folds of the paper upon themselves along the edges and at the ends of the bundles so that the moths cannot crawl into them. Hats and other articles that might be damaged by tight wrapping can be protected by being placed in ordinary unbroken hat boxes, cardboard boxes, etc., and the covers of the boxes sealed with gummed paper.

After clothing has been made into bundles or sealed in boxes, these bundles and boxes may be left exposed in garrets or on storeroom shelves without danger of infestation from without. If flake naphthalene is wrapped among the folds of clothing made into bundles, any small larvae or eggs that may have got into the cloth before it was wrapped will be killed.

MOTH CRYSTALS AND MOTH BALLS

The crystalline substances commonly used in moth control are naphthalene, paradichlorobenzene, and gum camphor. These can be purchased at drug or department stores and are of the greatest value and completely effective only if used in sufficient quantity and in tightly closed containers such as trunks, closets, or even rooms.

In evaporating slowly the crystals form a vapor or gas which is heavier than air and tends to sink to the bottom of the container. These vapors will even pass through paper if it is untreated. The mere smell will not protect garments (p. 12), and if the trunk or closet is not airtight and the vapors easily leak out, no practical protection is offered. But if the lid, or the closet door, shuts tightly against a felt strip or gasket and is kept shut most of the time, and

the closet is tightly constructed otherwise, genuine protection is given, for the vapors remain in sufficient concentration over a long enough time to prevent the moth worms from feeding and ultimately to kill them. The secret of success is to use only tight containers. If they are not as tight as they should be for the best results, make them as tight as possible by pasting strips of heavy paper over cracks or using crack fillers and employ a greater quantity of the chemical so that the vapors that escape will be replaced by others formed during the slow evaporation of the crystals.

NAPHTHALENE

Naphthalene is well known in the form of flakes or moth balls. If in good condition, it is one of the safest and best materials for protecting garments, rugs, etc., against moths. It is cheap and can be depended on if used in sufficient quantity; for long periods of storage it is as good as any crystalline substance for protection against moths, though its odor is not pleasant.

Naphthalene flakes cost from 6 to 20 cents a pound. They should be used at the rate of about 1 pound to each 6 to 10 cubic feet of space, which is the size of the average trunk. Experiments have proved that 2 or 3 ounces of flake naphthalene, or 8 ounces in the form of moth balls, will kill all stages of the moths if confined in a *thoroughly tight* container having a capacity of 5 cubic feet. In the opinion of the writer it is safer to use at least 1 pound of flake naphthalene scattered between the folds of clothing in a trunk of average size. You can thus be certain of killing the young and old moth worms, moth eggs, and the moths themselves if they happen to be present. A moth ball here and there will do no good. When large closets or rooms are used for storage no moth can cause injury if enough flake naphthalene is used to cause the eyes and nose to smart when one enters.

If a good grade of naphthalene is used there will be no sooty deposit when the crystals evaporate, but as a guard against impurities that may stain delicate fabrics it is wise to scatter the flakes between folds of old linen or tissue paper. In treating a closet, scatter the crystals well over shelf and floor before closing the door.

One advantage in using naphthalene compressed into moth balls or cakes is that these can be put in bags made of cheesecloth and hung from hooks in the closet. These balls or cakes evaporate slowly, thus lasting longer, but for quick results the flake form is better as the evaporation is much more rapid.

The vapors escaping from closets through cracks or when the door is opened will not be strong enough to harm a person outside.

PARADICHLOROBENZENE

Paradichlorobenzene, like naphthalene, can be had in the form of flakes or crystals, or compressed into forms variously colored and variously perfumed to mask the true odor, which is, to some, less objectionable than that of naphthalene. Paradichlorobenzene enjoys popularity because its odor is more pleasing to some and is less persistent, and because a greater effort has been made to merchandise

it in an attractive manner. For this the public pays an added price. In pound tins it sells for about 50 or 60 cents.

As in the case of naphthalene, it is best to scatter the crystals between layers of tissue paper distributed throughout the clothing in the trunk or chest. Paradichlorobenzene is used in the same manner as naphthalene, and is more quickly effective in stopping the feeding of the clothes moths than is naphthalene, but this fact is of little practical value if one is storing goods for the summer months, because for such a period the cheaper naphthalene will protect just as well, as is proved by its general use in the warehousing industries.

In a tight container one-half ounce of paradichlorobenzene for each 100 cubic feet of space has been reported to kill all stages of the moths in 31 days. Two ounces for the same space stops feeding quickly. But because no two household storages are equally tight unless specially built and because garments to be protected are always relatively valuable, the writer advises for complete safety the use of 1 pound of the crystals to each trunk of average size, although some advocate much less. Unless you know that your container is really tight it would be much better to use 1 pound of flake naphthalene than 2 ounces of paradichlorobenzene, as the pound of the former would last a considerable time and continue to give off vapors to replace those lost by leakage.

Remember that neither paradichlorobenzene nor naphthalene protect your garments longer than the crystals last. Unless they have been used in quantities sufficient to kill and in containers so tight that new moths cannot get in, they must be renewed after evaporation. It is for this reason that the heavier dosages are recommended.

CAMPHOR

Gum camphor used in the manner recommended for napthalene and paradichlorobenzene will kill all stages of the clothes moth. If of good quality and used at the rate of from one-half to one pound to each 5 cubic feet of space in tight containers, gum camphor will protect. To be most effective the camphor should be broken into small pieces and used in tight containers which will confine the fumes. While gum camphor does kill some eggs and larvae when sprinkled in small pieces upon infested cloth in open containers such as bureau drawers, pockets in clothing, etc., it is not to be depended upon except where the fumes given off by evaporation can be closely confined with the clothing to be protected.

PYRETHRUM POWDER

Pyrethrum powder, if fresh, will kill clothes moth larvae. Clothing should be thoroughly dusted with the powder and placed in a tight container such as a chest or trunk, or wrapped well in unbroken paper. Pyrethrum powder soon loses its protective value on exposure to air, hence it is not considered particularly effective for long storage and is inferior to napthalene or paradichlorobenzene. It is not always easy to obtain fresh pyrethrum powder at stores.

COLD STORAGE

Protection against injury by fabric pests of all kinds is assured by proper cold storage. Once fabrics are in cold storage, no injury can

take place. Cold storage (fig. 15) is depended on for absolute protection by dealers in carpets, furs, and other valuable articles such as stuffed animal heads, blankets, automobile robes, curtains, and upholstered furniture. Cold-storage facilities have increased with public demand until today no city or large town is without storage equipment. A tour during the summer months through the cold-storage rooms of large department stores and storage concerns with their wealth of furs and woolens cannot but impress one with the well-grounded faith of the public in this means of protection.

Articles will be protected from injury in storage at temperatures ranging from 40° to 42° F. A number of years ago a manager of a large storage-warehouse company in Washington, D. C., conducted certain experiments at the instance of the Chief of the Bureau of Entomology, with the result that it was found that larvae of the

FIGURE 15.—View in cold-storage room for rugs and carpets in a modern fireproof storage warehouse. Rugs and all other articles subject to attack by fabric pests are absolutely protected while in cold storage.

webbing clothes moth and of the black carpet beetle can withstand for a considerable time a temperature of 18°. It has been discovered that it is not so much the cold that kills. It is the sudden change from a cold to a warmer temperature and back to a cold temperature that most quickly results fatally. Thus it was learned that if articles infested with clothes moths were refrigerated at 18° for several days, then suddenly exposed for a short time to 50°, and then returned to 18°, and finally held permanently at about 40°, all moth life in them would be killed.

If storage concerns intend to destroy the clothes moths in articles intrusted to them, as well as to protect them from injury during the period of storage, it is recommended that the articles be exposed to

two or three changes of temperature as noted above before they are placed permanently at 40° to 42° F. The maintenance of a temperature lower than 40° to 42° is needless and a wasteful expense.

If the storage company merely guarantees to protect articles during the period of storage, it is quite sufficient to maintain them at a temperature of about 40° to 45° F. Companies should advise patrons that clothes-moth larvae can withstand storage at temperatures ranging from 24° to 45° for longer periods than that for which the majority of articles are refrigerated. Thus well-grown larvae of the webbing clothes moth in fur and wool held in commercial cold storage at a temperature said to fluctuate between 24° and 48°, but held mostly at about 40°, were found by the writer to be alive after storage for 6, 8, 10, 11, and 12 months. larvae in fur helmets placed in storage during February, removed the following December, and held in a steam-heated building, transformed in considerable numbers into active adults by the middle of January. These adults showed no effects of the refrigeration of the larvae from which they had developed, but laid many eggs that hatched normally. Refrigeration for 6 months had no noticeable effect upon the larvae, except to hold them inactive and incapable of causing injury. While larvae refrigerated for 10 to 12 months matured, as above stated, into moths, a large percentage of these moths, though active soon after removal from storage, died after being subjected to warmer temperature. These facts are important, for they explain why patrons have at times found living, active, and robust larvae in articles several days after they had been removed from the cold storage in which they had been held 4 or 5 months. If a fairly even temperature has been maintained, such a discovery is possible and is no reflection upon the storage concern. If articles are cleaned thoroughly before being placed in storage of any sort, as they always should be, the likelihood that they will contain well-grown larvae is very slight.

STORAGE IN VAULTS WITH FUMIGATION

During the last few years an increasing number of storage firms have installed burglarproof and fireproof storage vaults in which furs, coats, rugs, furniture, and other articles can be stored and absolutely protected from moths by fumigation. This method of storage combines tight storage and fumigation. Such treatment has long been recommended by this Department. When intelligently followed, this method of protecting articles against moth ravages is excellent and is the equal of any other. Because the cost of installing and operating this type of storage is moderate and because the results are satisfactory, it has been adopted by some of the largest department stores and storage concerns for storing furs and other articles during the summer. (Fig. 16.)

Operators of this type of storage and curators of furs at the National Museum have found that the luster and natural oils of tanned furs are not affected by such storage, although statements to the contrary are often heard. The life of the fur is prolonged by this method as it is by any other storage method approved by this Department, because the fur is protected from destructive insects, light, dust, and excessive humidity.

FUMIGATION OF ENTIRE ESTABLISHMENT WITH HYDROCYANIC ACID GAS OR SULPHUR FUMES

In large houses with many carpets or rugs, much upholstered furniture, and other fabric furnishings, and in tourist hotels and houses used only during the winter months, but closed through

FIGURE 16.—View in modern storage room where furs and other garments are protected perfectly from moth attack by applying the principle of tight storage and fumigation.

the long, hot summer season, fabric pests may become very abundant and so generally established that they cannot be reached easily by the more local treatments recommended farther on. In

such establishments insects may not only be secreted in the affected furnishings, but may be upon the walls, in floor cracks, behind mopboards, and in other places where they have crawled for protection or for transformation. The removal of furnishings and their treatment outside the establishment, or in special rooms, will remove at the same time most of the infestation; yet enough insects may be left behind to restock the furnishings when they are returned after treatment. For this reason, any control measure that can be applied to the house or hotel with the furnishings left as they are normally has its advantages. Exception should be made in the case of chests or other tightly packed containers. Clothing, blankets, and other contents of such containers should be removed and hung up in rooms or variously spread out over furniture, etc., so that fumes can more readily reach the larvae in them. This need not be done if the containers are treated as separate units as hereinafter suggested. It may be well to raise rugs or carpets so that the gas can more easily reach the underside, though this is not always necessary or feasible. The tops of pianos and organs (upon the felts of which the moths and carpet beetles may be feeding) should be raised, and all closet doors, bureau drawers, trunks, etc., should be left partially open.

Fumigation by either of two methods can be used for the treatment of houses or hotels as a single unit—namely, with hydrocyanic acid gas or with sulphur fumes. *Formaldehyde fumigation is worthless in controlling clothes moths or other fabric pests, notwithstanding the general belief regarding it.* Formaldehyde is a good disinfectant for use after contagious diseases, but should never be employed in controlling fabric pests.

HYDROCYANIC ACID GAS

Fumigation with hydrocyanic acid gas is the best known method of controlling fabric pests as well as other household pests, including the bedbug. It kills speedily and effectively. The gas is formed by the union of sulphuric acid, sodium cyanide or potassium cyanide, and water, or given off by certain other cyanide products. It is colorless, lighter than air, with a distinct odor, and when mixed with air in the proportion occuring during fumigation is noninflammable. It is not injurious to the most delicate fabric or dyes, or to any house furnishing, and does not tarnish silver, brass, or other household metals. When the house is ventilated, the gas quickly escapes skyward, and houses usually can be ventilated so that they may be occupied within 1 or 2 hours, often within 30 minutes. Sleeping quarters at hospitals and private homes can be fumigated during the day and ventilated so that they can be safely occupied the same night.

Hydrocyanic acid gas is deadly to human beings if breathed in concentrated form and should be used only by an intelligent, careful, and well-informed person who understands the element of danger as well as the excellent features of the gas. Hydrocyanic acid gas should not be used in an apartment house, office building, or city block of houses unless neighboring parties are notified and are ready to vacate if necessary during the period of fumigation.

Hydrocyanic acid gas fumigation costs approximately 35 cents to $1 for each 1,000 cubic feet of space fumigated. The house may be left exposed to the action of the gas for from 4 to 24 hours. Hydrocyanic acid gas fumigation is being employed in flour mills, warehouses, leading hospitals, schools, and colleges, as well as in private homes. For information on the method of fumigating with hydrocyanic acid gas see Farmers' Bulletin No. 1670.

SULPHUR FUMES

Fumigation with sulphur fumes is a remedy well known to the public. Sulphur fumes will kill clothes moths, but must be used at the rate of about 13½ ounces of sulphur to each 1,000 cubic feet of space. Fumigation should continue for a period ranging from 18 to 24 hours. *Remember* that there is some danger of fire in the careless use of sulphur candles; also that sulphur fumes may have a bleaching effect upon delicate fabrics and wall paper, and that they tarnish metals. The greater the atmospheric moisture the greater the bleaching effect. The Department of Agriculture does not recomment the use of sulphur fumes in homes equipped with valuable furnishings. Very often, however, the use of sulphur candles offers a most welcome method of moth control because of the availability of sulphur candles at drug stores. Naturally where fumes are used, rooms or houses must be tightly closed and more rather than fewer of the sulphur candles used. Failure with sulphur candles often is the result of dependence upon one or two improperly burned candles to do the work of the recommended 13½ ounces of sulphur for each 1,000 cubic feet of space to be fumigated. Directions for buring sulphur candles usually are supplied by the manufacturer or the dealer.

CARBON DISULPHIDE FUMIGATION

Carbon disulphide is an excellent fumigant for single rooms, closets (fig. 17), trunks (fig. 18), chests, and other tight containers. It is sometimes called "high-life", and can be purchased at drug stores or from wholesale chemical firms as a liquid put up in tin cans having a capacity of 1, 2, 5, 10, or more pounds at a cost of from about 6 to 35 cents a pound, according to the quantity used. It is a colorless [2] liquid that looks like water, but weighs about 10 pounds to the gallon. When exposed to the air it evaporates quickly, producing a foul-smelling gas about two and three-fourths times as heavy as air. While the liquid is not explosive or inflammable, the gas formed upon evaporation is. Because of this inflammable nature of the gas it must be kept away from fire in any form. The gas can be detected easily by its foul odor, but this odor disappears after thorough ventilation of rooms and fumigated articles. If used carefully and intelligently as directed and in the proper amounts, carbon disulphide speedily and surely kills fabric pests in tight containers. It is not recommended for the fumigation of entire buildings

[2] The ordinary commercial carbon disulphide has a decidedly yellowish color, owing to the excess of sulphur. This is a satisfactory fumigant, however, if too much of the impurities is not present.

FIGURE 17.—Clothing in closets can be freed of clothes moths if fumigated as illustrated with either carbon disulphide or carbon tetrachloride or the ethylene dichloride-carbon tetrachloride mixture. Since the gas formed by evaporation of these three liquids is heavier than air, pour the liquid into a shallow dish placed on the shelf of the closet. (Note white enamel dish on shelf.) As soon as liquid has been poured into dish shut door and seal cracks about door with gummed paper, or paste on strips of firm paper using a flour paste. Sealing the door prevents the gas from escaping rapidly

because of the fire hazard when so great a volume of gas is formed, although experienced persons can use it safely for the fumigation of detached houses if they can control surrounding conditions.

When used in small amounts about houses in accordance with directions, there is but little more danger than in the use of gasoline or benzene, with which the public is more familiar. For complete information regarding carbon disulphide and its use, write to the United States Department of Agriculture for Farmers' Bulletin 799.

FIGURE 18.—Trunk ready for treatment with carbon disulphide, carbon tetrachloride, or the ethylene dichloride-carbon tetrachloride mixture. On the clothing are shown two saucers. In the one to the left stands a 1-pound tin can of carbon disulphide; in the one to the right a glass bottle filled with the colorless carbon tetrachloride. Any one of the three fumigants mentioned may be used. Pour the required quantity of the one to be used into the saucer and close and seal the trunk. The liquid evaporates, forming a gas heavier than air that sinks down into the clothing and kills clothes moths and other insects.

Fumigation with carbon disulphide is not effective at temperatures below 65° F. Better results follow where the temperature is above 70°. In rooms and closets or in well-built trunks the evaporation from 4 to 6 pounds of the liquid to each 1,000 cubic feet of space should kill all moths and their larvae. If the walls are plastered, or plastered and papered, the floors tight, and the doors sealed after fumigation begins, 4 pounds of carbon disulphide should prove sufficient to kill fabric pests. More liquid, even as much as

20 pounds per 1,000 cubic feet of space, may be required in more loosely constructed containers. Assuming that 4 pounds of carbon disulphide will be used to each 1,000 cubic feet of space, the following rough calculations may be useful in determining how much liquid is needed for various containers:

QUANTITIES OF CARBON DISULPHIDE NEEDED FOR FUMIGATION

Space to be fumigated	Quantity needed
Room, 12 by 10 by 8 feet	4 pounds or 3¼ pints.
Closet, 3 by 8 by 8 feet	1½ pints.
Closet, 2 by 5 by 7 feet	¾ cup.
Closet, 4 by 5 by 7 feet	1½ cups.
Trunk, 21 by 20 by 42 inches	3 tablespoonfuls.
Box, 1 by 2 by 2 feet	1 tablespoonful.

Note that the method of application, as indicated in Figures 17 and 18, takes into consideration the fact that the gas formed is about two and three-fourths times as heavy as air. The liquid must therefore be exposed on top of the article to be fumigated.

CARBON TETRACHLORIDE FUMIGATION

Carbon tetrachloride is a good fumigant for single rooms, closets, trunks, chests, and other tight containers. It is a thin, transparent colorless liquid, in appearance similar to water, that evaporates on exposure to air, forming a gas with a pungent, aromatic odor. It is like carbon disulphide in that its gas is heavier than air. When carbon tetrachloride is used at the same rate as carbon disulphide, it is about one-half or one-third as effective. It has the great advantage over carbon disulphide that its gas is neither explosive nor inflammable; hence there is no fire risk in its use. Carbon tetrachloride is purchased at drug stores or from chemical firms in cans containing 1 or more pounds of liquid, and costs from 10½ to 30 cents a pound, according to the quantity purchased. It should be used at the rate of 8 to 12 pounds, or more, per 1,000 cubic feet of space if containers are very tight. When the temperature is 70° F. or above, good results in killing clothes moths should follow if the quantities given above for carbon disulphide for the respective spaces are trebled. Since the gas is heavier than air, the liquid should be exposed in shallow dishes at the top of the container to be fumigated. (Figs. 17 and 18.)

FUMIGATION WITH ETHYLENE DICHLORIDE-CARBON TETRACHLORIDE MIXTURE

Ethylene dichloride-carbon tetrachloride mixture consists of 3 parts by volume of ethylene dichloride and 1 part by volume of carbon tetrachloride. It is used in the same manner as are carbon disulphide and carbon tetrachloride. Like these, the gas produced by the evaporation of the liquid is heavier than air. Like carbon tetrachloride, the gas is noninflammable and nonexplosive and is not dangerous to human life in small quantities. It is about five times as toxic as carbon tetrachloride alone, but should be used at the rate of 5 quarts, or 14 pounds, per 1,000 cubic feet of space to be fumigated. Best results are obtained when the temperature is above

70° F., for the liquid vaporizes very slowly unless set on warm radiators or other heated apparatus. The enclosure fumigated must be very tight. This fumigant is purchased as a liquid in tin cans.

FUMIGATION WITH MIXTURES OF ETHYLENE OXIDE AND METHYL FORMATE WITH CARBON DIOXIDE

Ethylene oxide-carbon dioxide mixture and the methyl formate-carbon dioxide mixture are two new fumigants that can be used with reasonable safety in fumigating rooms in a house. They produce vapors that are heavier than air and will kill all stages of clothes moths and other household insects. Unfortunately, they are not readily available to the public. They are sold under pressure in steel cylinders, which makes their use difficult except by the professional exterminator. Further information will be furnished by the Department of Agriculture on request.

CEDAR-LINED CLOSETS

Closets lined with red cedar wood, as they are ordinarily installed and used in the average American home, are of doubtful value in protecting clothing from moth attack. The experience of house owners and the experimental work of this Department prove that injury from moths often occurs to clothing hung in cedar-lined closets. Usually the closets are not tightly enough constructed to retain the emanations from the cedar wood in sufficient strength to kill the worms. The beautifully contrasting white sapwood is of no value, and the more of it present in the lining the less effective is the closet. As already mentioned (p. 12), the mere odor of cedar does not keep moths from crawling or flying into a closet or from damaging the clothing or furs. Many people enjoy a false sense of security in believing the odor of cedar to be a certain protection.

In justice to red cedar wood it should be stated that closets very tightly constructed with the red heartwood and equipped with doors that close tightly against felt gaskets can be depended upon to protect against moth attack if the doors are clamped shut except when articles are being put in or taken out.

CEDAR CHESTS

Well-made chests of red cedar (*Juniperus virginiana*) heartwood, which are in good condition as regards tightness, can be depended on for protection against clothes moths, provided the articles to be placed in them are first thoroughly brushed, combed, or otherwise treated to remove the older clothes-moth larvae. Chests with the sides, ends, and bottoms made of red cedar heartwood at least three-fourths inch thick, and the cover of solid red cedar or of neutral wood lined with red cedar veneer, will kill all the newly hatched or young larvae of clothes moths. On the other hand, in experiments with chests of neutral wood having solid bottoms of ¾-inch red cedar, but lined on the sides, ends, and tops with 1/20-inch red cedar veneer, clothes moths were able to develop from egg to adult and to cause damage.

The aroma, or the persistent characteristic odor of red cedar, is due to a volatile oil present in the wood to an amount ranging from

1 to 2 percent. The redwood or pure heartwood of red cedar contains from 2 to 4 percent of this oil.[3] As it is the emanation from this volatile oil in the wood that protects clothing, the chests at all times should remain tightly closed except when clothing is being removed or placed in them, and this work should be done as rapidly as possible.

The average trunk in which clothing is stored is not tight enough to keep out moths. Indeed, the unusual tightness of cedar chests, when not cracked or warped, compared with ordinary trunks or other ordinary household receptacles for clothing, gives to such chests a great advantage, aside from their insecticidal value.

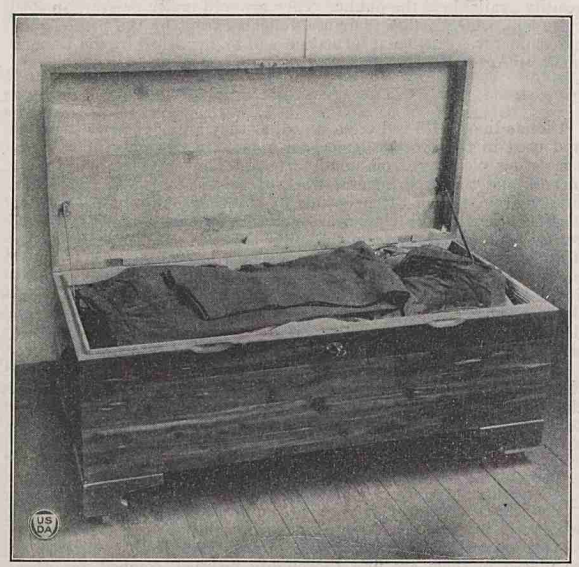

FIGURE 19.—Red cedar chests are among the best chests upon the market for the protection of clothing from clothes moths, provided they close tightly and directions for their use given in this bulletin are faithfully followed.

The value of cedar chests (fig. 19) in protecting clothing lies in the fact that they kill the newly hatched or young larvae or worms of clothes moths. Cedar chests cannot be depended on to kill the moths or millers, their eggs, or the worms after they are one-half to full grown or after they are 3 or 4 months old. Neither will the

[3] The principal constituents of the oil are the alcohol cedrol or cedrol camphor, the sesquiterpene alcohol cedrenol, and the sesquiterpene cedrene. The characteristic odor of cedar chests is probably due to the first two compounds mentioned.

chest kill all the pupae or chrysalids. It is because they will not kill these stages of the clothes moth that cedar chests are recommended as protectors of clothing from moth attack only when fabrics put into them are thoroughly cleaned, brushed, or beaten, just before they are placed in the chests. This preliminary treatment before storage, if carefully carried out, with special attention to brushing out pockets, seams, etc., will remove those stages of the moth that the chests will not kill. Remember that if the clothing is not thus brushed, etc., with scrupulous care, some of the older larvae may remain and go into the chests with the clothing and continue to cause damage.

Furs can not always be rid of these older worms by merely brushing or beating. Clothes moth worms often lie hidden next to the skin and are so firmly established by the webbing they spin that they are not dislodged from the fur by brushing or shaking. For this reason furs suspected of being infested should be combed out with a very fine comb, or should be fumigated. If furs are promptly stored as soon as the season for their use is over, however, there is little likelihood that they will contain moth larvae too old to be killed by the chests.

It is a matter of no practical importance whether cedar chests kill the moths, the eggs, or the pupae, for these stages are not capable of injuring garments. But too much can not be said about the necessity of making sure that clothing going into cedar chests is free from the older larvae or worms; otherwise the owners may sustain losses attributable to carelessness, rather than to the failure of the chest.[4]

CEDAR PRODUCTS

The belief that the mere odor of cedar will keep moths out of trunks, paper bags, boxes, closets, etc., is not based on experience. Red cedar heartwood, as used in good red cedar chests, can be recommended to protect clothing and destroy moths (p. 25). However, the small quantities of cedar oil in certain sprays, in garment bags, storage closets and chests made of corrugated or other cardboards, or in small devices to be hung in closets or rooms, are of no practical value.

Cedar wood oil, cedar leaf oil, or pine oil are often sprayed on paper garment bags, or cardboard storage units in the form of closets or trunks, which are then sold as being "cedarized", as though they were safe storage units because of their odor. As a matter of fact, these storage units are no better from a practical standpoint than if they had not been sprayed with cedar oil or pine oil. The smell of cedar or pine oil does not repel the adult moth or the larva, and weakens and disappears rather soon through evaporation.

Cedar chips and shavings are too apt to be worthless to be recommended.

[4] The foregoing statements regarding the effect of red cedar chests on adults, eggs, and larvae of clothes moths are based on a comprehensive study by the Bureaus of Entomology and Plant Industry of the U. S. Department of Agriculture. The results of this study were reported in Department Bulletin 1051, Red Cedar Chests as Protectors Against Moth Damage, by E. A. Back and Frank Rabak, published in 1922. Copies of this bulletin are no longer available for distribution, but may be consulted in the principal libraries of the United States.

Various plasters and paints, or sheets of cardboard with which to line closets or trunks, have a value too ephemeral to be depended on. Whatever limited value they may possess when honestly made and fresh is soon lost through the evaporation of the cedar oil, and if the surfaces are painted with fresh cedar oil, there is always the danger of the oil oxidizing in the garments and damaging or destroying them.

DRY HEAT

Heat is now recognized as an effective agent in killing insects. All fabric pests will be killed in a very short time if rooms can be heated to a temperature of 130° F. and held at that temperature long enough to permit all articles in the room to attain this temperature. Experimental work has demonstrated that even lower temperatures will kill the larvae of clothes moths. All larvae exposed in an incubator to 128°, 120°, and 110° died in 6, 11, and 31 minutes, respectively. At 105°, 20 percent were dead at the end of 31 minutes, while at 110°, 30 percent were dead at the end of 11 minutes. This killing power of heat can be readily utilized by ironing fabrics with very hot irons, or exposing them in superheated rooms before they are put away for the summer.

The rays of the sun in summer can often be used to kill or drive clothes moths from fabrics. Thus clothes-moth eggs on flannel, exposed to the bright sun at 128°, 125°, 120°, and 110° F., were killed at the end of 6, 6, 11, and 31 minutes, respectively. Exposure to the sun at 110° and 105° for 31 and 11 minutes, respectively, did not kill the eggs. Well-grown larvae of clothes moths in garments exposed for several hours to the hottest rays of the sun usually become restless and spin down from the garment. The old-time custom of sunning clothing to kill moths is based on experience.

OIL SPRAY

There are on the market a number of sprays, consisting almost entirely of light mineral oils with or without pyrethrum extract in varying quantities, and variously scented. These solutions are used as sprays and to be effective must be brought in actual contact with the insect itself. In other words, they are "contact sprays." Though they are inferior to fumigants in killing out moth infestations, they can be made to kill many moths, including the egg and worm stages, if they are sprayed well into floor cracks, about baseboards, or onto clothing or furniture. They are much more effective when applied with power sprayers. They impart no lasting protection against moths.

HOT WATER

Water boils at 212° F. At 115° a person finds water almost too hot to hold the hand in. Fabrics that will not be injured by water can be freed of living clothes-moth eggs and larvae by being dipped for 10 seconds in water heated to 140°. Care, however, must be exercised to have and keep the water at this or a higher temperature. Larvae and eggs in flannel dipped for 10 seconds in water heated only to 122° remained unaffected.

LAUNDRY SOAP

Clothing washed with a strong solution of neutral laundry soap will be freed from clothes moth larvae and eggs, and if wrapped tightly in paper, as suggested on page 14, as soon as taken from the drying line, will remain free from moth attack.

GASOLINE

Gasoline sprayed on fabrics kills clothes moths. Dipping clothing in gasoline will kill clothes moths, and articles so dipped and coming direct from the dry-cleaning process may be considered freed, temporarily at least, from moth infestation. Of course, as soon as garments are dried after treatment they are subject to reinfestation. The use of gasoline for the treatment of wearing apparel most subject to moth attack is not advised for the average home because of the dangers and difficulties of application.

TREATMENT OF CRACKS AND HIDING PLACES WITH GASOLINE, BENZINE, OR KEROSENE

Any effective method of control for clothes moths and other fabric pests must take into consideration the fact that woolen lint, hair, etc., accumulate in floor cracks, behind base boards, and in other such places. In this "dust" carpet beetles and clothes moths can and do subsist and migrate thence to other parts of the house. It is desirable, therefore, to reduce these hiding places as much as possible by the use of crack fillers such as can be purchased at paint shops, and treating them with kerosene, gasoline, or benzene. *Persons are warned against the careless use of these three liquids because of their inflammable nature.* If the premises are fumigated, clothes moths and other fabric pests in floor cracks and similar places are killed, and the more laborious treatment by liquids is not necessary.

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FARMERS' BULLETIN No. 1570

MOSQUITO REMEDIES AND PREVENTIVES

MOSQUITOES are man's inveterate tormenters and many of them are his dangerous foes. If they were merely a bothersome plague there would be ample justification for unrelenting warfare against them. When, however, it is known that a certain kind of mosquito found in houses in the South will convey yellow fever and breakbone fever from infected to healthy persons and that certain other kinds, by disseminating malaria, render many regions of great fertility almost uninhabitable, no other argument in favor of fighting them is necessary.

Swamps, ponds, and marshes are not the only places which breed mosquitoes. A little rain water in an old tin can, an uncared-for sewer trap, or an undrained roof gutter, if neglected, will supply mosquitoes for a neighborhood.

This bulletin describes the measures, substances, and materials, both offensive and defensive, that have been found most effective against these diminutive but serious menaces to comfort and health. It is a revision of and supersedes Farmers' Bulletin 444, entitled "Remedies and Preventives Against Mosquitoes."

Washington, D. C.

Issued October, 1930
Revised June, 1932

MOSQUITO REMEDIES AND PREVENTIVES

By L. O. HOWARD, *Principal Entomologist*,[1] and F. C. BISHOPP, *Principal Entomologist, in Charge, Division of Insects Affecting Man and Animals, Bureau of Entomology.*

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IMPORTANCE OF ANTIMOSQUITO WORK

SINCE the discovery that mosquitoes are not only nuisances, but also conveyors of malaria, yellow fever, filariasis, and dengue or breakbone fever, a great deal of remedial work has been done by individuals and communities, and, during the last few years, by the medical departments of the Army and Navy and the Public Health Service in the vicinity of camps, cantonments, and naval stations. Many remedies and plans of action have been tested on a large scale, and what follows is a summary of the results.

PROTECTION FROM BITES

PROTECTIVE LIQUIDS

Spirits of camphor or pine oil rubbed upon the face and hands will help to keep mosquitoes away for a time, and this repellent action is also a well-known property of oil of pennyroyal. None of these substances is durable; that is to say, a single application will not last through the night. Oil of citronella is one of the best substances to be used in this way. The odor is objectionable to some people but not to many, and it is efficient in keeping away most mosquitoes for several hours. The best formula tried by the writers was sent to them by C. A. Nash, of New York, and is as follows:

Oil of citronella	1 ounce.
Spirits of camphor	1 ounce.
Oil of cedar	½ ounce.

[1] Retired June 30, 1931.

130706°—35

Ordinarily a few drops on a bath towel hung over the head of the bed will keep the common house mosquitoes away. Where they are very abundant and persistent a few drops rubbed on the face and hands will suffice. Even this mixture, however, loses its efficacy toward the close of a long night. It is the habit of the yellow-fever mosquito (*Aëdes aegypti* L.) to begin to bite at daylight. By that time the average person is sleeping very soundly, and usually the effects of the mixture will have largely passed away. It follows that in the Southern States, where this mosquito occurs, these protective mixtures are not supposed to be as effective as they are in the North. As a matter of fact, however, the mixture, if applied shortly before dawn, would give satisfactory protection.

A mixture of 1 ounce of oil of citronella to 4 ounces of liquid petrolatum or of lanolin has also been found valuable as a repellent. The mixture greatly retards the evaporation of the oil of citronella.

SCREENS AND CANOPIES

Such obvious measures as screening houses, using netting for beds, and wearing veils and gloves after nightfall in badly infested districts need no detailed consideration. Houses can not be too carefully screened, and adjustable, folding, or sliding window and door screens never seem tight. Even when screens are well fitted mosquitoes often find opportunities to enter; constant vigilance alone will keep them out. In certain seasons in mosquito districts the insects will often succeed in making their way through the screens. When the mosquitoes are very numerous wire screens should be lightly painted with kerosene or oil of citronella.

Bed canopies should contain ample material to be perfectly folded under the mattress, and the greatest care should be taken to keep the fabric well mended. To insure perfect protection the traveler in the Southern States should examine his bed netting every night, and carry equipment for mending tears or expanded meshes.

Veils and nettings are absolutely necessary for camping in the tropics or other regions where mosquitoes abound. Light frames that fit helmetlike over the head and are covered with mosquito netting are useful in the daytime, and similarly frames that can be readily folded into a compact form can be used for a bed covering at night. Every outfit for camping in tropical or malarial regions should include such framework and plenty of mosquito netting.

The size of the mesh in mosquito bars and window screens is important. Eighteen meshes to the inch, or 16 to the inch if insect screen cloth of heavy-grade wire is used, can be relied upon to keep mosquitoes out, but screen having 14 meshes to the inch admits some of them. However, any good 16-mesh screen cloth will exclude most of the mosquitoes, and this mesh is now generally available. Although copper screen cloth is more expensive than the black or metal coated, its durability commends its use, especially on the coast or where there is considerable humidity. Painted and galvanized screen cloths will not last long under such conditions, although an occasional coat of screen enamel will greatly lengthen their life. A thin coat of enamel is also useful in reducing the size of the openings in 14-mesh screen to exclude small mosquitoes.

SMUDGES

Any dense smoke will drive away mosquitoes, and various smudges are used by campers. For household use a number of different substances have been tried.

REMEDIES FOR MOSQUITO BITES

The most satisfactory remedy known to the writers, through personal experience, is moist soap. Wet the end of a piece of ordinary toilet soap and rub it gently on the puncture, and the irritation will soon cease. Others have enthusiastically recommended household ammonia, alcohol, or glycerin. One correspondent touches the puncture with a lump of indigo; another with a naphthalene moth ball; another with iodine. Applying gentle heat has also been reported to relieve the irritation.

DESTRUCTION OF ADULT MOSQUITOES

FUMIGANTS AND SPRAYS

Pyrethrum powders, known to the trade as Dalmatian insect powder, Persian insect powder, buhach, and otherwise, are very effective when fresh and pure. Pyrethrum powders are generally used dry, and are puffed or blown into crevices frequented by insects, or into the air of a room in which there are mosquitoes. Burning the powder in a room at night is common. The powder is heaped up in a little pyramid which is lighted at the top and burns slowly, giving out a dense and pungent smoke. Often the powder is moistened and molded roughly into small cones, and after drying burns readily and perhaps with less waste than does the dry powder. Mosquitoes are stupefied by the smoke and fall to the floor, whence they may be swept up and burned. With open windows and constant currents of fresh air this fumigation is not especially effective, and it is necessary, for protection, to sit in a cloud of smoke. The powder may be placed upon a metal screen above the chimney of a kerosene lamp, with the result that the vapor will be dissipated. This is said to be very effective. It is economical in powder, and the odor is slight. Another method of burning the powder is to puff it from an insufflator into a burning gas jet. In New Orleans it has been found that in order thoroughly to clear houses of mosquitoes pyrethrum must be burned at the rate of 1 pound of powder to every 1,000 cubic feet of space.

Destructive and repellent sprays may be useful in combating mosquitoes within dwellings and other buildings. Probably the most effective and available spray for this purpose is a kerosene extract of pyrethrum. Many of the commercial fly and mosquito sprays now on the market are essentially of this composition.

In applying such sprays the infested building should be closed tightly and the spray applied freely with a good atomizer. Special attention should be given to spraying behind and beneath furniture and in closets and other protected places where the mosquitoes may be hiding. Not only are the mosquitoes which are struck by the spray killed, but if the air is well filled with the spray mist and the

rooms are kept closed for some time, mosquitoes which are flying about are destroyed.

TREATMENT OF PLACES HARBORING ADULT MOSQUITOES

There is a common belief that mosquitoes breed in tall grass, shrubbery, and vines. This idea is erroneous, but such growth may hide water in which breeding may take place. It is well to keep in mind the fact that dense growths of vegetation give protection to mosquitoes and thus encourage them to stay in the vicinity of dwellings. Thus it is obvious that grass and weeds should be kept cut near habitations and dense growths of shrubs and vines avoided. In the South, where houses are not provided with basements, mosquitoes often hide beneath these dwellings. This condition can be remedied to some extent by spraying the supports and the woodwork beneath the floors with creosote oil, which not only preserves the wood but has a distinctly repellent effect on mosquitoes.

ABOLITION OR TREATMENT OF BREEDING PLACES

Mosquitoes, as a whole group, utilize breeding places of the most diverse character. While some species, however, have general breeding places and their larvae will live in almost any chance accumulation of water, other species are restricted in the character of their breeding places. Certain forms breed only in holes in trees; others, in accumulations of water in epiphytic plants; others, only in crabholes on sea beaches. Some species breed only in salt marshes and lay their eggs on mud; others lay their eggs on the surface of water. Certain species in the more northern States breed only in pools formed by melting snow, and as such pools occur only at one time of the year there is but one generation, and the eggs are laid in midsummer or later in hollows in the earth that will be filled with water from melting snow in the ensuing spring. Another species, frequently very annoying, breeds only in certain permanent swamps, where the larva lives attached to the roots of certain aquatic plants. Still another breeds in the pitchers of pitcher plants (Sarracenia).

The house mosquito (*Culex pipiens* L.) in the North and the rain-barrel mosquito (*C. quinquefasciatus* Say) and the yellow-fever mosquito (*Aëdes aegypti* L.) in the South, however, breed in every chance receptacle of water about residences, and their elimination requires the abolition or treatment of all such receptacles.

Where rain barrels and rain-water tanks are necessary they should be screened. The waste places in the immediate vicinity of a house should be carefully searched for tin cans, bottles, and wooden or tin boxes in which water can accumulate and all such receptacles should be destroyed or carried away. It is good practice to punch several holes in each can as it is emptied so that, wherever it may be finally deposited, water will not be held in it. The roof gutters of every building should be carefully examined to make sure that they are not clogged and allowing water to accumulate. Where the branches of tall trees overhang roofs this is especially likely to occur by the agency of falling leaves or twigs. The chicken pans in the poultry yard, the water in the troughs for domestic animals, the water cup of the grindstone, are all places in which these mosquitoes will breed,

and water should not be allowed to stand in them for more than a day or so at a time.

In the South the water accumulating under water tanks should be treated or drained away. Urns in New Orleans cemeteries have been found to breed mosquitoes abundantly. Holy-water fonts in churches, especially in the South, have been found to breed many mosquitoes. In slightly marshy ground a favorite breeding place is the footprints of cattle and horses. In one country village, which contained many small vegetable gardens in clay soil, during a rainy season mosquitoes were found breeding abundantly in the water accumulating in the furrows in the gardens.

Even in the house these mosquitoes breed in many places where they may be overlooked. Water in vases or in the pitchers in guest rooms should be frequently changed, as otherwise mosquitoes may breed therein. They will breed in the tanks in water-closets, in pipes, and under stationary washstands where these are not frequently used. In warehouses and on docks they breed abundantly in the fire buckets and water barrels. Treatment of such places with borax will prevent mosquito breeding. The borax is used in the proportion of 2 ounces per gallon of water to be treated. Water so treated can not be used for drinking or for watering plants.

In country houses in the South, where ants are troublesome, and where it is the custom to insulate the legs of tables with small cups of water, mosquitoes will breed in these cups unless a small quantity of kerosene is poured in. Where broken bottles are placed upon a stone wall, water accumulates in the bottle fragments after rains, and mosquitoes will breed there.

Old, disused wells in gardens are frequent sources of mosquito supply, even where apparently carefully covered, and here the nuisance is easily abated by the occasional application of kerosene. The same thing may be said of cesspools. Cesspools are frequently covered with stone and cement, but the slightest break in the cement, the slightest crack, will allow the entrance of these minute insects, and unlimited breeding often goes on in these pools without the cause of the abundance of mosquitoes in the neighborhood being suspected.

Fountains and ornamental ponds are common breeding places, and here the introduction of fish, as indicated in another place, is usually all-sufficient. It frequently happens, however, that the grass is allowed to grow down into the edges of ornamental ponds, and mosquito larvae find refuge among the vegetation and so escape the fish. Broad-leaved water plants are also often grown in such ponds, and where these broad leaves lie flat on the surface of the water, as they frequently do, one portion of a leaf may be submerged so that mosquito larvae may live undisturbed in the water above the submerged portion of the leaf, protected by the leaf itself from the fish rising from below. It is necessary, therefore, to keep the edges of such ornamental ponds free from vegetation and to choose aquatic plants whose growth will not permit mosquito-larvae protection.

In these latter localities will be found not only the house mosquitoes, previously mentioned, and the rain-barrel mosquitoes, but also some of the other forms, and particularly the malaria-breeding mosquitoes of the genus Anopheles. Some of these breed in all sorts of water accumulations.

In many small country towns, even where there is a water supply, tanks to supply bathrooms are built under the roofs. Such tanks should be screened, since mosquitoes gain entrance to the tank room, either through dormer windows or by flying up through the house from below, in search of places to lay their eggs.

About a large old house or a public building there are so many of these chance breeding places that only the most careful and long-continued search will find them all. As an example, in a State hospital, after a search which lasted for many days, and after treatment of all possible breeding places found, mosquitoes still continued to annoy the patients. Finally in the darkest part of a disused cellar was found a half-barrel containing water, which was giving out mosquitoes at the rate of hundreds per day. Frequent change of water or the use of kerosene will render all such breeding places harmless.

In community work in cities all of the points mentioned must be borne in mind, and where the residences are for the most part villas, in the absence of swampy suburbs, the householders are in the main responsible for their own mosquitoes. There are, however, breeding places for which the municipality may be said to be responsible, and these entirely aside from public fountains, reservoirs, or marshes. Open gutters or ditches on the roadside may breed a generation of any one of several species of mosquitoes, including malarial mosquitoes. On a pasture or common, where sod has been removed, water accumulating in the excavations thus formed may breed a generation of malarial mosquitoes. All such accidental breeding places should be filled in.

It seems unlikely that in any general sewage system mosquitoes may breed in the sewers proper. That they do breed in the catch basins is well known. The purpose of the catch basin is to catch and retain by sedimentation sand and refuse which would otherwise enter the sewer and be deposited in it. It is intended to be water-tight and to hold a considerable body of water, which stands in it up to the level of the outlet pipe. Such catch basins are very commonly located in back yards and at street crossings. The water is removed only by rain or when the street or yard surfaces are washed. In dry seasons the period of stagnation may last several weeks, certainly long enough for mosquito breeding. As a matter of fact, mosquitoes in midsummer do breed in such traps or catch basins by millions. These basins may be treated with fuel oil, or the municipal authorities may flush them once a week, carrying away such larvae as may be hatched. Oiling such places is best, however.

Since many serious mosquito-breeding conditions have been brought about by railroad, highway, and other construction work, such operations should be well supervised and the contractors prevented from creating mosquito nuisances.

Public dumps are great breeding places, because here accumulate old bottles, cans, boxes, bits of tin or iron vessels, and other objects in which water may stand for a time. Even a very small quantity of water will make a breeding place for very many mosquitoes. It is quite possible for half of a bottle to contain enough water to give out literally thousands of mosquitoes. The writers know of one instance in which a veritable plague of mosquitoes was traced to a case of empty bottles allowed to remain in a back yard for

some weeks in midsummer. It is of great importance to have unburnable refuse from villages and cities dumped in definite places, and the dumps properly cared for. It is usually possible to find a hollow in a convenient location where the dumping may be done systematically and where the unsightliness of the débris as well as the danger of mosquito breeding may be avoided, at reasonable expense, by keeping the freshly dumped material covered with earth.

The suitability of such places for mosquito breeding should be destroyed by carting away chance receptacles, by turning over vessels, by filling in excavations, or by treating other receptacles with a film of kerosene, or by introducing fish into fountains and artificial pools.

Under certain circumstances mosquitoes may breed in water accumulating in the troughs of underground-conduit electric railways.

DRAINAGE MEASURES

Drainage measures are one means of treating breeding places. The value of reclaimed swamp lands for agricultural and industrial purposes has been fully demonstrated, and the advantages of eliminating swamp areas in the vicinity of well-populated districts are manifold. The drainage of swamp areas primarily to improve sanitary conditions and to reduce the scourge of mosquitoes, which in itself often prevents the proper development of near-by regions, is being done. Drainage on a small scale to do away with mosquitoes has been practiced for a long time, and in many parts of the country large-scale drainage for mosquito abolition is going on, notably in New Jersey and in California. Methods of draining can not be discussed in this bulletin, but it should be pointed out that in case of salt-marsh land the operation is comparatively inexpensive, and results of great value have been obtained in California, New Jersey, Florida, and other States.

Mosquito breeding along small streams can often be prevented at small cost by straightening and cleaning the banks and cutting small ditches from pools and seepage areas to the stream. While ditching may not always eliminate all the pools, the ditches allow minnows to gain ready access to them, and these minnows can be relied upon to destroy all accessible mosquito larvae.

Great numbers of mosquitoes breed in irrigation waters on meadows, in sloughs created by waste water, and in rice fields. These create problems that are difficult to handle, but the periodic drainage of rice fields and occasional cutting off of irrigation waters are possible methods of attack under certain conditions. Proper grading and the installation of drainage ditches or tile drains often aid in reducing mosquito breeding in sloughs and marshes created by irrigation. The utilization of minnows and other control methods are usually necessary supplemental measures in rice fields and meadows.

Where the abolition of mosquito-breeding places demands extensive drainage, it is most effective and economical to employ a drainage engineer to map out the entire program before the work is actually begun.

OILS AND LARVICIDES

While it is obviously best to abolish breeding places in the ways mentioned, it often happens that it is not possible to drain them and as a temporary expedient at least it becomes desirable to treat the water so as to kill the mosquito larvae. Many substances have been tried, and, aside from certain proprietary mixtures, nothing has given such good results as oils. Efforts to find oils that can be used to better advantage than petroleum have failed. Because of its general availability and low cost, ordinary low-grade kerosene is very satisfactory. For extensive oiling operations, however, one of the petroleum distillate fuel oils, known also as gas oils, is preferable to kerosene.

In choosing the grade of oil two factors are to be considered: (1) It should spread rapidly; (2) it should not evaporate too quickly. The heavier grades of oil will not spread readily over the surface of the water, but will cling together in spots and the coating will be unnecessarily thick. The rapidity with which the film spreads is also important. If the water is still, an ounce of kerosene to 15 square feet of surface space is about the right proportion, and in the absence of wind such a film will remain persistent for 10 days or slightly longer. Even after the iridescent scum apparently disappears there is still an odor of kerosene about the water. Wind will frequently blow the film of kerosene to one side, but a change of wind will blow it back again, so the larvae are destroyed. Not only are larvae and pupae destroyed by the kerosene film, but many adult mosquitoes alighting on the surface of the water to drink or to lay their eggs are killed by it. In California, H. J. Quayle has used a combination of heavy oil of 18° gravity and a light oil of 34° gravity, in the proportion of 4 to 1, respectively. This mixture made an oil just thin enough to spray well from an ordinary spray nozzle and yet thick enough not to evaporate rapidly. It was applied from a barrel pump where this could be used, and from an ordinary knapsack pump in other regions. A single application was found to be effective sometimes as long as four weeks. The army of occupation in Cuba used oil every two weeks.

In New Jersey much experimental work with various larvicides has been done. The authorities in charge of antimosquito work in that State have found very satisfactory distillate fuel oils of a specific gravity ranging between 28° and 38° Baumé with a minimum flash point of 150° F. J. M. Ginsburg, of the New Jersey Experiment Station, has also found that the addition of 1 gallon of crude cresylic acid containing 95 per cent of tar acids to 100 gallons of fuel oil increases the spreading of the oil on both salt and fresh waters covered with dead organic matter and vegetation.

There is some objection to the use of the colored petroleum oils and to kerosene on small ornamental pools on account of the discoloration effected by such oils and their adverse effects on plants. Where it does not seem feasible to utilize fish in such pools, the mosquito larvae can be destroyed by covering the surface with a film of gasoline, but the effect of this treatment is of short duration.

In this connection mention should be made of the pyrethrum mosquito larvicide developed by workers of the New Jersey Experiment Station, which appears to be admirably suited for use in orna-

mental pools or wherever oil is objectionable. This larvicide is made up to contain 66 per cent kerosene, or a similar light petroleum oil, containing pyrethrum extract (equivalent to 1 pound of pyrethrum flowers to the gallon of oil) and 34 per cent of water containing from 3 to 5 per cent of soft soap. The ingredients are thoroughly mixed by violent agitation, thus forming an emulsion which mixes readily with water. For use in killing mosquito larvae and pupae, dilute this stock solution with from 10 to 15 times its bulk of water and spray it on the mosquito-breeding pools. Extensive tests by the New Jersey authorities have shown it to be efficient in mosquito control and harmless to waterfowl, fish, or ornamental plants.

The use of a spray pump has been mentioned. Small ponds can be sprinkled with an ordinary watering pot with a rose nozzle, or pouring the liquid out of a dipper or cup will be satisfactory. In larger ponds pumps with straight nozzles may be used. A straight stream will sink and then rise and spread until the whole surface of the pond is covered without waste. The English workers in Africa advise mopping the kerosene upon the surface of the water by means of cloths tied to long sticks and saturated with kerosene.

In many cities of the eastern States it has been found both economical and efficient to oil open breeding places regularly by means of a tank truck equipped with a good lead of hose and a spray nozzle. Catch basins along the streets can be expeditiously treated by means of an air-pressure hand sprayer carried in a motor-cycle side car, the stop at each basin consuming something less than a minute.

In Panama a larvicide made as follows is being used: 150 gallons of carbolic acid is heated in a tank to a temperature of 212° F., then 150 pounds of powdered or finely broken resin is poured in. The mixture is kept at a temperature of 212°. Thirty pounds of caustic soda is then added and the solution is kept at the same temperature until a perfectly dark emulsion without sediment is formed. The mixture is thoroughly stirred from the time the resin is added until the emulsion is made. One part of this emulsion to 10,000 parts of water is said to kill Anopheles larvae in less than half an hour, while 1 part to 5,000 parts of water will kill them in from 5 to 10 minutes. At a larvicide plant at Ancon, 4,600 gallons of this mixture was made at a cost of $0.1416 per gallon. Although this mixture has been used to a large extent in Panama, crude oil was also used on streams having a fair velocity.

It has been found that Paris green of standard quality mixed with fine dust and blown as a powder over the surface of water will kill the top-feeding larvae of Anopheles mosquitoes. This method has come into use in antimalaria operations in many parts of the world. Paris green is mixed with road dust, fuller's earth, powdered soapstone, or something of the sort, in the proportion of about 10 per cent by weight of Paris green. This dust may be distributed over breeding waters in many ways. A very convenient and effective distribution over comparatively small bodies of water may be made from a boat by means of a hand or motor-driven dust gun such as is used for dusting cotton for boll-weevil control. On large areas of marsh the airplane has been found an expeditious and economical means. In malaria mosquito control operations at Quan-

tico, Va., in 1927, under the joint auspices of the Public Health Service and the Medical Department of the Navy, the effective quantity of Paris green was found to be about 1 pound per acre of marsh and the cost of material 72 cents per acre.

It has since been shown that Paris green may be used against mosquito larvae that feed below the surface of the water if it is mixed with moist sand which drags it below the surface film.

IMPOUNDING WATER TO CONTROL MOSQUITOES

The breeding of mosquitoes, especially of those species which carry malaria, is greatly favored by the presence, along the banks of streams, ponds, and bayous, of vegetative growths, shallow water, and irregular bank lines. In certain sections the drainage depends upon extensive systems of sluggish streams and bayous. By raising the water level in such bayous by means of dams, it is possible greatly to reduce the opportunities for mosquito breeding. Such a plan increases the wave action, reduces the quantity of vegetation growing in the water, and enables top minnows and mosquito-feeding insects to carry on their work more effectually. The shelter along the banks of the streams is also reduced, thus giving less protection for the adult mosquitoes and decreasing egg laying.

PRACTICAL USE OF NATURAL ENEMIES OF MOSQUITOES

The common goldfish and silverfish destroy mosquito larvae and should be put in artificial ponds. Top minnows of several species have been introduced successfully in several localities and are great feeders upon mosquito larvae. Certain species introduced from Texas into Hawaii have been successful, and a small top minnow of the genus Girardinus, known in the Barbados as "millions," has been carried with success to other British West India Islands. In Rio de Janeiro another top minnow has been placed by the public health service in tanks and boxes where it was impossible to use petroleum. Top minnows are present in all parts of this country and are very useful in destroying mosquito larvae. One of the most effective mosquito-destroying top minnows, which occurs abundantly in the fresh or brackish waters of the Southern States, is known as *Gambusia patruelis*. This top minnow has been successfully introduced into more northern localities. The effectiveness of these minnows may be increased by clearing the water of any vegetation or débris which will prevent the minnows from free access to all parts.

Many predatory aquatic insects feed upon mosquito larvae; others catch the adults. Certain birds prey upon the adults, and bats also eat them, but the erection of bat roosts in the hope that this action will bring about an appreciable reduction in the mosquito population is not recommended by this department.

LOCATION OF DWELLINGS IN RELATION TO MOSQUITO-BREEDING PLACES

In the establishment of new town sites and of sites for camps the importance of choosing high, well-drained ground, well removed from mosquito-breeding areas is obvious. Since most mosquitoes

do not travel great distances,[2] especially in nonwooded areas, it is possible to avoid a great deal of mosquito annoyance by a proper choice of such sites.

RELATION BETWEEN LIVESTOCK AND MOSQUITOES AND MALARIA

In many parts of the country, especially along the coast where the salt-marsh mosquitoes breed, livestock are greatly annoyed by the attack of these insects. In fact, when swarms of mosquitoes become especially large the cattle, which normally feed in the more or less wooded areas along the coast, are so beset that their flesh condition and vitality are reduced, and they are ultimately driven into the open country, where the mosquitoes are less numerous. In irrigated areas in the West, as well as in inland swampy areas, livestock and poultry are often greatly annoyed by mosquitoes. No satisfactory method of protecting livestock from mosquitoes has been found. Well-constructed dairy barns may be screened so as to give some protection and kerosene-pyrethrum extract sprays will kill great numbers of the mosquitoes and have a slightly repellent action on others. Smudges have also been found to give a certain degree of protection to livestock, both in buildings and in pastures.

The fact that mosquitoes will feed upon various animals and poultry apparently has some protective effect for man. It has been observed frequently that where domestic animals are in close proximity to human beings the mosquitoes will feed upon the former and neglect the latter. It is possible that this may be a factor in reducing the incidence of malaria under certain conditions. The statement has been made that when malaria-infested mosquitoes feed repeatedly upon domestic animals they soon lose their ability to carry the disease.

DETERRENT TREES AND OTHER PLANTS

A great deal has been published about the properties of certain growing plants which are said to keep away mosquitoes. Among these may be mentioned several species of Eucalyptus, the castor-oil plant, the Chinaberry tree, and others. Although the evidence in regard to these plants is contradictory, all observations made by scientific men in different parts of the world negative their value as mosquito repellents; claims of such properties are made only by people who have not made thoroughly scientific tests. Evidence is accumulating, however, that certain algae of the genera Chara and Nitella will render water pools distasteful to mosquitoes.

[2] The salt-marsh mosquitoes are notable exceptions to this rule.

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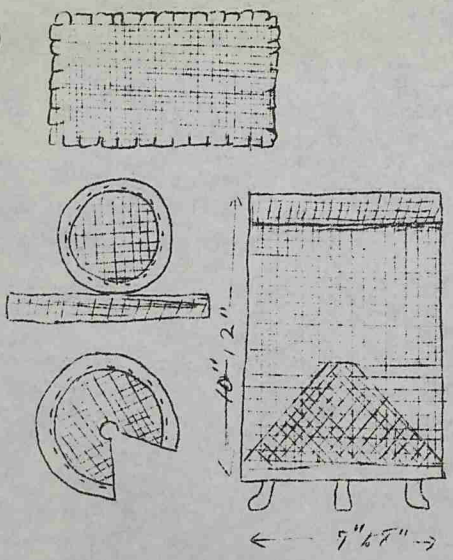
FLY TRAP AND WINDOW SCREEN



Material: Rust proof 16 mesh wire screening, heavy denim and strong coarse thread.

To Make Fly Trap: (1) Cur circle of screening the size of the desired diameter of the trap. Bind edge with bias of denim.

(2) Cut rectangle of wire sufficiently long to go around circle and lap for sewing, and of height desired for finished trap. Blanket stitch or bind edges.

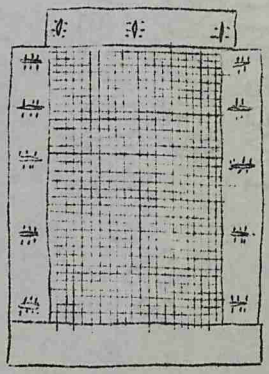
(3) Cut 2" strip of same length for the rim of the top. Sew this around circle one. (If top is completed first the cylinder can be made to fit it tightly).

(4) Cut circle about 4" larger than No. 1 and lay off the length of strip No. 3 on this circumference. Cut out the small section remaining over. Make small opening at center. Bind edge. Sew into cone shape and fit inside the cylinder.

(5) Finish with bent wire feet to permit dish of bait to be placed beneath.

To Use Fly Trap: Baith with sour milk and sugar; meat or fish scraps, or sugar, vinegar and water. To destroy flies pour boiling water over the trap and burn flies. Trap should be scalded thoroughly every few days.

To Make Window Screen: Cut screen to fit inside the window casing. Bind with 4" strip of dark colored denim leaving an extension of cloth beyond the screen for eyelets. Place tacks in top and sides of window casing and secure screen by placing eyelets over heads of these tacks. This is an especially good method for screening windows with irregular casings which frames will not fit.



Notes: Mosquitoes can enter through screens coarser than 16 meshes to the inch.

Covered garbage pails are essential to fly control.

All breeding places of flies should be removed or treated to destroy larve.

References:

Farmers' Bulletin No. 927 - Farm Home Conveniences.
Farmers' Bulletin No. 1408 - House Fly and How to Suppress It.

N. C. State College, Raleigh
Home Demonstration Division

Pauline E. Gordon, Extension Specialist
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Kitchen Sanitation

Frequent cleaning saves time and strength, and it is better for the kitchen and its furnishings. Dust ground in or covered with a grease film is hard to remove.

Unfinished wood surfaces (walls, floors, and cabinets) absorb grease and dirt readily and are harder to keep clean than wood that has some finish on it.

Storage Space

Dark, dusty, poorly ventilated pantries and cupboards are very unsanitary. They harbor cockroaches, mice, rats, and other insects. Occasionally everything in a pantry or cupboard should be taken out and the floors, walls, and shelves thoroughly cleaned and aired.

In the sanitary pantry the floor can be easily cleaned.

Flies, Cockroaches, Rats, Mice, and House Pests

The clean kitchen is free from flies, cockroaches, mice, and other household pests.

Cleanliness is the best prevention from household pests but the following precautions should be taken:

1. Screened windows and outside doors.
2. Cracks and holes in floors and walls filled.
3. Crumbs and bits of food promptly cleaned up.
4. All food kept covered.
5. Garbage kept in a covered receptacle.
6. Prompt disposal of garbage.
7. All decaying vegetable and animal matter near home disinfected or removed.

Washing of Window Glass

A few drops of ammonia or 1 tablespoon of washing (sal) soda to a pail of warm water may be used for cleaning windows. Soft paper or lintless cloth are used for washingtand wiping.

A cloth dampened with wood alcohol makes a most efficient cleaner but is more expensive.

Note: Whiting or some prepared cleaning paste may be used, if the washing is done before the room is cleaned as much dust results where this dried powder is wiped from the window.

Soap is less satisfactory as a cleaner as it leaves a film on the glass.

Clean windows when sun is not shining in them as this causes uneven evaporation of moisture which produces a streaked effect.

Cleaning Window Shades

Large flat surface bowl or pan
Soap
Warm water
Cloths

For badly soiled shades:
Flat-tone paint of desired color
Paint brush

If washable:

1. Lay on flat surface.
2. Scrub with soapy water and rinse well.
3. Dry with cloth.
4. Re-hang and leave pulled down until dry.

If not washable:

1. Lay on flat surface.
2. Dust thoroughly.
3. Go over with cloth dampened in mild, soapy water and again with cloth wrung out of clear water.
4. Wipe and polish with a dry cloth.

To paint shades:

Lay on flat surface and paint. Let dry and re-hang.

Washing Dishes

Boiling water
Two dish pans
Dish drainer
Soap, scouring material and metal chore girl
Dish cloth
Plate scraper
Clean dish towels
Cold water in small container if there is no sink

In dish washing several minutes may be saved daily by using a tray to carry soiled dishes from the table, stacking the dishes at the right, washing them, then rinsing them and draining them at the left of the worker. A good method is to wash them, dipping them in a pan of hot water, and putting them in a dish drainer. If the person is left handed, the order should be reversed. This does away with lost motion in crossing hands, as the dishes are washed and put into the drainer. If cupboards are built at the left of the table or sink, or a wheel tray is used to carry the clean dishes to the cupboard, additional steps and time are saved.

Put cooking pans to soak as soon as empty.
Soak in cold water those that contain eggs, milk, or starchy foods.
Soak in hot water those that have contained sugar, syrup, or greasy foods.
Use tray or wheel tray to carry dishes from table for washing.
As dishes are brought from table, scrape.
Stack dishes according to size and carry to right of worker.
If desired, the dishes may be washed in clear water as they are scraped and stacked.
Wash dishes in plenty of hot, soapy water.
Wash glasses and silver first then china.
Dip dishes in a pan of boiling water at left of worker, then place in dish drainer to dry, or put into dish drainer and scald.
Dish drainer saves towels and time.

Cleaning Painted Walls

Sponge off with a mild soap and water. Beginning at the bottom working toward the top of the wall, using a downward motion on the section being washed prevents streaking. Covering with a starch after cleaning keeps them clean longer and makes the next cleaning easier. Thin laundry starch made as for starching is applied with a wide brush as in painting. Care must be taken not to spread too thick.

Cleaning Woodwork

Strong soaps, scouring powders and alkaline cleaning compounds are injurious to the finishes used upon woodwork.

Varnished Woodwork:

Dust frequently with a dustless dust cloth. For periodic cleaning use the following mixture:

1 quart hot water
3 tablespoons boiled linseed oil
1 tablespoon turpentine

Wash the woodwork with soft cloth wrung out of the above mixture kept warm by setting over hot water (do not heat on stove as turpentine is inflammable). Polish the woodwork dry with a second cloth. Discard the misture as it becomes soiled and mix a fresh supply.

This method is also used in cleaning oiled woodwork.

Painted Woodwork:

Woodwork should be finished with semi-gloss paint. Any treatment removing or roughening the hard glossy surface causes it to collect dirt more rapidly and become harder to clean. Dust frequently. When necessary rub with a cloth wrung out of hot water. Wipe dry. For badly soiled spots use a little whiting on the wet cloth. Wipe well with cloth wrung from clean warm water and wipe dry.

Cleaning Metals

Daily care: Washing in hot soap suds, rinsing in boiling water and drying (polishing) with soft dish towel eliminates the necessity for much periodic cleaning.

Fine Metals: In polishing all fine surfaces-- silver, nickel, porcelain, brass, etc., only the finest of scouring powder (whiting) should be used. Following is a simple rule for polishing:

Silver, gold:	Whiting and denatured alcohol
Nickel:	Whiting and ammonia
Brass, copper:	Whiting and soap jelly and few drops diluted oxalic acid (poison)
Pewter:	Whiting and rottenstone (half and half) and oil
Porcelain, zinc:	Whiting and kerosene.

In all cases the whiting is moistened with other ingredient mentioned to make a thick paste.

Kitchen Utensils:

Aluminum:	Scour with alkali free soap and 00 steel wool. Boil in a dilute acid solution.
Enamel and Iron ware:	Boil in water containing two tablespoons of washing soda per quart.
Tin:	Do not scour nor boil in alkali which destroys the tin coating on vessel.

Homemade Silver Polish: Make paste of 5 ounces pure white soap dissolved in one quart hot water. Remove from heat and stir in one-half pound of whiting and one tablespoon ammonia. Stir occasionally until cold.

Soaps and Soap Preparations

SOAP MAKING

Ingredients: 6 lbs. clarified fat, 4 cups water, 1 can lye.
Note: If hard fat, ei. beef or mutton, is used, use 6 cups water.

To clarify fat: Waste fats may be used for soap making. Place fat, a sliced raw potato in a large quantity of water and bring to a boil (take precaution of using a large container.) Strain through a muslin cloth and cool. When cold remove fat from water. Repeat if fat had been salted. Then heat fat until it stops crackling, indicating that it is free from moisture. Allow to become cold but not to solidify before combining with lye.

Lye Mixture: Pour lye into water and stir occasionally until dissolved. Allow to become cold. Caution: Use enamelware or iron utensils.

To Make Soap: Pour lye into grease slowly stirring constantly. Beat until of consistency of strained honey. Sufficient air stirred into soap makes it float.

To Mold: Pour into pans or boxes lined with waxed paper. When set score with knife for cutting. At end of 18 to 24 hours remove from container and cut with pliable wire or strong cord. Set away for 5 or 6 weeks before using. This allows complete union of fat and alkali. An alkali free soap should result.

To Test Soap for Free Alkali: Place a piece of red litmus paper against a freshly cut edge of soap. If free alkali is present it will immediately turn blue.

To Make Strong Laundry Soap: Add $\frac{1}{2}$ cup of ammonia and $\frac{1}{4}$ cup of borax to fat and mix well before adding lye. These alkalies are not harmful to hands and fabrics but are to delicate colors.

To Scent Soap: Add a few drops of oil of lavender or any oil scent while beating soap.

SOAP FLAKES: Flakes may be made by shaving dry bar soap with a vegetable cutter or putting it through food chopper.

SOAP JELLY: Dissolve one large cake of neutral soap (8 oz.) into one gallon of hot water or use one part of soap flakes to 4 parts of water.

PORCELAIN CLEANER: Before soap jelly coagulates add 2 tablespoons of kerosene to one cup of the mixture and store for cleaning enamel and porcelain sinks and basins.

SCOURING SOAP: Mix one part of soap jelly with 4 parts of whiting. Store in wide mouthed container. This makes a scouring mixture of a fineness which will not injure most surfaces.

Liquid wax for refinishing and polishing:

¼ lb. paraffin
¼ lb. beeswax
1 qt. turpentine

Melt the paraffin and beeswax together, heat turpentine by putting it in a vessel large enough to mix the polish in and set it in a vessel of hot water (it should not be set directly on the stove as there is a great danger of it catching fire). When hot, stir in melted paraffin and beeswax; stir until cold.

Floor Wax

¼ lb. beeswax
1 lb. paraffin
½ pt. raw linseed oil
1½ pts. turpentine

First melt the beeswax and the paraffin, add the linseed oil and turpentine, and stir the mixture well. Turpentine is inflammable.

Water Stain for Floors

1 gallon of water
1 peck green walnut hulls

Let the water remain over the hulls 48 hours. Strain off and apply to the clean, dry, floor. Test the stain on pieces of board like the floor on which it is to be applied. If the color is darker than you desire, add water to it; if it is lighter than you like, add one or more teaspoons of permanganate of potash.

Mixture to remove water and heat spots on varnish

1 tsp. vinegar
½ tsp. turpentine
3 tsp. oil

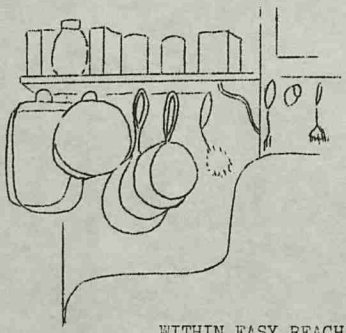
Mix. Shake well before using. Put a few drops on stain, let stand for 5 minutes, then rub briskly with soft cloth, rubbing with the grain of the wood. Go over entire surface with oiled cloth when stain is removed.
Note: Preventing spots is the best policy, as in many finishes they cannot be removed.

Hand Lotion: ¼ oz. gum tragacinth, soak in one pint soft water for 48 hours; to this add 2 oz. alcohol, 2 oz. glycerine, 1 oz. rose water. Beat all together until well mixed. Put into bottles.

Home Demonstration Division
Agricultural Extension Service
N. C. State College, Raleigh.

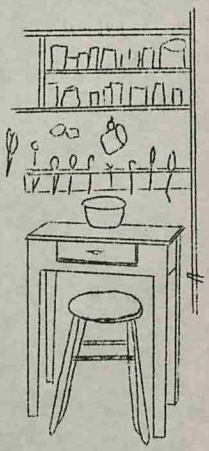
Home Management
Specialists

WITHIN EASY REACH OF THE SINK



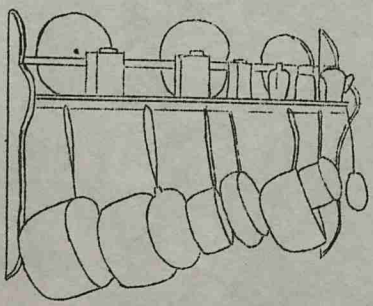
Dish Pans
Dish Drainer
Covered Garbage Pail
High Stool
Coffee Pot
Tea Pot
Tea and Coffee
Double Boiler
Colander
Sink Strainer
Dish Towels
Soap Shaker
Dish Mop
Copper Mit
Vegetable Brushes
Scissors
Can Opener
Paring Knife
Sink Brush
Measuring Cup
Hand Towels
Drinking Cups

WITHIN EASY REACH OF THE WORKING SURFACE

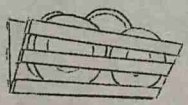


2 Measuring Cups
Biscuit Cutter
2 Tablespoons
2 Teaspoons
1 Wooden Spoon
2 Case Knives
1 Butcher Knife
1 Bread Knife
2 Paring Knives
1 Spatula
2 Case Forks
1 Meat Fork
1 Grater
1 Egg Beater
1 Egg Whip
Rolling Pin
Bread Board
Sauce Pans and Covers
Set Mixing Bowls
Casserole
Knife Sharpener
Lemon Squeezer
Funnel and Can Filler
Jelly Thermometer
Pressure Cooker
Food Chopper
Baking Tins
Containers for Salt, Sugar, Spices, Etc.

NEAR THE STOVE



High Woodbox
Tea Kettle
Salt and Pepper
Flour Dredger
Hot Pan Lifter
Matches
Oven Thermometer
Pot Covers
Potato Masher
Long-handled Spoon
" " Fork
Toaster
Skillet
Griddle



Agricultural Extension Service
Home Demonstration Division
N. C. State College, Raleigh

Pauline E. Gordon, Specialist in
Home Management and House Furnishings
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KITCHEN ARRANGEMENT

"Efficiency Ceases When Fatigue Begins"

The atmosphere of the kitchen affects the thoughts and general outlook on the life of the home maker. The size of the family, the amount of money to be spent, and the personal preferences of the home maker all modify the arrangement of the kitchen, but every kitchen should be a 4-C kitchen-- clean, convenient, comfortable, and cheerful.

A satisfactory plan for remodeling or rearranging a kitchen can result only from a careful study of each individual plan.

Size and Shape:

The rectangular shaped kitchen seems to permit the most efficient arrangement. Equipment may be placed against the wall with a clearance between pieces of furniture of five feet, allowing two persons to work without interference with a minimum of unnecessary steps. (Figures 1 and 2). Thirty inches is the least clearance. Clearance of more than five feet requires unnecessary walking.

Large or irregular shaped kitchens may reduce steps by grouping the work centers at one end and using the other end for breakfast alcove, rest unit, business unit. (Figures 3 and 4).

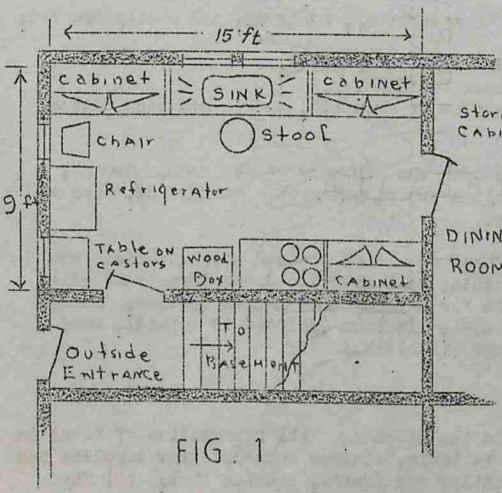


FIG. 1

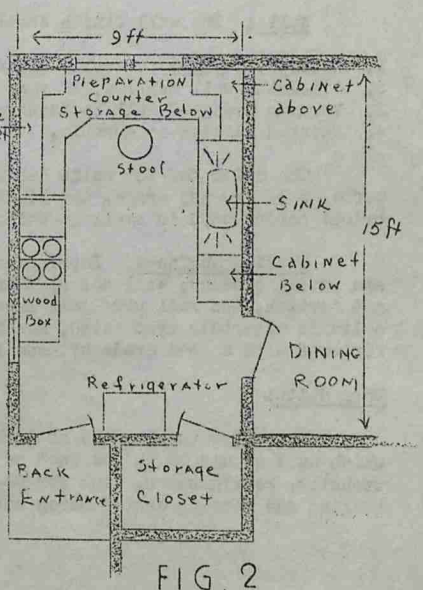


FIG. 2

Windows and Doors:

Windows on two outside walls insure cross ventilation and distribute good light. "The number of doors in a kitchen is determined by the floor plan. Doors establish lines of traffic through the kitchen and also take up wall space. Three doors should be sufficient. Glass in the outside doors lessen the window requirement."

The windows should be 36 inches high, so that equipment may be placed under them and higher if they are over a sink. Windows that are grouped give more space for equipment. All doors and windows should be well screened.

Artificial Light:

Kerosene lamps with reflectors should be placed to throw light where needed. If electricity is available, the kitchen should be illuminated by the use of a 100 watt lamp, enclosed in a white glass bowl, hung close to the ceiling. Supplementary lighting is always desirable.

Background Finishes:

Floors. The kitchen floor should be easy to clean, wear-resisting, comfortable and attractive.

1. Wood floors may be painted, oiled or varnished. Waxed floors are not suitable for the kitchen. They water-spot and are slippery.

2. Linoleum is attractive, durable, and easily cleaned. Inlaid linoleum has more lasting qualities than the printed variety. Printed linoleum will wear longer, if waxed after being wiped. It should not be scrubbed with a cleanser.

Walls: The wall finish should be waterproof, sanitary, and easily cleaned.

1. Waterproof paper is easily cleaned but not long lived.
2. Oilcloth, well applied, is very close to ideal.
3. Various types of wall boarding, painted or enameled, give a pleasing finish.
4. Painted plaster is durable.

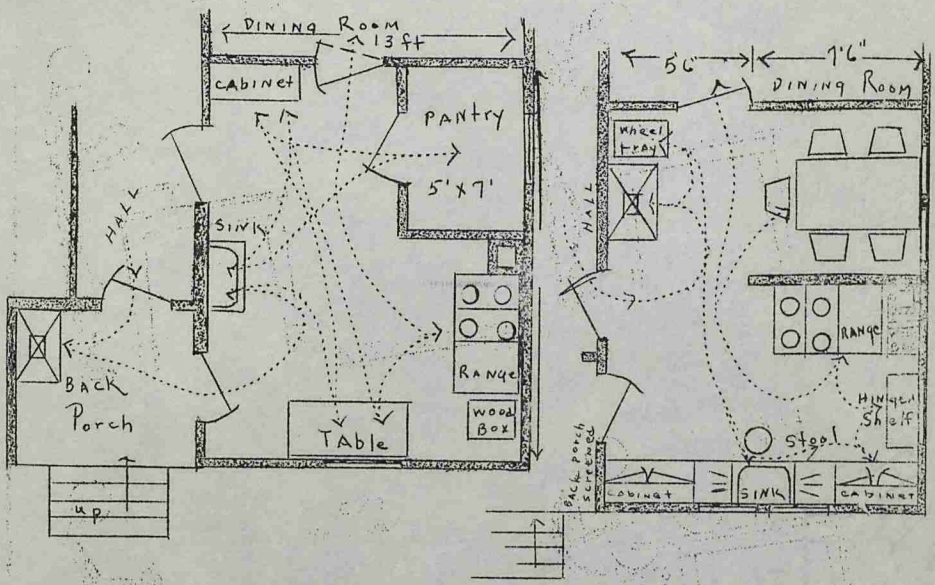
The color for the walls depends upon the exposure of the room. Creams, buffs, pale greens, grays, and light blues are pleasing as a background, with the bright colors used in small quantities.

Working Surfaces. Working surfaces should be covered with materials that are easily cleaned, will not spot or stain, will stand up under abrasives, will not scratch, and will give good service for a reasonable length of time. Some suitable materials are: zinc, Monel metal, linoleum (printed or inlaid), wood finished with a good grade of enamel, and oil cloth.

Work Units:

There are three units of work in the kitchen: (1) preparation of food; in which unit should be the cabinet or work table, storage cupboards for supplies and utensils, refrigerator, bins for vegetables and fruits, and the sink. (2) The cooking and serving center which contains the range, with shelf or cupboard for

utensils and serving dishes, a shelf for salt, pepper, etc. and some kind of serving table. (3) The cleaning away center has a stack table, garbage receptacle, sink and drain board, storage for left overs, and cabinets for clean dishes. A cart or wheeled tray may be used in serving the meal and to bring the dishes back to the stack table. This unit should be arranged so that one works from right to left. Single drainboard should be at left of sink.



Heights for Working Surfaces:

The height of all work surfaces should be such that the worker can stand erect when carrying on various activities in the kitchen. Correct height of work surfaces saves: (1) energy; (2) fatigue, and (3) round shoulders.

To find the correct height of work surfaces such as tables, cabinet, and stove:

1. Stand erect and place the palms of the hand flat. From the palm of the hand to the floor is the height of the work surface.

2. At a point eight inches below the elbow of the worker.

3. At one half the height of the worker.

The bottom of the sink should be 1 - 1½ inches lower than the top of the table. The height may be checked by standing erect and placing the knuckles and finger joints on the bottom of the sink. Drain boards should be attached so that both sink and drain boards are at an ideal height.

If two people of different heights are to work in the same kitchen, the equipment should be made for the correct height of the taller one and a small platform provided for the shorter worker.

Work surfaces may be raised by casters or blocks beneath the legs. Surfaces that are too high may be lowered by cutting off the legs.

TABLE TOO LOW

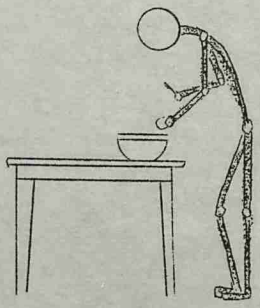
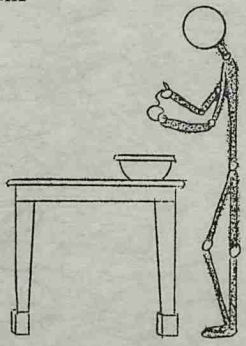
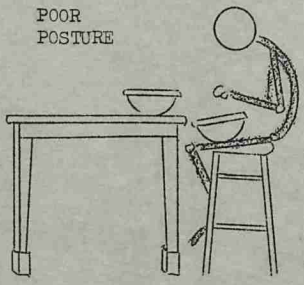


TABLE CORRECT HEIGHT

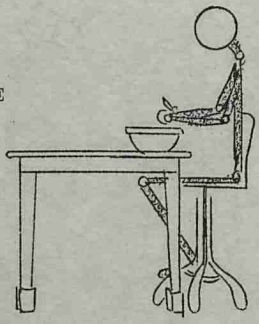


SITTING IS BETTER

POOR POSTURE



GOOD POSTURE

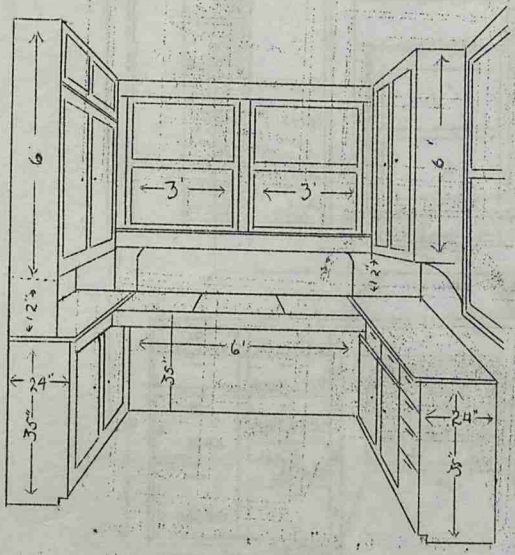


POSTURE WHEN PREPARING VEGETABLES
(Drawing from the Bureau of Home Economics of the United States Department of Agriculture.)

Home Demonstration Division
Agricultural Extension Service
N. C. State College, Raleigh

Pauline E. Gordon, Specialist in
Home Management and House Furnishings
Mamie N. Whisnant, Assistant Specialist

BUILT-IN KITCHEN EQUIPMENT FOR THE FARM HOME

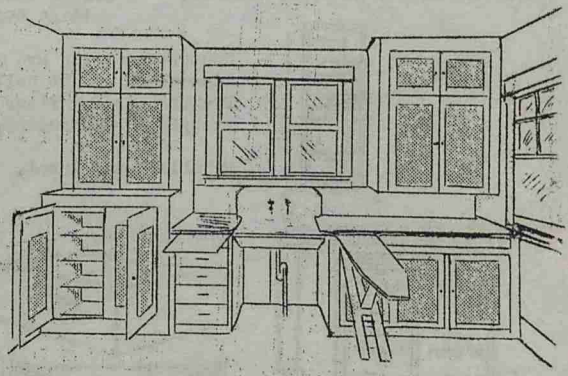


The most satisfactory storage space in the farm kitchen is the built-in cabinets. Built-in equipment is constructed in sizes required by the construction of the kitchen. Built-in cabinets should extend from the floor to the ceiling in order to give maximum storage space and to prevent dust collecting above or below.

The shelves should be of such width and height that dishes and utensils may be sorted in single rows.

Suitable Covering for Work Surfaces

1. Zinc.
2. Monel Metal.
3. Oilcloth.
4. Linoleum - printed or inlaid.
5. Wood finished in a good grade of enamel.

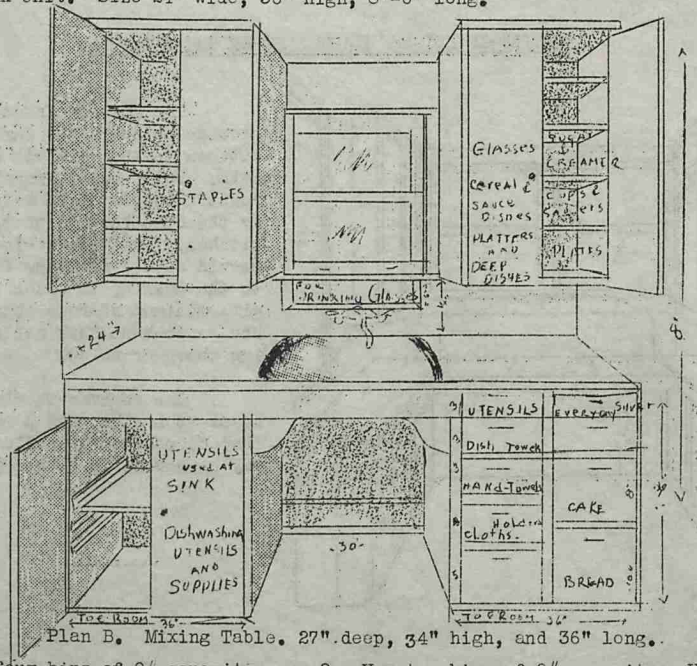


KITCHEN STORAGE ARRANGEMENTS

PLAN V.

Utilization of Storage Space Above and Below Work Surfaces.

A. Sink Unit. Size 24" wide, 36" high, 8'-6" long.



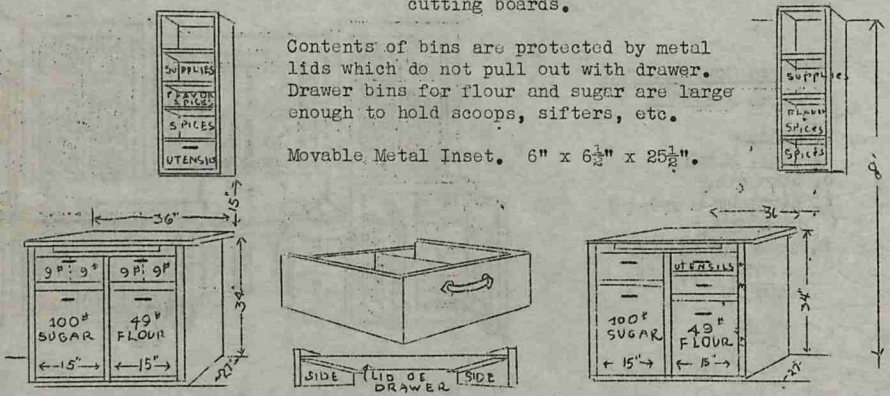
Plan B. Mixing Table. 27" deep, 34" high, and 36" long.

1. Has four bins of 9# capacity. Utensil Drawer in upper cabiner.

2. Has two bins of 9# capacity. Utensil Drawer below work surface. Has place for cutting boards.

Contents of bins are protected by metal lids which do not pull out with drawer. Drawer bins for flour and sugar are large enough to hold scoops, sifters, etc.

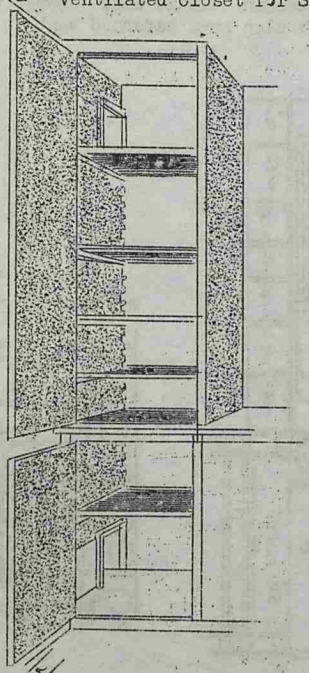
Movable Metal Inset. 6" x 6½" x 25½".



Reprint: U. S. Department of Agriculture, Bureau of Home Economics.

KITCHEN STORAGE ARRANGEMENTS

PLAN VI - Ventilated Closet for Storage of Foods - SIZE 22" x 22"



ESSENTIALS IN CONSTRUCTION

Tight-fitting Door.
Shelves removable and adjustable as to distances apart.

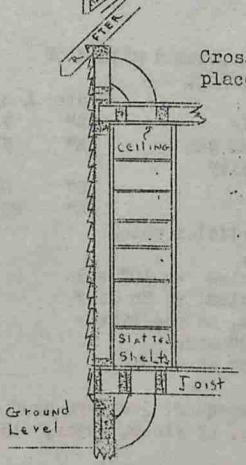
Shelves as open as possible.
They may be made of wooden slats or heavy wire.

Two vents are essential.
The lower one should be at or below the floor level; the upper one should be as high as possible.

Large vents are more effective than small ones.

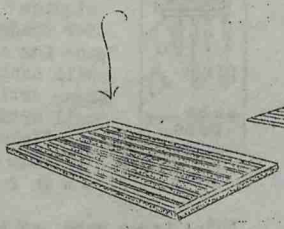
Vents should be covered with fine mesh copper screening which can be removed for cleaning.

Vents should be fitted with some arrangement for closing which can be operated from inside.

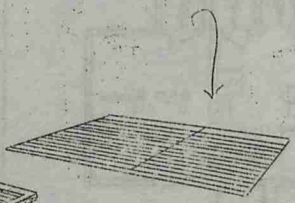


Cross-Section of cooler with vents placed below and above floor levels.

Shelf made of wooden slats.



Shelf made of wire.

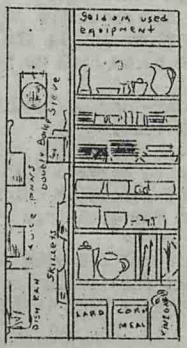


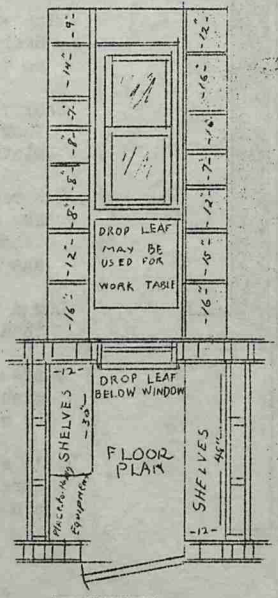
Reprint: U. S. Dept. of Agriculture, Bureau of Home Economics.

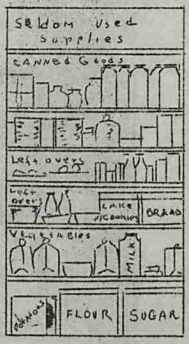
KITCHEN STORAGE ARRANGEMENTS

PLAN VII. SIZE 48" x 48"

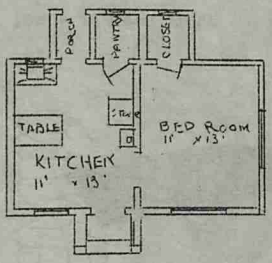
Holds all equipment and supplies for medium-sized family. Storage within reach provides only for articles in current use. Closet ventilated by a double-hung window. May also have screened vent at floor level.







Two-room house plan showing how the above kitchen closet or pantry may be used.



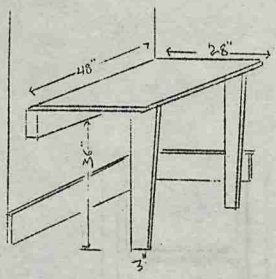
Capacity and assumed method of Storing.

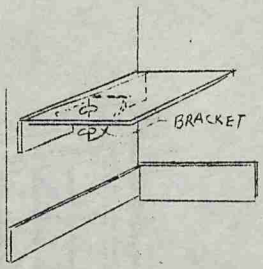
Shelf Space	Width	Length
For utensils	12"	7'
Dishes - for six	12"	7'
Large-quantity staples	16"	5½'
Other foods	12"	20'

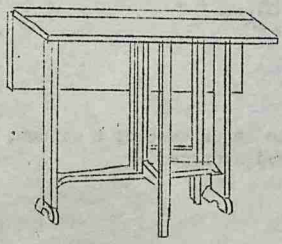
Space for articles which will hang.
Large articles - 18" wide
Small articles - On door
Flat articles, as pie tins - 2 slots 3" wide
Lids - in rack on door

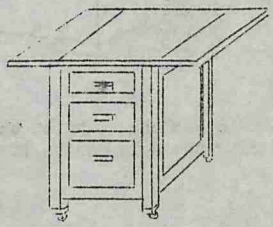
Note: Large cans and two-quart jars are used for bulk supplies, as flour, sugar, etc.

Reprint: U. S. Dept. of Agriculture, Bureau of Home Economics.

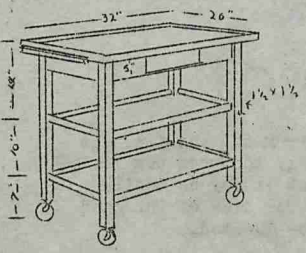


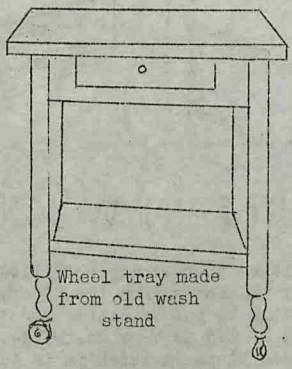


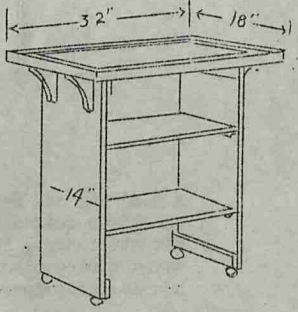




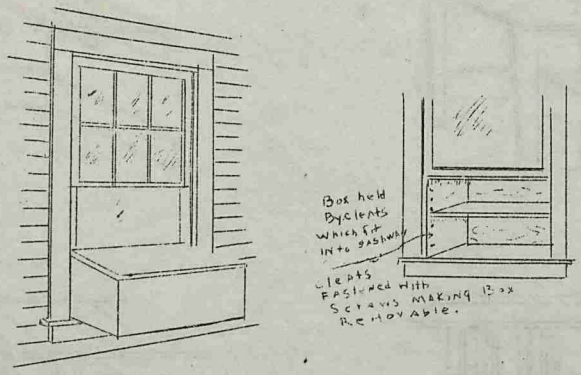
Folding wall tables, drop leaf shelves and drop leaf tables.



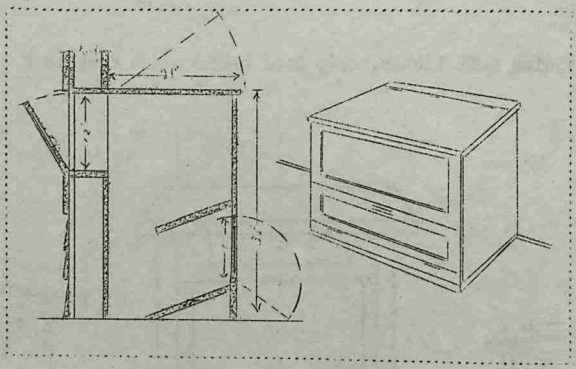




Homemade wheel trays equipped with 3-inch rubber-tired casters.

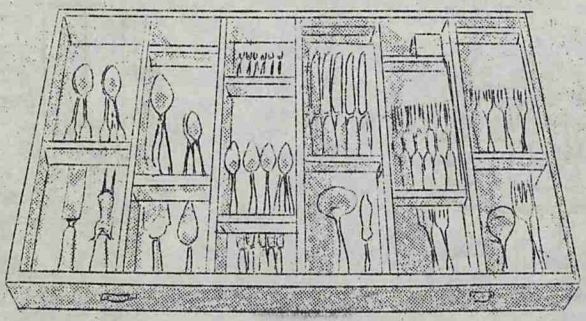


A cold box can be built on the outside of the lower sash of a window. During the cold months it can be used for food storage.

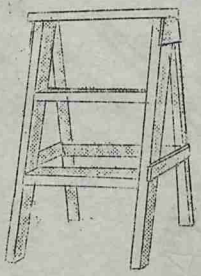


BUILT IN WOODBOX

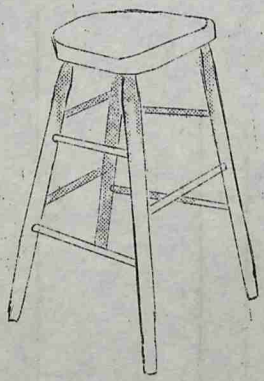
A wood box can be built so that it may be filled from the outside. It should be raised 10 or 12 inches from the floor. If the wood box is not stationary, it should be put on castors so that it may be easily moved during cleaning. A lid is very desirable. The size of the wood box is determined by the place in which it is to be located.



A drawer or a box that will fit into one of the cabinets may be partitioned to form compartments for the silver.

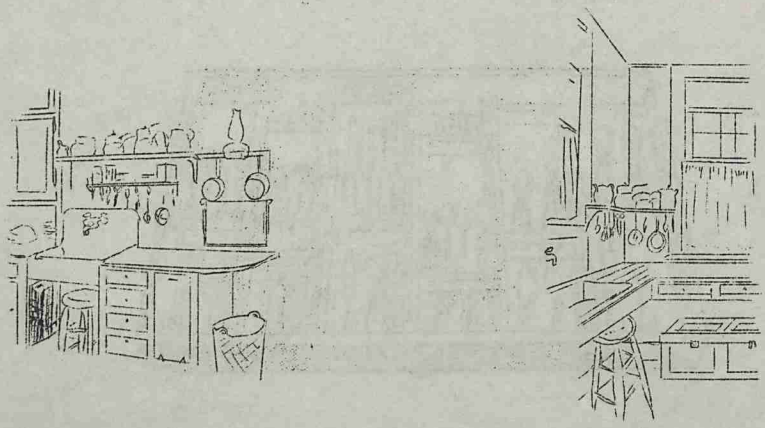


Built from odd pieces of lumber.

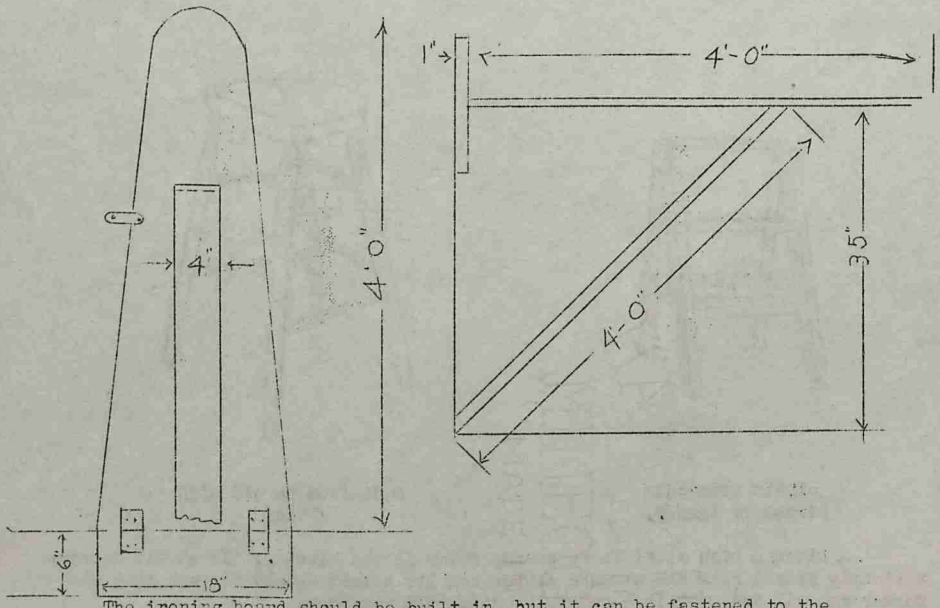


Made from an old high chair.

A kitchen high stool is an energy saver in the kitchen. It should be conveniently placed near the working center and its height should be such that the worker may sit and work in a natural, unstrained position.



Shelves built above the sink or near the stove is a great convenience.



The ironing board should be built in, but it can be fastened to the wall with hinges at the proper height. A wooden pin can be used to keep it in place.

Home Demonstration Division
Agricultural Extension Service
N. C. State College, Raleigh.

Pauline E. Gordon, Specialist in Home Management and House Furnishings. Mamie N. Whisnant, Assistant Specialist.

KITCHEN SCORE CARD

		1st Score	2nd Score
I.	Location of Kitchen and Floor Area ---------- 8		
	a. Location		
	b. Size		
	c. Shape		
II.	Background ---------- 15		
	a. Floor		
	(1) Type		
	(2) Finish		
	(3) Covering		
	b. Walls and Woodwork		
	(1) Finish		
	(2) Color		
	c. Window Arrangement		
	(1) Curtains		
	(2) Shades		
III.	Convenient Arrangement of Work Units ---------- 26		
	a. Storage of food		
	b. Storage of equipment		
	c. Relation of tables, cupboards, stove, fuel, water, etc.		
IV.	Height of Work Surfaces ---------- 15		
	a. Tables		
	b. Cabinets		
	c. Sinks		
	d. Stove		
	e. Wood box		
V.	Sanitation ---------- 15		
	a. Screens		
	b. Disposal of waste water		
	c. Disposal of garbage		
	d. Care of dish towels		
	e. Flies, roaches, rats, etc.		
	f. General Cleanliness		
VI.	Ventilation ---------- 4		
	a. Doors		
	b. Windows		
VII.	Lighting ---------- 8		
	a. Natural		
	b. Artificial		
VIII.	General Appearance ---------- 9		
	Total 100		

NOTE: State cost of Kitchen Improvement expenditures.

Agricultural Extension Service
Home Demonstration Division
N. C. State College
Raleigh

Home Management
Kitchen Improvement
Project

SUGGESTIONS AS TO PRACTICAL MEANS OF OBTAINING GENERAL REQUIREMENTS

I. Mixing surface may be cabinet top, table or shelf so long as it is within a few steps of the storage space for foods and utensils and within easy reach of flour, sugar and condiments.
There are two practical ways of securing separate surface for serving in a small kitchen: One the drop shelf arranged between stove and dining room door, and the other a handle-less wheeled serving tray.
No sink is complete without the double drain board. If sink is so placed as to make this impossible, either the drop shelf or small wheeled table may be used.
Remember to make provision for hanging the ironing board and providing a surface for any other type of work carried on in the kitchen.

II. The greatest aid to step-saving sequence in arrangement of equipment is intelligently planned storage spaces within the four walls of the kitchen rather than pantry and porch storage spaces. In the larger families this will probably mean built-in cabinets rather than the smaller commercial ones or a combination of both.
Sinks and work-shelves may be arranged across an offending low window if the window cannot be changed. Best ventilation occurs when windows come within one foot of the ceilings. Offending doorways have to be eliminated or changed to secure the best arrangement.
In preparing the meal, steps may proceed from right to left or left to right so long as they end at the dining room door.
In clearing away steps should always proceed from left to right if one is right handed. The dishes should be convenient to storage area at the end of process.

III. This is easiest secured by arranging large equipment in a continuous working surface along the walls on either side of dining room door. Closets and equipment not used in preparing food are grouped at far end of room. An oblong room is easiest arranged. Total floor area for a kitchen with range should be around 120 square feet. For room with gas or electricity around 100 sq.ft. If the room is too large the meal preparation activities should be definitely confined to a smaller area. This may be accomplished by using work tables, sink units, cabinets, screens or 5 foot partitions at right angles to one wall, thus making a long rectangular work area with stove and window on opposite ends and sink unit and mixing center on opposite sides.

N. C. AGRICULTURAL EXTENSION SERVICE

N. C. State College of Agri.
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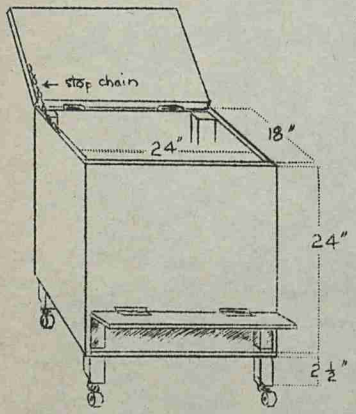
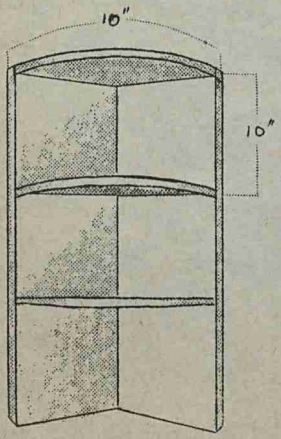
of Agri. Cooperating

HOME MANAGEMENT AND HOUSE FURNISHINGS
Pauline E. Gordon, Ext. Specialist in
Home Management & House Furnishings
Mamie N. Whisnant, Assistant Specialist
H.M. Leaflet #55

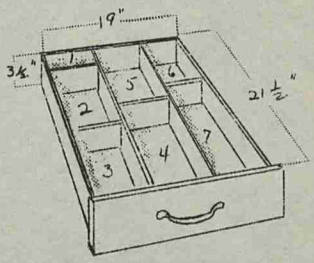
Homemade Kitchen Conveniences

Covered Wood Box





Silver Drawer With Compartments



Compartment No.	1,	5" x 5½"
" "	2	7½" x 5½"
" "	3	6¾" x 5½"
" "	4	8¾" x 5½"
" "	5	10⅜" x 5½"
" "	6	8¾" x 5½"
" "	7	10¾" x 5½"

Division boards - 3/8" thick
Outside boards - 3/4" thick

Corner shelves

Shelf radium - 10"
Distance between shelves - 10"

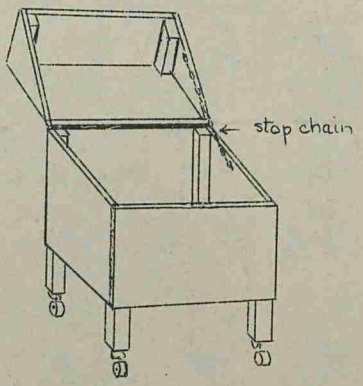
An odd number of shelves is more interesting than an even number

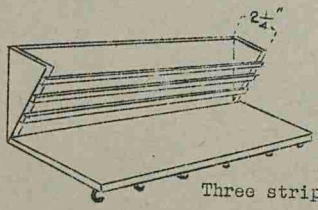
Shelf size and distance between shelves may vary to suit the corner space

Covered Garbage Container

Width - 16½"
Length - 16½"
Front Depth - 10½"
Back Depth - 15½"

Length of Corner
Posts (2" x 2") - 19"





Stove shelf and Pot Lid Rack Combined

Length - 24"
Width of shelf - 8½"
Heighth of back - 10"

Three strips - 3/8" x 3/4" x 24"

The upper strip is one inch from the top, and all are placed one and a half inches apart.

Six hooks are underneath for hanging things.

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N. C. State College of Agriculture & Engineering & U. S. Department of Agriculture Cooperating

Pauline E. Gordon, Extension Specialist, Home Management & House Furnishings.
Mamie N. Whisnant, Assistant Extension Specialist

H. M. Leaflet #51

FINISHES FOR THE KITCHEN

Floors - The kitchen floor should be easy to clean; wear-resisting, comfortable and attractive.

1. Wood floors may be painted, oiled or varnished. Waxed floors are not suitable for the kitchen. They water-spot and are slippery.
2. One of the most satisfactory floors is stained and oiled.
3. Unfinished floors absorb dirt and grease easily. They require more labor to take care of than the finished floor.

Floor Coverings -

Linoleum is the most satisfactory floor covering for the kitchen. It is attractive, durable and easily cleaned. Linoleum is of two kinds, inlaid in which the pattern extends through the material to the back, and printed, on which a surface pattern is finished with varnish or lacquer. A smooth under floor is essential to satisfactory wear. Any linoleum is best laid over a felt base and cemented to the floor. The inlaid linoleum is higher in price but the additional material and labor costs of protecting the printed type renders it as costly over a period of time.

Walls

The kitchen wall finish should be waterproof, sanitary and easily cleaned.

1. Waterproof paper is easily cleaned but not long lived. Not advisable to use it.
2. Oilcloth, well applied, is very close to ideal.
3. Various types of wall boarding, painted or enameled, give a pleasing finish.
4. Painted plaster is durable.
5. Water paints and wall papers are not washable; therefore, it is not advisable to use them.

Color for Kitchen Walls

The color for the kitchen walls depends upon the exposure of the room. Creams, buffs, pale greens, grays, and light blues are pleasing as a background, with the bright colors used in small quantities.

Characteristics of Good Working Surfaces

1. Working surfaces should be covered with materials that:
   a. Are easily cleaned.
   b. Will not spot or stain.
   c. Will stand up under abrasives.
   d. Will not scratch.
   e. Will give good service for a reasonable length of time.

2. Some suitable materials are:
   a. Zinc
   b. Monel metal
   c. Linoleum (printed or inlaid)
   d. Wood finished with a good grade of enamel
   e. Wood finished with oil

Zinc - is not easily cleaned and spots and stains easily.
- gives good service
- is inexpensive

Monel metal - is easily cleaned - does not spot or stain
- gives good service
- is more expensive than zinc
- is very good finish

Linoleum - gives the best service
- should be cemented down

Wood finished with a good grade of enamel - is inexpensive, will not spot or stain.
- will give good service for a reasonable length of time.

Wood finished with oil - is inexpensive
- will give good service

Oilcloth - Is expensive
- will give very little service
- not advisable to cover working surfaces.

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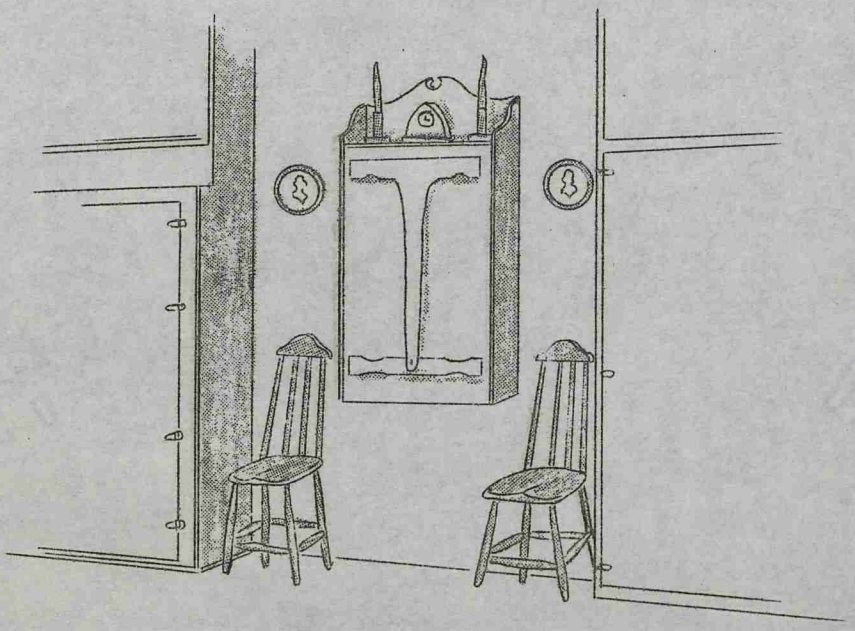
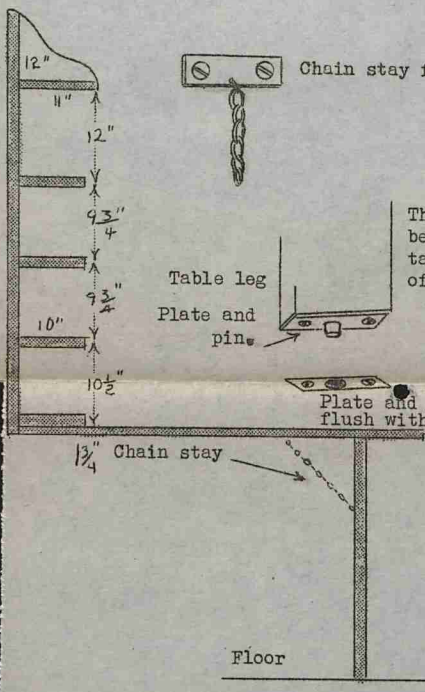
N. C. State College of Agri. & Engineering & U.S. Dept. of Agri. Cooperating
Pauline E. Gordon, Ext. Specialist Home Management and House Furnishings
Mamie N. Whisnant, Asst. Extension Spec.

A BREAKFAST CABINET WITH DROP-LEAF TABLE

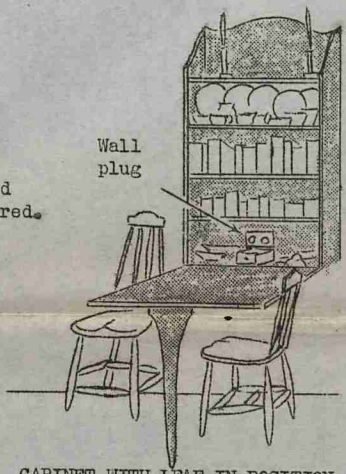




Chain stay for table leg.

This detail may be used to stay table leg instead of chain if desired.

Plate and socket flush with floor



CABINET WITH LEAF IN POSITION AS TABLE.

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H. M. Leaflet #45

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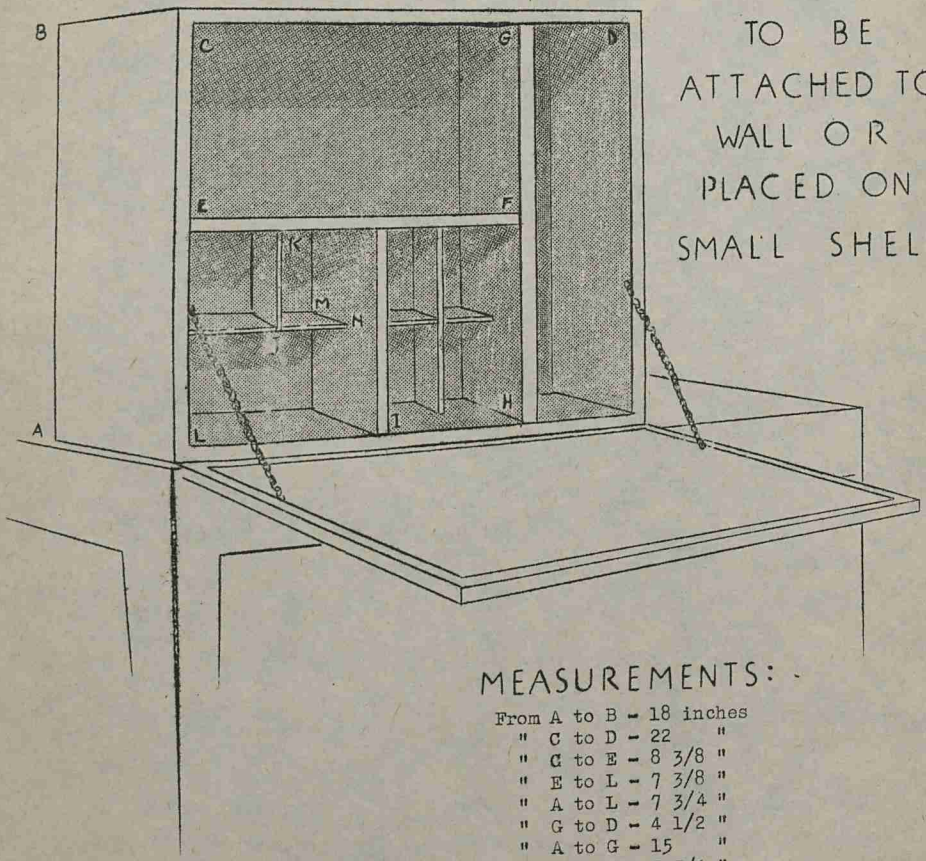
Mgt. and House Furnishings
Mamie N. Whisnant, Asst. Ext. Spec.

KITCHEN BUSINESS UNIT



TO BE ATTACHED TO WALL OR PLACED ON SMALL SHELF

MEASUREMENTS:-

From A to B - 18 inches
" C to D - 22 "
" C to E - 8 3/8 "
" E to L - 7 3/8 "
" A to L - 7 3/4 "
" G to D - 4 1/2 "
" A to G - 15 "
" M to N - 3 3/4 "
" J to N - 3 3/4 "

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N. C. AGRICULTURAL EXTENSION SERVICE

N. C. State College of Agri. & Engineering & U. S. Dept. of Agri. Cooperating

D. E. Jones,
Rural Electrification Specialist
Pauline E. Gordon, Spec. in Home Management and House Furnishings

FARM HOME LIGHTING

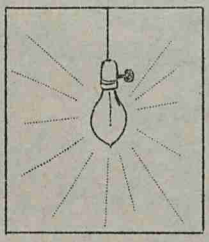
Electricity has made it possible to have a safe, steady, and sufficient amount of light for all types of seeing. Every homemaker should be conscious of the fact that the proper kind and amount of light is essential for seeing. Through ignorance one can abuse the eyes. According to its use, light may be helpful or harmful. Bad lighting impairs the vision. Poor seeing affects both the mental and physical health. All activities that require close seeing, such as reading and sewing, require the proper kind as well as the proper amount of light.

Light that has an unpleasant sensation:

1. Injuries the eye.
2. Increases fatigue.
3. Affects the nervous system.
4. Distracts attention.
5. Lowers speed at which the eye operates.

One of the chief enemies of good lighting is glare. Four types of glare most prevalent in homes are:

1. Direct glare
2. Reflected glare.
3. Glare by contrast.
4. Glare by volume.



Direct glare comes from unshaded or insufficiently shaded lamps which shine directly in the eyes. The common practice of using bare lamps is bad. Light from a bare lamp is never an aid to vision. The discomfort and ugliness caused by unshaded lamps are very apparent.

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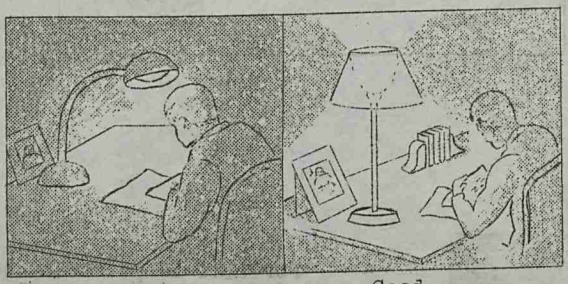
Good

Poor

When an undiffused light falls on a bright and glossy surface and is reflected into the eye, the reaction is identical with that of direct glare.

Glare by contrast is caused by high intensity against dark backgrounds.

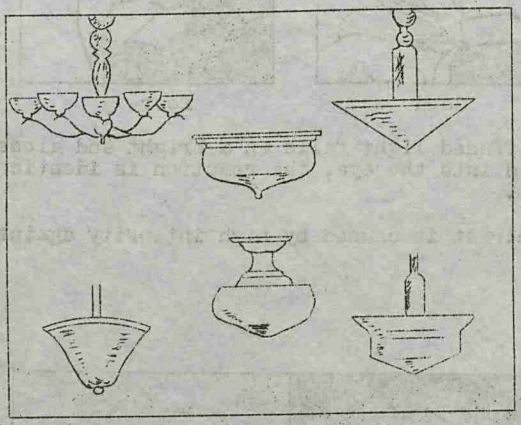


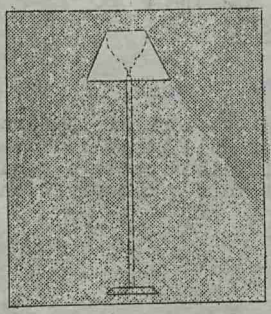
Poor Good

An unshaded electric lamp is too brilliant to look at comfortably. All light fixtures and portable lamps should be well shaded to eliminate glare and shadows. Lamps of sufficient wattage should be used so that there is enough light for one to see clearly without eye strain.

TYPES OF FIXTURES SUITABLE FOR THE FARM HOME

Fixtures of bare bulbs have no place in the well lighted home. Utility and beauty should be the guides in selecting light fixtures. In selecting a fixture, it is wise to consider the type of illumination resulting from it, whether it is easy to keep clean and whether it harmonizes with the furnishing of the room.



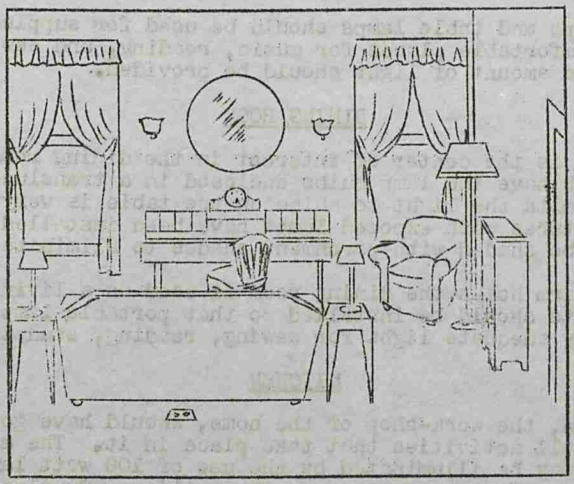


Portable lamps should be used for activities that require close seeing. These lamps should be chosen first for seeing and second for decoration. The characteristics of good portable lamps are:

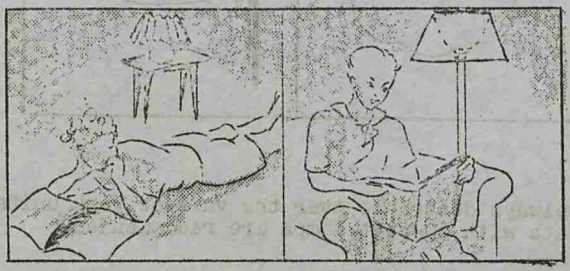
1. Sufficient height and shade size to cast light over large area.
2. Shade linings of white.
3. Open top shades.
4. Lamp bulb enclosed in light-diffusing glass bowls hidden under the shade.
5. Lamp bulbs of sufficient wattage.

LIVING ROOM

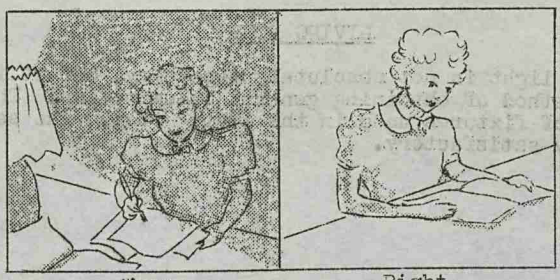
A center light is not absolutely necessary, but it is the most satisfactory method of obtaining general illumination. There are several types of fixtures used in the living room. The semi-indirect fixture is very satisfactory.



Bracket lights supply decorative effect. A great many must be used for general illumination. They make it difficult to rearrange furniture. All bracket lamps should be shaded.



Wrong Right



Wrong Right

Floor lamps and table lamps should be used for supplementary lighting. Comfortable places for music, reading, and sewing with the right kind and amount of light should be provided.

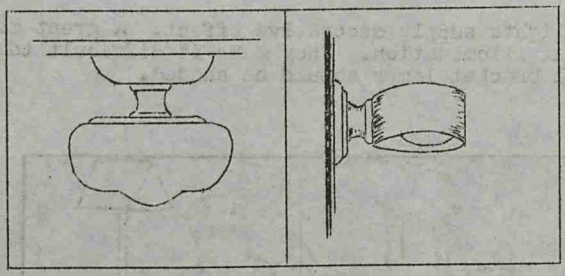
DINING ROOM

The table is the center of interest in the dining room. The fixtures which have the lamp bulbs enclosed in a translucent glass bowl that permits the light to shine on the table is very satisfactory. If fixtures with exposed lamps have been installed, these bulbs should be shaded with parchment shades to eliminate glare.

In many farm homes the dining room is used as a living room. Convenient outlets should be installed so that portable lamps may be used to supply adequate light for sewing, reading, studying, etc.

KITCHEN

The kitchen, the work-shop of the home, should have good lighting provided for all activities that take place in it. The moderate size kitchen may be illuminated by the use of 100 watt lamp enclosed in a white glass bowl hung close to the ceiling. Supplementary

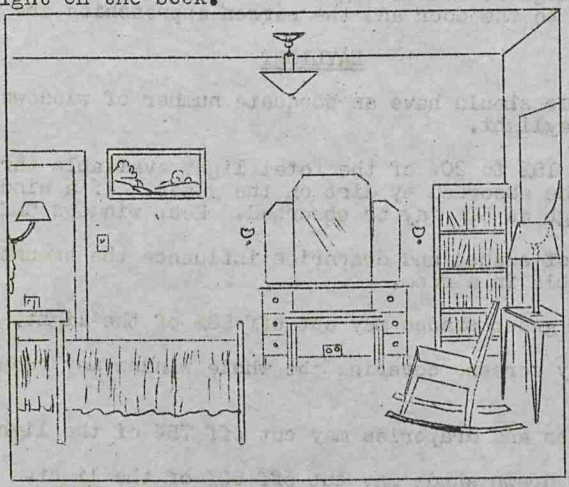


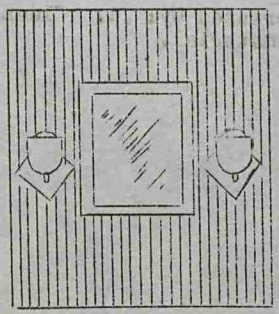
lighting is always desirable over the various work units. Glass-shaded brackets with 60-watt lamps are recommended.

BEDROOM

The well lighted bedroom requires general illumination supplemented by illumination at the bed and dressing table. A ceiling fixture of the indirect type or a single globe fixture is recommended.

If the light at the bed is to be used for reading, it should be slightly to one side and just above the head of the person sitting up in a good reading position. The shade should be wide enough to throw the light on the book.





The lights at the mirror may be provided from either wall brackets or from a pair of lamps placed on the dressing table. The lamps should be so placed that the light will fall on the person in front of the mirror.

BATHROOM

In the moderate size bathroom, sufficient illumination may be supplied by an upright bracket lamp on each side of the mirror. These should be 60 to 66 inches from the floor so that the mirror will be well lighted. The large bathroom should be equipped with a ceiling enclosed globe.

HALL AND PORCHES

In the halls ceiling fixtures are suitable. Stairways should be provided with enough light for safety. Adequate light for the porch may be provided by a single light over the door or two bracket lights. These lights should be so located that both the approach to the door and the person approaching are visible.

DAYLIGHT

A home should have an adequate number of windows to furnish the needed daylight.

From 15% to 20% of the total light available through windows may be absorbed by dirt on the glass. If a window is very dirty, as high as 50% may be absorbed. Keep windows CLEAN.

Use of shades and draperies influence the amount of daylight available in a room.

Dark green shades may cut off 98% of the light.

Smoky screens covering the whole window may reduce the light 50%.

Shades and draperies may cut off 75% of the light.

Half drawn shade may cut off 60% of the light.

Light green shades may cut off 80% of the light.

Heavy drapes and curtains in a room may reduce the light 75%.

Daylight available in a room is increased by: 1. Clean windows; 2. Light shades; 3. Very light material.

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Home Management and House Furnishings
H. M. LEAFLET #58

CARE AND REPAIR OF ELECTRICAL EQUIPMENT

Electricity, when used with approved equipment, connected to adequate and properly constructed circuits which are well arranged and maintained, is the safest, most convenient source of light, heat and power. It is made unsafe by injury or lack of repairs to the circuit or by the use of inferior or poorly made materials perhaps improperly put together. Lack of repairs to worn or damaged equipment creates an unnecessary hazard and reduced usefulness and efficiency of electricity.

When trouble is located between the entrance switch and convenience outlets an electrician should be called.

FUSES

Fuses are used to protect wiring from possible overloads. Overloading might cause fires or damage to wiring and appliances. Fuses are made the weakest link in a circuit in order to protect, by their weakness, the more expensive parts of the circuit. No. 14 wire is used for lighting circuits. A 15 ampere fuse is the largest fuse that should be used on a No. 14 circuit.

When a fuse blows eliminate the cause for blowing before replacing. When renewing fuses in a live circuit use one hand only and always stand on a dry board or other insulating material. Do not attempt to replace fuses in the dark, put the fingers into the fuse socket or touch the fuse clips. IF POSSIBLE, FIRST PULL THE SWITCH AHEAD OF THE FUSE.

SHORT CIRCUITS

A "short circuit" occurs when current accidently flows through a relatively low resistance path from one conductor to the other or to the ground. The common causes of short circuits are bare wires touching each other, poor insulation, poorly connected plug caps and connector bodies, poorly spliced electric cords, appliance and motors. A short, once started, will continue until fuse is blown.

EXTENSION CORD MATERIAL

In selecting the materials for extension cords keep in mind the uses that are to be made of them. If the cord is to be subjected to hard usage and moisture, it should be moisture proof and have a tough rubber insulation. For ordinary purposes the ordinary cotton or silk braided cord is adequate. Extension cords should not be tacked to walls or molding, nor run under doors or rugs where they will be rubbed. Surface extension materials are available whereby safe outlets can be put easily and cheaply.

CARE AND REPAIR OF ELECTRIC CORDS

A "short circuit" occurs when current accidentally flows through a relatively low resistance path from one conductor to another or to the ground.

The most common causes of short circuits are: (1) bare wires touching each other, (2) poor insulation, (3) poorly connected plug caps and connector bodies, (4) poorly spliced appliance cords, (5) wet appliance cords, (6) wet appliances and motors.

Extension Cords The use of an extension cord determines the material from which it is made.

(1) Extension cords with rubber insulation (moisture proof) should be used in cellars or where there is any dampness.
(2) Cotton or silk braided cords are adequate for radios, and lamps.
(3) Asbestos insulated cord should be used with irons and all heating appliances.

It is advisable to use unbreakable plug caps.

Extension cords should not be tacked to walls or molding or run under door where the insulation will be rubbed off.

Care of Cords when storing. Avoid kinking or twisting of cords. Do not wrap around appliance Hang cords on two wood pegs about one foot apart.

Remove extension cords from convenience outlets by taking hold of plug caps rather than cord.

Repair a Plug Cap.
1. Remove insulation from ends of wires.
2. Twist wires tightly.
3. Place under binding screws with wires pointing in the direction the screws turn to tighten.
4. Tighten screws.
5. Check for loose strands of wire. They are dangerous.

Repair of Iron Cords.
1. Remove the two halves of connecting plug.
2. Remove small bolts and study its inside.
3. Cut 1½ inches off the end of one wire of each cord.
4. Twist wires lightly, allow enough wire for tucking carefully in proper grooves.
5. Fit halves of connecting plug carefully so that all wires and copper connecting tubes will remain in their proper places.

To repair breaks in Extension cords.
1. Cut the cord at the break.
2. Remove four inches of outer insulation from each end.
3. Cut 1½ inches of insulation from each wire.
4. Remove 1½ inches of insulation from each wire.
5. Scrape ends of wires clean and twist strands together tightly.
6. Wrap each wire with rubber tape.
7. Cover with a layer of friction tape.

N. C. AGRICULTURAL EXTENSION SERVICE

N.C.State College of Agri. & Engineering & U.S. Dept. of Agri. Cooperating

Pauline E. Gordon, Extension Spec., Home Management & House Furn.
Elizabeth Williams, Assistant Ext. Spec. Home Mgt. & House Furn.

H.M. Leaflet #59

SELECTION OF ELECTRICAL EQUIPMENT

Facts To Be Considered in Deciding What Electrical Equipment To Buy

1. Study needs of the family for various pieces of electrical equipment.
2. Weigh values of choice.
   Ex: Which is more important to your home, a water system or an electric refrigerator? Why?
   A washing machine or a range? Why?
3. Decide what increased satisfaction or financial gain would result from the ownership of the equipment.
   Ex: Time and energy freed by doing the job electrically instead of by the older method.
   Increased cash income by sale of sweet cream, etc.
4. Study cost of:
   a. Equipment
   b. Operation
   c. Servicing
5. Determine if the home is adequately and safely wired for the operation of the appliance. Check wattage requirement on name plate of appliance.
   Ex: The average electric iron requires 660 W to 1000 W to operate. Many persons plug an iron into drop cords that are manufactured to operate effectively appliances that require no more than 250 W.
6. Decide on a plan of payment
   a. Cash
   b. Installment
   c. Short-term-loan

Cost of Operation

The cost of operation of any electrical equipment depends upon:
1. The number of kilowatt hours it is used.
2. The rate per kilowatt hour.

Kilowatt hour consumption for electrical equipment:

Equipment	Average Kilowatt Hour Consumption Per Month
House lights	35
Range	166
Washing machine	3
Ironing machine	12½
Flat iron	5 to 8
Percolator	3-1/3
Refrigerator	62½
Water heater	300
Water pump (for house)	4
Radio	12

General Suggestions for the Selection of Electrical Equipment

1. Select ONLY equipment made by reliable manufacturers. A cautious buyer will beware of new makes.

2. Buy models that have been on the market six months or more.

3. It is preferable to buy from reliable local dealers that will give prompt and efficient service.

4. Buy makes whose parts are available on local markets.

5. Purchase from mail order houses that have testing laboratories and sell by specifications.

6. Select equipment which can be easily cleaned.

7. Study the guarantee and know what it includes. Only written guarantees are worthwhile.

8. Do not purchase from house-to-house canvassers.

9. When considering buying a certain make of electrical equipment, talk with five persons who have owned and operated it for years. Do not purchase makes that have not given satisfaction.

10. Know the points that should be considered in order to make a wise purchase before selecting a piece of electrical equipment. Study suggestions for the Selection of Refrigerator, Range, Washing Machine, etc.

Facts to Be Considered in Selecting An Electric Refrigerator

1. The motor should be 1/4 horse power, should operate quietly and should be well regulated.
2. The price should be $100 and up.
3. The size of the refrigerator needed depends on the size of the family and the amount of food kept for home and market. For the average farm family the eight cubic foot refrigerator is practical.
4. The outside finish of the refrigerator should have few seams and joints, and should be easily cleaned. The outside surface is generally made of lacquered or enameled metal sheeting, or porcelain enamel, or other special materials. The covered metals are less expensive but durable.
5. The door should open facing the preparation center of the kitchen, should open easily and should fit tightly.
6. The doors and walls of the refrigerator should have at least two inches of insulation. Among the insulation materials often used are mineral wool. Inquire concerning the insulation before purchasing.
7. The food compartment should be so placed and arranged that it is not neeessary to stoop when placing or removing food.
8. The shelves should be of rust proof material, should slide forward easily, balance to prevent tipping when pulled out, be removable and adjustable.
9. The lining should be without seams, have rounded corners and be non-corroding.
10. The ice trays should have levers or some type of device for removing ice cubes easily.
11. Two freezing shelves are better than one.
12. Some device is needed for controlling the speed of freezing as fast, normal, and slow.
13. The refrigerator should either set flat on the floor or have legs high enough to permit cleaning beneath.

Care and Use of the Electric Refrigerator

1. Read carefully the book of directions for the care and use of the electric refrigerator and keep the book in a convenient place.
2. Locate refrigerator in convenient place where there is free circulation of air. It should stand two or three inches from the wall and have at least twelve inches clearance above it. Never place on porch where it is exposed to the elements.
3. Cover all foods kept in an electric refrigerator. Clean vegetables and fruits, place in tight containers before placing in the refrigerator. Clear glass containers are preferable to earthenware as contents can be easily seen. Fruit jars are good containers especially for milk.
4. Paper is a non-conductor of heat; therefore, food should not be left in paper bags or wrapped in paper.
5. Place food in refrigerator so that the air can circulate freely. Round dishes are preferable to square ones.
6. Use refrigerator for storage of foods that need low temperature to keep them. Store such foods as jellies, etc. elsewhere.
7. Never put hot foods in a refrigerator.
8. Defrost refrigerator when frost is 1/4 inch thick on unit. This should be done according to the directions of the manufacturer.
9. Wash the interior of the refrigerator with warm soda water after defrosting. Rinse with warm water and dry. Do not allow food to accumulate in the refrigerator.

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Pauline E. Gordon, Extension Specialist in Home Management and House Furnishings
Home Management Leaflet #63

Electrical Terms

In order to get the most from electric appliances it is necessary for one to have some knowledge of the laws which have been established in regard to their action.

Electric Current.

The flow of electricity in a definite direction through a substance is called an "electric current." Electric currents are measured in amperes. (Note fuses are marked in amperes.)

Conductors and Non-Conductors

Certain materials transmit electric current readily, and are known as conductors. Aluminum and copper are the two best conductors. Water and the ground are good conductors and care must be taken not to come in contact with currents of electricity when the shoes and hands are wet.

Glass, rubber, wood, procelain, rubber, cotton, silk and asbestos are non-conductors.

Circuits

The voltage forces the current through the entire length of the conductor and back to the generator. This path over which the current travels is known as an electric circuit.

Fuses

The fuse or circuit breaker is a safety device placed in an electric circuit to protect the lighting equipment and electrical appliances from damage caused by excessive current.

Fuses are of two kinds---plug and cartridge. The plug fuse is commonly used in the home. Fuses are rated in amperes. A blown plug fuse must be replaced with a new fuse. Never use a penny or tin foil.

Watt

Watt is the unit of measure for electrical power. The watt is such a small unit that the kilowatt (1,000 watts) is used commercially in measuring power.

Name Plate

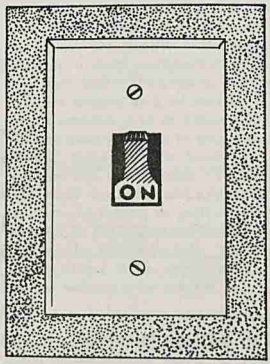
Electrical appliances are constructed to operate under certain standard conditions. The conditions are specified on the name plate. The specifications include kind of current, voltage and either wattage or amperage.

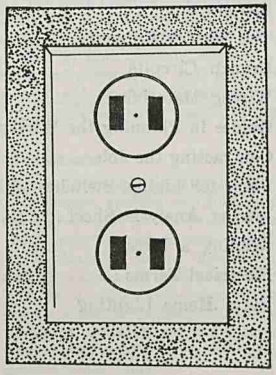
Short Circuit

Occasionally the insulation on conductors become worn so that the two wires accidentally come in contact with each other. The current then returns to the generator by a path of very low resistance. This is known as a short circuit and is often recognized by a monentary flash of light. Short circuits frequently occur in cords attached to small electrical appliances, especially the hand iron which is moved so continuously back and forward. Since water is a good conductor, a fabric covered corn may develop a short circuit if it becomes damp. It is not a safe practice to handle electrical appliances attached to live circuits when shoes are wet.

March, 1937 Extension Circular No. 213

Wiring and Lighting The Farm Home





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Wiring And Lighting The Farm Home

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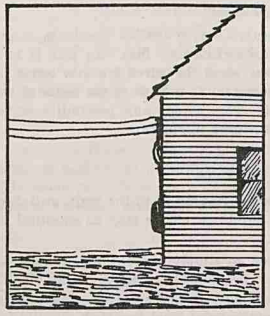
INTRODUCTION

With the coming of electric service to the farm home the new customer is immediately faced with the problem of wiring his home and the farm buildings. Wiring should be adequately done so that the customer may enjoy to the fullest, the benefits which this ready servant affords. This circular is prepared to help customers plan the wiring of their home and farm so that they may realize the greatest satisfaction possible from their electric service. It is not written as a manual for a farmer to use in doing his own wiring—such a practice is to be discouraged.

Care must be given to planning to make sure that enough outlets are put in—and these properly located—to make the installation as convenient as possible, and that enough circuits of proper size wire are installed to take care of all the lights and appliances that may be operated. Thought should be given to future, as well as present, needs so that adequate capacity is installed in the beginning when it is cheaper and easier to do. It is essential too that the wiring be safe. The difference in price between safe wiring and unsafe wiring is too small to be a factor, but the results of unsafe wiring are too serious to be ignored.

THE SERVICE ENTRANCE

A very important part of the wiring system is the service entrance, composed of the service cable, (or conduit), the meter, and the switchbox and fuses, for through this must come all the current used on the farm. This "bottle neck" should be large enough to let plenty of current through for doing the dozens of jobs to which it will be applied. Otherwise when more current is desired, it will be necessary to tear it out and replace with heavier equipment—a rather expensive undertaking.



As a general rule, the organization furnishing the power will install the service wire from the line to the house and through the meter. Information as to the amount of equipment to be operated should be available so that adequate service wires will be run.

Sometimes it is necessary to have a three wire 115/230 volt service. When the load is heavy as would be

on a dairy farm, or in any home where an electric range or water heater is to be operated, the three wire service is needed.

The switchbox must be of a size to take care of all the circuits necessary to adequately supply all the lights and outlets planned for. A 30-ampere switchbox is adequate only for a small installation, where the number of outlets is twenty-four, or less, and very little household equipment is to be used. For the average farm home of five to eight rooms with one or two buildings to be lighted, and with operation of household appliances and a water pump, a 60-ampere switch is recommended. This size switch will permit use of four 15-ampere branch circuits and an electric range. When a three to five horse power motor is to be operated in addition to the range and house equipment, a 100-ampere switch will be needed.

Consult a qualified electrician as to the best location for the entrance so that the switchbox may be located. It is desirable to have the meter and entrance near the rear of the house, in an inconspicuous place, as a matter of appearance.

The type of meter generally used is the outdoor meter. It is located on the outside wall of the house where it is readily accessible to the service man who takes the reading each month.

Fuses

The branch circuits between the switchbox and the fixtures or wall outlets are designed to carry a stated amount of electric current safely. To prevent the circuits carrying current in excess of this safe amount, fuses are provided that "blow out" when the current exceeds the safe amount. The fuse is the electric safety valve, giving protection against fire as it "blows out" and automatically cuts off the current whenever the wires get too hot or a short occurs. If the fuse should blow repeatedly, don't put in a large size fuse because they defeat the purpose of the fuse as a safety valve. The correct fuse size for the average house circuit is 15 amperes. Do not bridge the fuse with pennies or other pieces of metal.

Circuit Breakers

A newer and more convenient protective device against overloads is the modern circuit breaker. It acts as both switch and fuse. In fact it is a switch that can be operated by hand, but when the wires are overloaded, it opens automatically. Then all that is necessary is to remove the cause of the overload and close the switch by hand. This avoids any possibility of inconvenience and delay that lack of extra fuses might cause.

BRANCH CIRCUITS

The branch circuits are the sets of wires leading from the main switch of fuse panel to the various outlets in the buildings. They may be classified on the basis of the load each is to supply.

The 15-ampere branch circuit is used to supply current for lights, and convenience outlets for small appliances. It should be of wires of size No. 12, and protected with a fuse not more than 15 amperes rating. As a rule, a farm home of six or seven rooms should have at least two such circuits for

lighting and wall receptacles, in addition to an appliance circuit in the kitchen and dining room. The number needed may be determined by allowing one branch circuit for each twelve outlets.

The appliance branch circuit is needed to supply the heavier current-consuming appliances such as electric irons, hot plates, waffle irons, and small heaters. This circuit should be of No. 12 wire and fused with a 20-ampere fuse. This circuit should supply outlets in the kitchen, back porch, breakfast room and dining room.

The heavy duty branch circuit is used to supply the larger current-consuming appliances such as water heaters, and large motors, and to provide feeders to the barn, garage, chicken house, and other out-buildings. The size wire to be used will depend upon the load and the distance the wire must be run.* As a rule, wire smaller than No. 10 should not be used.

The individual appliance branch circuit is one such as used to supply an electric range. The electric range normally requires a No. 6, 3-wire cable circuit.

Generally, the dealer's price on an electric range includes putting in the necessary circuit and equipment. Sometimes, if the circuit is already installed, this cost—usually about twenty-five dollars—will be deducted. This should be investigated at the dealer's in the customer's community.

WIRING MATERIALS

Wiring systems used on farms may be classified according to the type of protection given the wires. The kind of material used for protection depends upon the type and the use of the buildings being wired.

Wires in barns, pack-houses, stables and other buildings where the circuit must be run on the surface near where animals are housed, where rough work is done, or where there may be moisture and fumes, need more protection than wires in homes where the circuits are in the walls and floors. Any good system will meet the following requirements:

1. Protect the wires from injury.
2. Protect persons and livestock from shock.
3. Resist corrosions from moisture, fumes, and disinfectants.
4. Be economical.
5. Be free of fire hazard.

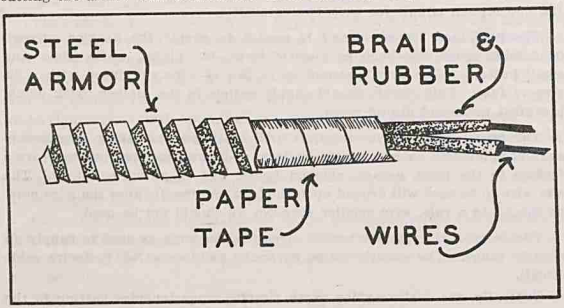
Some of the different kinds of wiring material most frequently used may be classified under the following general headings:

Armored Cable

Armored cable, commonly known by a manufacturer's trade name as BX cable, is being most generally used in this State for wiring rural homes. In this cable the wires are enclosed in a spirally wound steel jacket, which affords excellent protection from injury. Care must be taken when the wir-

*A table of wire sizes for various loads and distances may be obtained by writing Extension Agricultural Engineering Department, State College, Raleigh, N. C.

ing is being installed to avoid damaging the insulation on the wires when cutting the armor with a hacksaw. This cable may be pulled through walls,

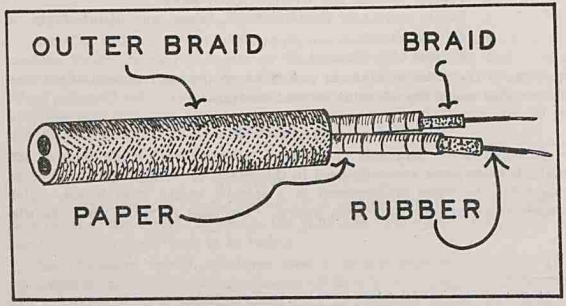


Armored Cable—BX

partitions, ceilings, and floors without adding other insultation or protection. It is held in place by metal staples or pipe straps. It should be securely fastened to all the metal outlet boxes, and this contionuous metal network permanently grounded to a water piping system or iron rods driven well into the earth. It is subject to corrosion in very damp places.

Non-Metallic Sheathed Cable

Non-metallic sheathed cable, as the name implies, is without the metal covering found in the BX cable. Its very tough, impregnated, fibrous covering gives it the necessary protection. It is inexpensive to install. It may be pulled through partitions, and between floors without additional protection, and fastened securely with metal staples. It is flame proof, moisture proof,

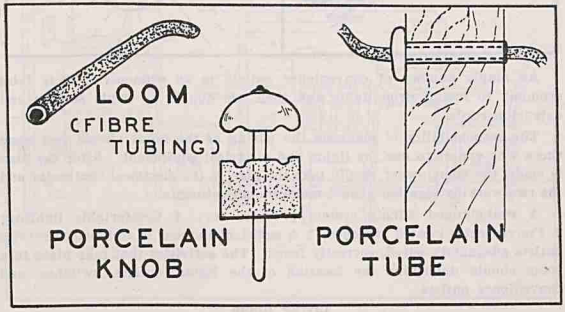


Non-Metallic Sheathed Cable

and rodent proof. As there is no metal about it, it will not rust or corrode, and offers very little possibility of shock to livestock or persons. It is especially adapted to barns and stables because livestock is very susceptible to shock, and because moisture and ammonia fumes are usually present. It finds its place, too, in dairies and milk houses where moisture is usually present.

Knob and Tube Wiring

Knob and tube wiring is a method of wiring in which insulated conductors are carried on porcelain knobs over the surface, or through porcelain tubes in floor joist, uprights, etc. In finished buildings the wires may be pulled



through partitions by enclosing them in loom, a flexible, fibrous tubing. The material is somewhat cheaper than cable, but the labor to install it is considerably more, particularly in old buildings.

Conduit

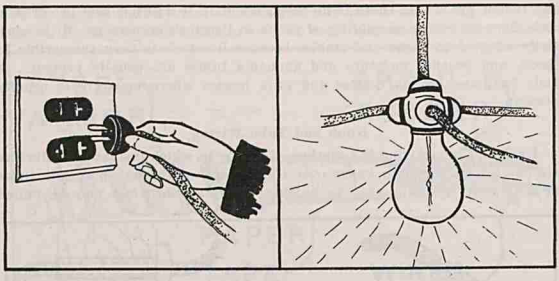
Conduit is a pipe prepared especially for electrical work. The pipe is first put in place and then rubber covered wires pulled through it. It is more expensive than either the cable or knob and tube, for which reason it is used very little in farm homes and buildings.

GUIDES IN PLANNING THE WIRING

One should install the wiring system so that it will meet the future needs as well as those of the present. Wiring for appliances that one plans to use later should be installed in the beginning. It is a great deal cheaper to install proper wiring than to add to or rip out inadequate wiring.

To get the greatest satisfaction from electricity, it is necessary that the homemakers work out a plan for the wiring of their farm so that they may present the wiring job to the contractors.

A good plan, executed by a good contractor, who presents the customer with a certificate of inspection and approval from the National Board of Fire Underwriters, should insure an adequate and safe wiring installation.



An ample number of convenience outlets is an economy. It is false economy to install drop lights and then use double or triple sockets and extension cords.

The responsibility of planning the wiring of the home should rest upon those who expect to use the lights and electrical equipment. After the plan is made, the home owner should take the plan to the electrical contractor and the two working together should make the adjustments.

A well-planned wiring system provides for: 1. Comfortable lighting; 2. Conveniently located switches; 3. A sufficient number of well-placed service outlets adequately wired, correctly fused. The activities that take place in a room should determine the location of the lights, outlets, switches, and convenience outlets.

Living Room

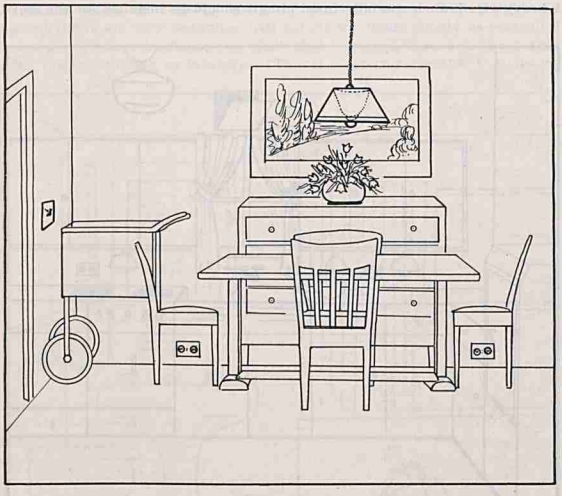
Center light for general illumination. Switches placed on lock side of door about forty inches from floor. In room when the line of traffic is from two doors, it is advisable to have the three-way switches. Double convenience outlets located on each wall are desirable but there should be at least two convenience outlets to permit the use of portable lamps, radio, vacuum cleaner, etc. Double convenience outlets should be located about 12 feet apart and never put in the middle of a wall space or in any space where one cannot use them without moving furniture.

Bracket lights are mostly decorative. It may be advisable to use a convenience outlet in the mantle.

Dining Room

Convenient wiring of the dining room requires center light controlled by a single or three-way switch that is conveniently located. The dome luminaire should be 24 inches above the table. Shower units are hung 36 inches above table.

A minimum of two double convenience outlets, one near the buffet and one on opposite side of the room will take care of appliances, portable lamps, fans, etc. It is advisable to supply convenience outlets well located for appliances used at the table. A separate circuit supplied by a No. 10 wire is necessary in order to get the best service for electrical appliance used at the table.



Kitchen

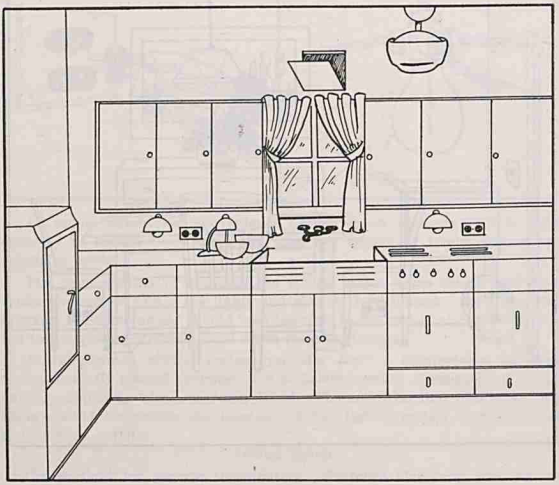
The kitchen floor plan and the plan for the arrangement of work units in the kitchen should be carefully studied before a wiring layout is started. In the farm kitchen where such activities as washing, ironing, churning, reading, keeping household records, etc., take place, convenience outlets should be provided for the use of electrical appliances.

A central light should be located close to the ceiling, so that all parts of the room are equally lighted. This light should be controlled by three-way wall switches located at the dining room and rear doors. Shaded lights should be placed at the sink and work tables.

The outlet for the refrigerator should be located in a *protected, convenient* and *well ventilated* place.

Outlets for the electric iron, washer, churn, and other electrical appliances should be 36 to 42 inches from the floor and within a few feet from the place where the appliance is to be used. The equipment circuit should be separate from the light circuit. The outlet for the iron should be so located that the cord will not be in the operator's way and so that she will not stand

in her own light. A No. 10 wire should be used for the convenience circuit. A heavy-wire branch specially fused circuit should be installed for the stove.



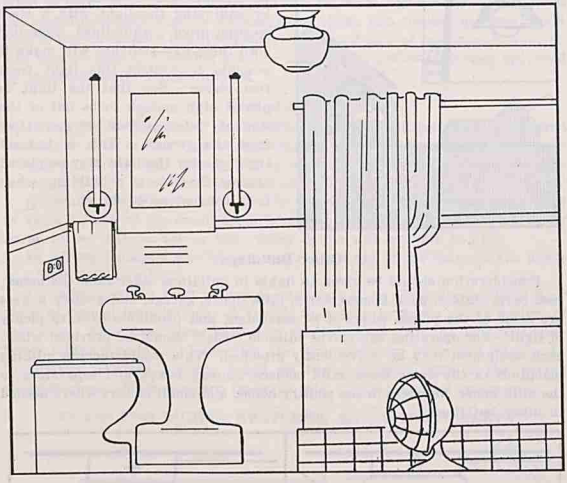
Bedroom

A center ceiling outlet, for general lighting, is desirable in the bedroom. This light should be controlled by a wall switch at the door. A light controlled from the bed is the first requirement of a well lighted bedroom. A double convenience outlet near the bed is desirable. Adequate light for the dressing table, reading, etc., should be provided.

A switch in the master bedroom to control the yard light is a great convenience.

Bathroom

Bracket lights are sufficient to light small bathrooms. Ceiling light and bracket lights are very desirable. All outlets for lights should be controlled by a wall switch or insulated pull chain that is beyond the reach of a person using the tub, shower, or lavatory. (This is a safety precaution.) A heavy-



wire circuit, controlled by a wall switch, should be installed if a heater is to be used. Bathroom outlets should be covered with or made of well insulated material such as porcelain.

Closets

All closets of 15 square feet floor area or over should have a light outlet. The wall outlet placed over the door should be controlled by a pull chain or a door switch.

Halls and Stairways

Ceiling outlets that illuminate the head and foot of the stairway should be controlled by a three-way switch. One convenience outlet is advisable.

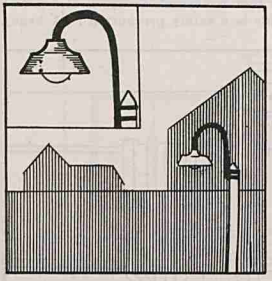
Outside Lighting

Front Porch. One ceiling or two bracket lights controlled by a switch in entrance hall. One common convenience outlet.

Back Porch. One ceiling outlet controlled by a switch just inside the door. One or more convenience outlets located 36 inches to 42 inches from the floor, the number to be determined by the activities that take place on the porch.

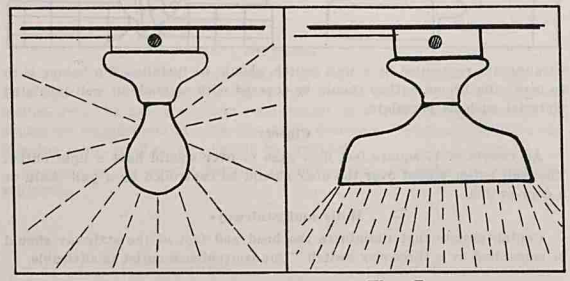
Yard Light

Don't forget to plan for an outdoor light for the yard or the drive from the house to the barn and garage. Such a light will be found very useful, particularly during the winter when the days are short. Provide for better light, and protection to the lamp by equipping the light with a steel weather-proof, white-lined reflector. Two three-way switches will make it possible to control this light from two places. See that the light is placed high enough to be out of the line of vision—fifteen or more feet from the ground. With a bracket type reflector the light may be placed against the side of a building, when it is conveniene to do so.



Other Buildings

Consideration should be given to lights in buildings other than the home; feed barn, stables, pack houses, dairy, milk house, garage, and poultry houses are some of the places where it is convenient and profitable to have plenty of light. For operating equipment suitable outlets should be provided where such equipment may be conveniently attached. This would include milking machines in the dairy barn, milk coolers, storage boxes, and separators in the milk house, brooders in the poultry house, and small motors where needed in other buildings.



Without Reflector — With Reflector

Lights in barns, and other roughlined buildings, should be provided with metal, porcelain-lined reflectors for better illumination and protection of the lamp. With the same size lamp more light is received where it is needed when the reflector is used.

CONTRACTING THE JOB

When the wiring plans are completed, there still remains one of the most important things to be considered—that of obtaining a competent, reliable, and honest wireman to do the work. It is advisable to have more than one contractor bid on the work. Your plan will enable each one to know exactly what is being considered and his bid can be made accordingly. When it is not stated definitely what is wanted, some of the less responsible men might plan to use an inferior quality of materials, or circuits of inadequate capacity, and thus be able to underbid others. Insist upon use of materials approved by the Underwriters Laboratories.

Cost of Wiring

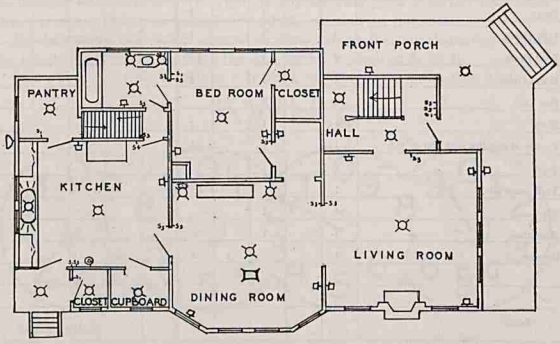
It is difficult to say how much wiring the farm will cost as it is affected by factors such as the type of construction of the building, and how elaborately and completely the system is planned. Every farm should be estimated by exactly what is to be installed.

Generally the price on an outlet basis will vary in the State from $2.50 to $3.50. Some of the small farm homes in the State can be satisfactorily wired for as little as $40 or $45. Other farms will cost $75 to $175.

In wiring a home a cost of two to three percent of the value of the house is a fair consideration.

In order to get a good wiring installation, it is advisable to study floor plans of typical installations. A typical floor plan is shown at the bottom of this page. After floor plans have been studied check over the Typical Installation table on page 14. Then plan the wiring of your home and fill out the Installation Desired column, found on the right-hand side of the wiring analysis sheet. Then you are ready to talk to the electrical contractor.

PLANS FOR LIGHTS, SWITCHES, AND WALL OUTLETS



⊙1	Special Outlet for Electric Range	⊢	Floor Receptacle Outlet
S1	Single Pole Switch Outlet	⊙	Ceiling Light
S3	Three Way Switch Outlet	⊙	Bracket Light
S4	Four Way Switch Outlet	⊣	Wall Receptacle

WIRING ANALYSIS SHEET

TYPICAL INSTALLATION	INSTALLATION DESIRED
Service Entrance: Cable-3 wires, No. 6	Service Entrance:
Switch-60 Amp.	Switch Amp.
Range Circuit: 3 wires, No. 6	Range Circuit:

	Typical Installation					Installation Desired				
			Switches					Switches		
	Ceiling Outlets	Bracket Outlets	Single	3 Way	*Convenience Outlets	Ceiling Outlets	Bracket Outlets	Single	3 Way	Convenience Outlets
Front Porch	1	or 2	1		1					
Back Porch	1		1		1					
First Floor Hall	1			1	1					
Living Room	1	2		2	4					
Dining Room	1	2		2	2					
Kitchen	1	1		2	3					
Second Floor Hall	1			1	1					
Bath Room	1	or 2	1		1					
Bedrooms (Each)	1		1		2					
Closets	1		1							
Attic	1		1							
Cellar	2		1		1					
Laundry	1		1		1					
Pump House	1		1							
Barn	1		1		1 P					
Dairy			1		1					
Milk House	1		1		1					
Feed Room	1		1		1 P					
Horse Stable			1		1					
Hay Loft	1		1							
Shop	1 or 2		1		1					
Poultry House (for each 100 sq. ft.)	1		1		1					
Yard	1			1						
Yard - near silo	1				1 P					
Silo	1		1							
Woodshed	1		1							
Garage	1			1	1					
Total										

* The letter "P" in this column indicates a 230 volt power outlet.

House wiring to be: Armored Cable.....Non-metallic.....

Branch circuits for house:.....Of No. 14 Wire.....Of No. 12 Wire

Water pump circuit to end at..... Wire Size.....

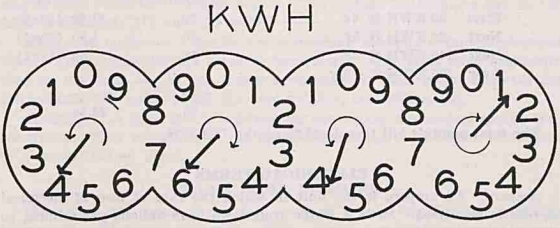
Yard light; one switch at house, one switch at.....

Four-point switches at.....

READING A METER

Can you get a reading of 3641 from the following dial?

NOTE: The first and third pointers move in a counter-clockwise direction, whereas those on dials two and four move in clockwise direction. This is for mechanical reasons. Note the arrows.



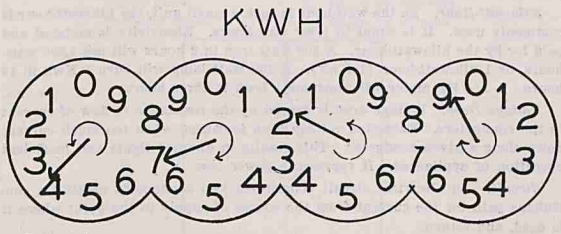
The best way to read a meter is to read each dial separately, beginning with the one on the right. In determining the above reading look at the right hand pointer—it has passed 1, but has not yet reached 2; therefore put down 1.

The next pointer to the left, moving in the opposite direction has passed 4, but has not yet reached 5,—then put down 4. Similarly, the other two dials are read as 6 and 3, respectively, giving a complete reading of 3641 kilowatt hours.

In case a pointer is right at a number you must look at the next dial at the right to know whether to read that number or the next lower one. When the pointer on this dial at the right is approaching zero, read the next lower number; when it has passed zero, read the number in question.

To determine how much current is used during the month read the meter the second month and subtract the first month's reading from it.

You should be able to obtain a reading of 3719 KWH from this dial:



Subtracting—

3719	KWH	2nd month
3641	KWH	1st month
78	KWH	used during month.

To Calculate Monthly Bill

The bill for the 78 KWH will vary according to the rates in any given vicinity. A calculation using the following rate schedule will serve as an example.

A *sample* rate schedule:

		Amount Used	*Cost*
First	30 KWH @ 6¢	30	$1.80 (30x6)
Next	30 KWH @ 5¢	30	1.50 (30x5)
Next	140 KWH @ 3¢	18	.54 (18x3)
Over	200 KWH @ 1¾¢		
		78	$3.84

The total month's bill then is $4.29 on the 78 KWH.

ELECTRICAL TERMS

Ampere. An ampere is the unit in which the rate of flow of electrical *current* is measured. As in a water system we have gallons per minute, so in an electrical system we have amperes (so many units of current per minute.) The capacity of fuses, switches, and wires are expressed in amperes—15 amperes, 60 amperes, etc.

Volt. A volt is a unit in measuring the electrical pressure causing the current to flow. In a water system the pressure produced by the pump, in pounds per square inch, corresponds to the pressure in an electrical system, measured in volts.

Watt. The watt is a unit of measure for electrical power. It is the product of the volts times the amperes: one ampere flowing at one volt pressure is one watt of power. An electric iron at 110 volts using 5 amperes will require 550 watts ($110 \times 5 = 550$).

Watt-Hour. The watt-hour is a unit of measure for electrical energy. It is equivalent to one watt being used for one hour. A 50 watt lamp burning for 4 hours consumes 200 watt-hours; a 500 watt iron used for 2 hours uses 1,000 watt-hours.

Kilowatt-Hour. As the watt-hour is such a small unit, the kilowatt-hour is commonly used. It is equal to 1,000 watt-hours. Electricity is metered and paid for by the kilowatt-hour. A 500 watt iron in 2 hours will use 1,000 watt-hours, or 1 kilowatt-hour (1 Kwh). A 100 watt lamp will burn 1 Kwh in 10 hours. A 1/4 HP motor will consume 1 Kwh in three hours.

Voltage Drop. Voltage drop is caused by the resistance to flow of current in the conductors. Excessive voltage drop is caused when too much current flows along a given conductor. This results in dimmed lights and inefficient operation of appliances. It represents power loss.

Circuit. An electrical circuit consists of two conductors making a continuous path for the current from the source of supply to the point where it is used, and return.

Switch. A switch is a device for "turning on" and "turning off" a circuit.

3-Way Switch. A 3-way switch is a switch for controlling a light from two points—as at the bottom and top of the stairs, or at the porch and the garage. A 3-wire circuit is necessary for its operation.

Thermostat. A thermostat is a switch device for automatically "cutting on" and "cutting off" the current to protect heating appliances from overheating, and to maintain definite temperatures where desired. It is found on automatic irons, electric stoves, electric brooders, and some motors.

Transformer. A transformer is a device to change the voltage on the "high line" to a voltage suitable for use in the home. The high line voltage may be 2300 volts, 4400 volts or higher. The voltage in the home and on the farm is generally 115 and 230 volts.

Motor. A motor is a device for converting electricity into mechanical work. Their capacities are rated in horsepower. The sizes most commonly used on the farm are ¼, ½, 3, and 5 horsepower. The motor operates the refrigerator, the water pump, the feed grinder, the milker, etc.

Generator. A generator is a device for converting mechanical energy into electricity. They are found at the power plants, and on the farm sometimes in a home-lighting plant.

FARM HOME LIGHTING

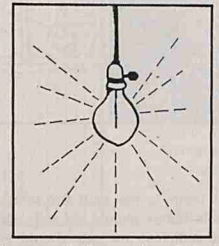
Electricity has made it possible to have a safe, steady, and sufficient amount of light for all types of seeing. Every homemaker should be conscious of the fact that the proper kind and amount of light is essential for seeing. Through ignorance one can abuse the eyes. According to its use, light may be helpful or harmful. Bad lighting impairs the vision. Poor seeing affects both the mental and physical health. All activities that require close seeing, such as reading and sewing, require the proper kind as well as the proper amount of light.

Light that has an unpleasant sensation:

1. Injures the eye.
2. Increases fatigue.
3. Effects the nervous system.
4. Distracts attention.
5. Lowers speed at which the eye operates.

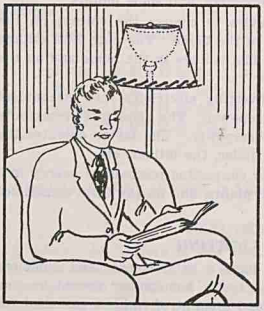
One of the chief enemies of good lighting is glare. Four types of glare most prevalent in homes are:

1. Direct glare.
2. Reflected glare.
3. Glare by contrast.
4. Glare by volume.



Direct glare comes from unshaded or insufficiently shaded lamps which shine directly in the eyes. The common practice of using bare lamps is bad.

Light from a bare lamp is never an aid to vision. The discomfort and ugliness caused by unshaded lamps are very apparent.

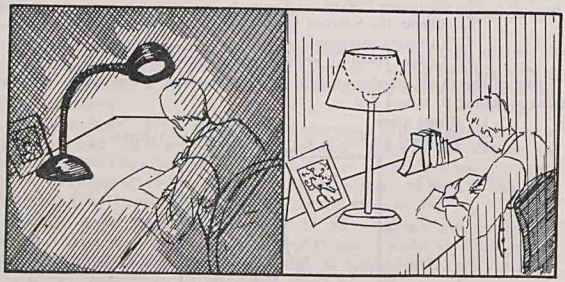


Good

Poor

When an undiffused light falls on a bright and glossy surface and is reflected into the eye, the reaction is identical with that of direct glare.

Glare by contrast is caused by high intensity against dark backgrounds.



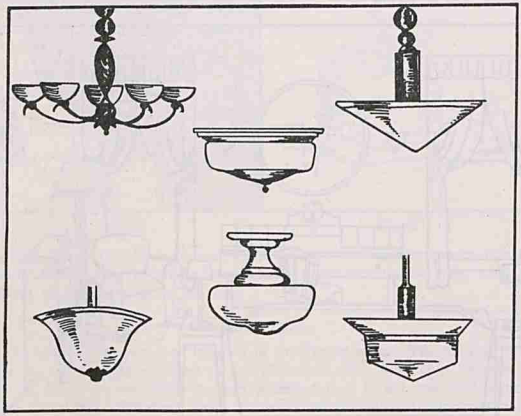
Poor

Good

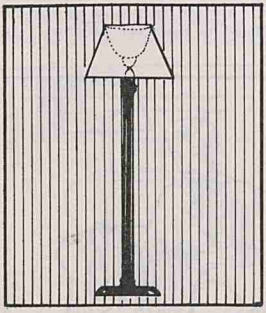
An unshaded electric lamp is too brilliant to look at comfortably. All light fixtures and portable lamps should be well shaded to eliminate glare and shadows. Lamps of sufficient wattage should be used so that there is enough light for one to see clearly without eye strain.

Types of Fixtures Suitable For The Farm Home

Fixtures of bare bulbs have no place in the well lighted home. Utility and beauty should be the guides in selecting light fixtures. In selecting a



fixture, it is wise to consider the type of illumination resulting from it, whether it is easy to keep clean and whether it harmonizes with the furnishing of the room.

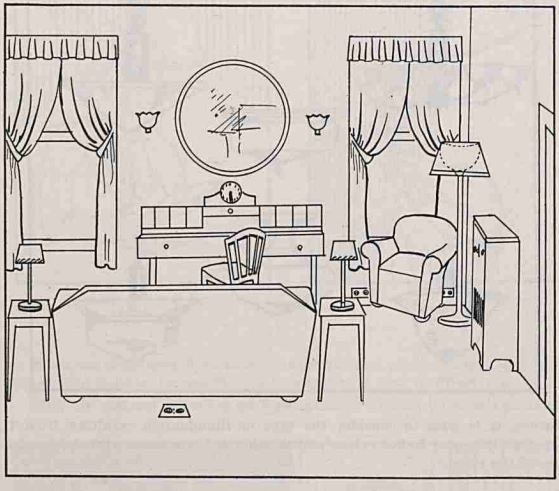


Portable lamps should be used for activities that require close seeing. These lamps should be chosen first for seeing and second for decoration. The characteristics of good portable lamps are:

1. Sufficient height and shade size to cast light over large area.
2. Shade linings of white.
3. Open top shades.
4. Lamp bulb enclosed in light-diffusing glass bowls hidden under the shade.
5. Lamp bulbs of sufficient wattage.

Living Room

A center light is not absolutely necessary, but it is the most satisfactory method of obtaining general illumination. There are several types of fixtures used in the living room. The semi-indirect fixture is very satisfactory.



Bracket lights supply decorative effect. A great many must be used for general illumination. They make it difficult to rearrange furniture. All bracket lamps should be shaded.

Wrong Right

WRONG RIGHT

Floor lamps and table lamps should be used for supplementary lighting. Comfortable places for music, reading, and sewing with the right kind and amount of light should be provided.

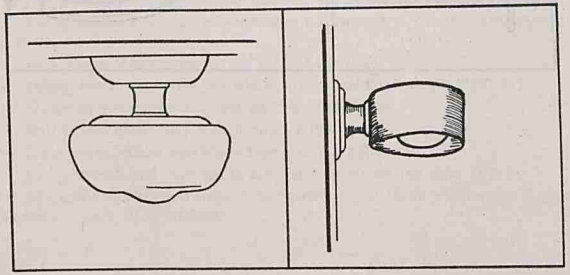
Dining Room

The table is the center of interest in the dining room. The fixtures which have the lamp bulbs enclosed in a translucent glass bowl that permits the light to shine on the table is very satisfactory. If fixtures with exposed lamps have been installed, these bulbs should be shaded with parchment shades to eliminate glare.

In many farm homes the dining room is used as a living room. Convenience outlets should be installed so that portable lamps may be used to supply adequate light for sewing, reading, studying, etc.

Kitchen

The kitchen, the work-shop of the home, should have good lighting provided for all activities that take place in it. The moderate size kitchen may



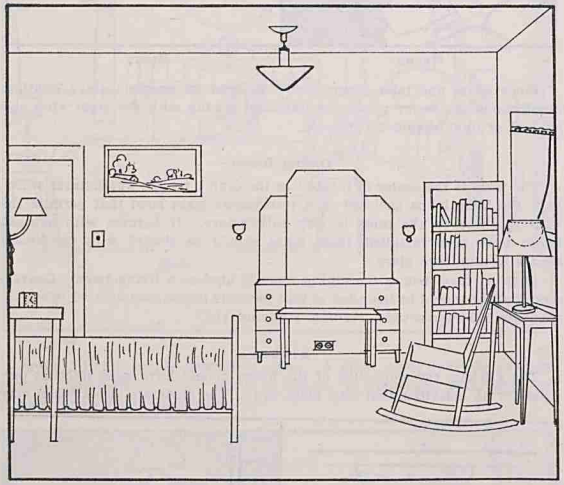
be illuminated by the use of 100 watt lamp enclosed in a white glass bowl hung close to the ceiling. Supplementary lighting is always desirable over

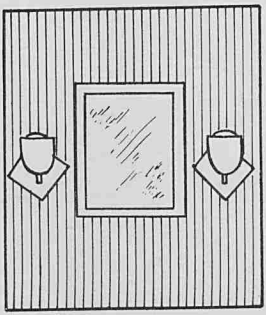
the various work units. Glass-shaded brackets with 60-watt lamps are recommended.

Bedroom

The well lighted bedroom requires general illumination supplemented by illumination at the bed and dressing table. A ceiling fixture of the indirect type or a single globe fixture is recommended.

If the light at the bed is to be used for reading, it should be slightly to one side and just above the head of the person sitting up in a good reading position. The shade should be wide enough to throw the light on the book.





The lights at the mirror may be provided from either wall brackets or from a pair of lamps placed on the dressing table. The lamps should be so placed that the light will fall on the person in front of the mirror.

Bathroom

In the moderate size bathroom, sufficient illumination may be supplied by an upright bracket lamp on each side of the mirror. These should be 60 to 66 inches from the floor so that the mirror will be well lighted. The large bathroom should be equipped with a ceiling enclosed globe.

Hall and Porches

In the halls ceiling fixtures are suitable. Stairways should be provided with enough light for safety. Adequate light for the porch may be provided by a single light over the door or two bracket lights. These lights should be so located that both the approach to the door and the person approaching are visible.

Daylight

A home should have an adequate number of windows to furnish the needed daylight.

From 15% to 20% of the total light available through windows may be absorbed by dirt on the glass. If a window is very dirty, as high as 50% may be absorbed. *Keep windows CLEAN.*

Use of shades and draperies influence the amount of daylight available in a room.

Dark green shades may cut off 98% of the light.

Smoky screens covering the whole window may reduce the light 50%.

Shades and draperies may cut off 75% of the light.

Half drawn shade may cut off 60% of the light.

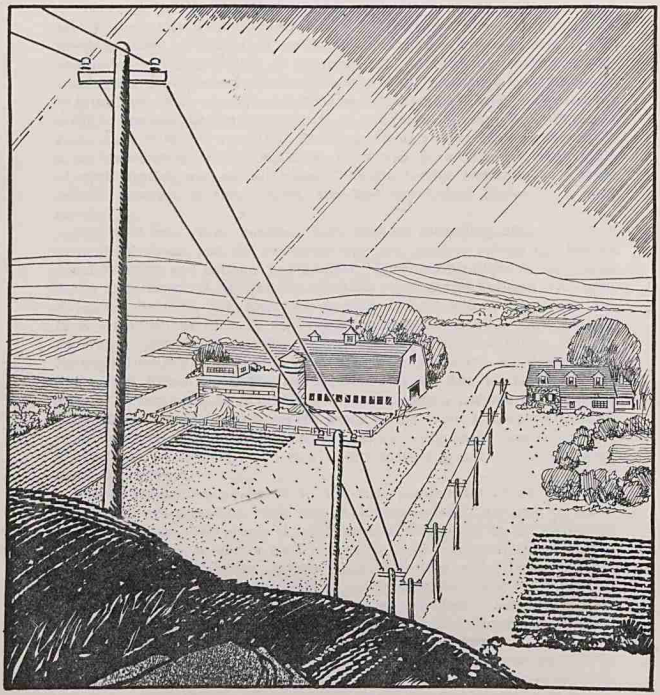
Light green shades may cut off 80% of the light.

Heavy drapes and curtains in a room may reduce the light 75%.

Daylight available in a room is increased by: 1. Clean windows; 2. Light shades; 3. Very light material.

April, 1937 Extension Circular No. 213

Using Electricity on North Carolina Farms



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U. S. DEPARTMENT OF AGRICULTURE, CO-OPERATING
N. C. AGRICULTURAL EXTENSION SERVICE
I. O. SCHAUB, DIRECTOR
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RALEIGH

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Using Electricity On North Carolina Farms

By
David S. Weaver,
Extension Agricultural Engineer,
N. C. State College, Raleigh, N. C.

The past two decades have seen the use of electricity applied to practically every city dweller, regardless of his income. The concentration of great numbers of people in cities, the mechanical improvements in the production and distribution of electricity, the perfection of equipment for its use, and the increased purchasing power of the consumers have all tended to bring this about. During this same period, there have been some attempts made to increase the use of electricity on our farms, but no united effort was made until relatively recently. Previous attempts were confined largely to areas immediately surrounding cities, but a wide-spread, truly rural program of electrification was not attempted. Certain foreign countries have made notable progress in this respect, and lead the United States by a wide margin.

The past two years, however, have seen an altogether different attack upon the problem, and the movement for rural electric service has become definite, active, and national in character. Such organizations as the United States Department of Agriculture, the State Agricultural Colleges with their Extension Services, the American Society of Agricultural Engineers, the farm organizations such as the National Grange, American Farm Bureau Federation, and others, together with the Edison Electric Institute, and the National Electrical Equipment Manufacturers Association are coöperating. The recent formation of the Rural Electrification Administration by the Federal Government, an organization with the single purpose of promoting rural electrification in all unserved areas of the country, coöperating with the above named organizations, has done more in the short time it has been in existence to accelerate the rural electrification program than all other agencies combined.

Power companies, awakened to the vast possibilities of an electrified agriculture, are extending lines into territories formerly unsuited to profitable distribution. The people of rural America, stimulated by the knowledge that it is possible to secure electric service, have increased their demands to a point which will make possible many extensions which formerly could not have been made. Reduced costs of construction have also increased this possibility. All agencies working together may produce a network of lines throughout the farm areas, enabling thousands upon thousands of rural people to enjoy the many benefits which electricity can bring.

In North Carolina, the Rural Electrification Authority at Raleigh is attempting to promote the electrification of the rural areas by coordinating the efforts of all existing agencies. The North Carolina Agricultural Extension Service through its departments of Home Economics and Agricultural Engineering is conducting an extensive educational movement. County Agents and Home Demonstration Agents in the majority of the counties have taken active parts in instructing their people in the possibilities of electric service for rural homes and farm operation. In both the home and on the farm, the introduction of electric service will mean a lessening of back-breaking drudgery, so often a part of farm life.

While there are many ways in which the city dweller uses electricity, there are literally hundreds of uses which can be made of it in the farm home and on the farm. Briefly, electricity can be used in three principal ways: (1) as a source of light, (2) as a source of power, and (3) as a source of heat. When one considers the many applications of these three factors in rural life, one can readily see the desirability of having a versatile servant which can produce light, power, and heat at the throw of a switch, without noise, odor, or waste of any kind.

As a source of light, electricity illuminates the home, barn, garage, poultry houses, hog houses, other buildings, and the farm yard. Rural schools, community halls, and churches become more efficient in building a finer social and spiritual life when lighted adequately by electricity. Radios, moving pictures, lighted out-door recreational centers are all possible in the country when electricity is available.

As a source of power, electricity can render great service in the pumping of water; operating refrigerators, cream separators, churns, grindstones, wood saws, washing machines, etc. Electrically operated milking machines and milk coolers are revolutionizing the dairy industry. Wherever human muscles or animal power are doing work which can be done by an electric motor, a change to electricity as a source of power will usually be found profitable. Electric ranges, water heaters, incubators, brooders, toasters, irons, percolators make use of electricity as a source of heat.

A recent report of the North Carolina Rural Electrification Authority indicates that some 30,500 rural customers are now using or soon will be using electric service. This is in addition to the number who have made use of electricity prior to June, 1935. This is just a beginning, however, and before a decade has passed, there apparently is little doubt but that this number will be increased indefinitely. It is for this great group of North Carolina farmers that this bulletin is prepared. It should also prove interesting and useful to those who have been receiving service for some time, because the invention and perfection of numerous electrically operated devices have opened a wide field in their use for improving farm living conditions.

Electric service in any home means more than mere comfort and convenience. It means the conservation of human energy and the preservation of precious eyesight. It means the saving of time and labor, conservation of food products, and an improvement in the health of the family. In a large measure, it means a banishing of drudgery and fatigue, permitting the farm family to enjoy the leisure which is rightfully theirs. Electricity is useless without the means of converting it into light, power and heat, and the farm family, which has recently been privileged to secure electric service would do well to give careful thought to the equipment they should provide themselves with, in order to make maximum use of this versatile servant. This bulletin deals largely with brief summaries of the devices which have been perfected, and are proving to be of value, in performing profitable functions in the farm home and on the farm.

WIRING

The first problem in connection with the use of electricity is that connected with a system of safe and adequate wiring. Unsafe wiring constitutes a dangerous hazard, both from the standpoint of fire and injury to people or

livestock. Inadequate wiring constitutes a handicap in the proper and profitable use of electric service. It is practically universally true that in the past, the wiring of most homes has later proved inadequate. The natural increase in the use of appliances soon taxes the capacity of the wiring system. It is very much more economical to wire a home adequately than it is to begin with an inadequate system with the idea of adding to it later. Adequate wiring costs little more than inadequate wiring if done right the first time.

Reliable wiring contractors should always be employed in the wiring of the farm home and the farm. These people are experienced in this work, and with the help of the members of the family, can economically plan a system which will take care of present as well as future needs. Adequate wiring consists of securing proper size entrance switches, fuses, and wire. A farmer is not qualified to pass upon this matter, and the services of a trained expert are essential. For convenience, the location of the switches, outlets, light fixtures, etc., should be determined by people who have had experience with the use of electricity. It is not reasonable to assume that an inexperienced farm family knows exactly where each outlet should be placed. It is reasonable to assume that a contractor who has wired hundreds of homes will be able to pass on to the new user his many experiences in providing this service for others. The farm family should be certain, however, that the contractor, in an effort to put in a low bid, is not omitting outlets which are needed for the probable equipment to be purchased later.

In the matter of safety, the new user of electricity has no other alternative but to employ the services of a reliable trained wiring contractor. One cannot take chances on an inferior job when the maiming or killing of a person or valuable livestock may result from the inferior work done by a novice or unscrupulous person. It is hoped that an adequate inspection system will be required on the part of rural installations such as is now a compulsory part of city systems. The few dollars necessary for an inspection service would be more than offset by the knowledge that the system is safe from the standpoint of the reduction of fire hazards and electrical shock.*

USING ELECTRICITY AS A SOURCE OF LIGHT, POWER AND HEAT

Electricity for the production of light, power, and heat in the home must be used through various appliances. In order to give some idea as to the number and variety of appliances now in common use the following partial list is included:

Range	Refrigerator
Water Heater	Water Pump
Hair Curler	Fan
Emersion Heater	Food Mixer
Percolator	Vacuum Cleaner
Heating Pad	Washing Machine
Waffle Iron	Sewing Machine
Iron	Kitchen Ventilating Fan
Mangle	Radio
Toaster	Doorbell Transformer

*Note: A bulletin on safe and adequate wiring may be obtained by writing Extension Agricultural Engineer, State College, Raleigh, N. C.

The first column contains appliances which employ electricity as a source of heat. The second column, with the exception of the last two items, employ electricity as a source of power.

With the present price of electricity, a farmer can well afford to substitute this for other forms of power in his farm work. As a source of power it cannot be surpassed in reliability, safety, ease of starting and stopping, noiselessness, freedom from dirt, and space requirement. From the standpoint of automatic control it has no equal. One example of this very desirable feature of electric power is demonstrated by the automatic water pump. With a pressure gauge operating a switch, the pressure can be maintained at practically a constant figure. This feature means that personal attention is very seldom necessary, and then only to make slight adjustments. Many other uses for the automatic starting and stopping feature are to be found in farm work. Farm power machines are driven by motors ranging from fractional horsepower up to 10 HP size. As a rule, the 5-HP motor is the largest which is practical to operate on average farms and with average electrification distribution systems.

The following is a partial list of operations for which electrical farm equipment may be obtained. It is given here in order to show a few of the many uses to which electricity can be put in every day farm practices.

Baling Hay	Irrigating
Brooding Chicks	Cooling Milk
Churning Butter	Operating Forge
Cleaning Grain	Operating Milking Machine
Elevating Grain	Operating Water Pump
Farm Yard Lighting	Refrigerating Dairy Products
Filling Silo	Sawing Wood
Grading Fruit	Separating Cream
Grinding Feed	Shearing Sheep
Grinding Tools	Shelling Corn
Heating Soil	Spraying
Heating Water for Dairy	Sterilizing Dairy Utensils
Hoisting Hay	Sterilizing Soil
Husking and Shredding Corn	Testing Seed Corn
Incubating	Threshing

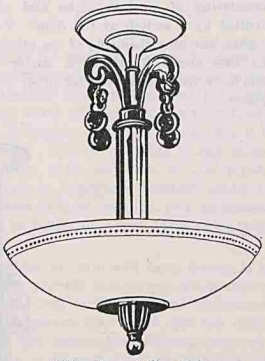
Before discussing these various uses to which electricity can be put in farm homes and on the farms, it is well to understand something about the way in which electricity is sold. Each farmstead is equipped with a meter through which all the electricity must pass. This meter records the amount of electricity which goes through it in terms of kilowatt-hours (abbreviated KWH). This is a technical term and represents the unit by which electricity is sold, just as cotton is sold by the pound, milk by the quart, and corn by the bushel. The meter records the kilowatt hours used and by reading the meter at stated intervals the bills are figured. Practically all power companies sell current in blocks at graduated prices, the price per unit being reduced as more current is consumed. This means that wherever practical more electricity should be used as the decreasing cost of the greater number of units, means that the average cost per unit will be reduced. In discussing the cost of operating any piece of equipment, we talk in terms of average cost. This does not necessarily mean that a piece of equipment that an

individual farmer would install would use exactly the same amount of current as one which is neighbor would install or as the average. Both high and low operating costs are included in the average cost, and as in the operation of all machinery, efficient use means reduced costs, whereas careless operation will increase cost. Just as a man can operate and care for his automobile in the correct manner and thus reduce his cost per mile of travel as compared to careless operation and maintenance, so can a farmer by following very simple precautions reduce the cost of operating electrically-driven equipment.

The following are brief descriptions of some of the more common uses to which electricity can be put in the farm home and farm. More detailed explanations of the appliances may be obtained by writing the Rural Electrification Administration, Washington, D. C., or your local power company, for bulletins.

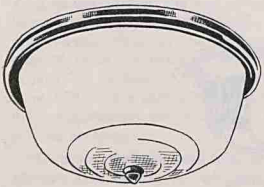
LIGHTING THE HOME

Ordinarily the first use of electricity will be for lighting purposes. People use their eyes at night incomparably more than they did 50 years ago. The use of improper and insufficient light is responsible not only for permanently impaired eyes in tens of thousands of cases, but also for nervousness and other diseases that result from continued eye-strain. All lamp bulbs in the direct field of view should be shielded with shades made of glass, silk, or parchment. Exposed lamp bulbs are a source of annoying glare which is a hindrance to good seeing.



Living Room Ceiling Light

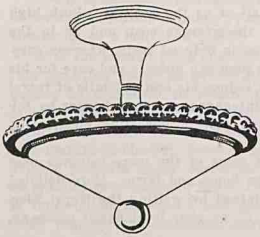
Some light throughout the whole room is advisable in addition to the light provided by individual local lamps in order to eliminate the unpleasant effect of pools of light in otherwise dark surroundings. Properly designed portable lamps which will provide comfortable seeing should be available for reading or other work demanding close, visual application.*



Kitchen Ceiling Light

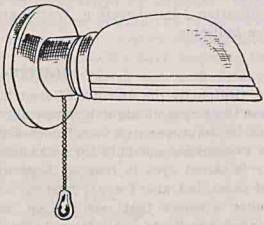
Kitchen. The kitchen is one of the most important places on the farm. The center ceiling fixture should consist of a glass globe equipped with a 100- or 150-watt bulb.

*A bulletin on Farm Home Lighting may be obtained by writing Home Management Specialist, Agricultural Extension Service, Raleigh, N. C.



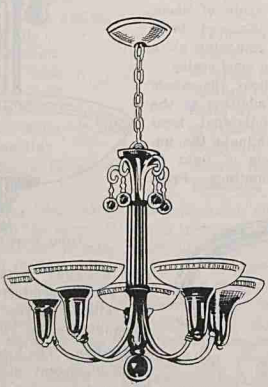
Bedroom Ceiling Light

Bedroom. The bedroom should be illuminated by a center ceiling fixture, preferably of the type which uses only one bulb. Attractive and inexpensive fixtures are on the market today for translucent and colorful glass bowls which fit very nicely in the bedroom. Side lights on either side of the mirror of the dressing table or dresser are very helpful and a bed lamp is also desirable.



Bathroom Wall Light

Bathroom. The bathroom should be illuminated by a ceiling fixture consisting of a glass globe and controlled by a switch at the door. Two lights, one on either side of the mirror, or one above it, make it easier to shave or use the mirror for other purposes.

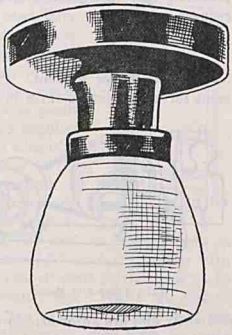


Dining Room Ceiling Light

Dining room. The dining room should be lighted by a central fixture usually dropped low from the ceiling. Additional side lights may be placed on the walls on either side of the buffet or other pieces of furniture.

Halls, stairways and closets. Light should be provided in all halls, stairways, and closets and controlled by conveniently located switches. Lights on stairways should be carefully planned so that no dark shadows are cast on the stairs which might cause an accident.

Light in the basement, attic, and on porches is essential and adds much to the convenience and safety of traveling through these places after dark.



Hall Ceiling Light

LIGHTING FARM BUILDINGS

There is no doubt but that farm chores and farm work can be done with a considerable saving of time when properly illuminated by electric lights as compared to a lantern or other more feeble lights. Good lighting makes chores easier and more than that, increases the safety as far as fire hazards are concerned. The use of lanterns and kerosene lamps about the farm has long been a source of fire risk and the safety alone makes electricity well worth its cost. With thousands of dollars worth of livestock, equipment, and stored feed in the modern farm barn, it is foolish to risk its loss by fire if it is at all possible to have electric light there. The use of lights in hay mows, hay chutes, silo chutes, alley-ways, between dark buildings, etc., is recommended, as many accidents can occur due to conditions brought about by darkness. The use of light about the farm reduces stealing to a minimum. An adequate yard or flood light should be found on every farm using electricity.

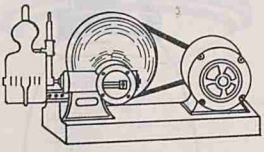
The most common fault found in lighting of farm and farm homes is in that the bulbs are not of sufficient size to provide the correct illumination. The cost of illumination is made up of the cost of the bulb and the cost of operating it. A mistaken impression is common that bulbs cost too much. As a matter of fact, the cost of bulbs is very reasonable. Fifteen cents will buy a bulb of 15-watt size, 25-watt, 40-watt, or 60-watt size. Seventy-five-watt and 100-watt sizes may be purchased for 20 cents, while 150-watt bulbs cost only 25 cents. A common occurrence is that bulbs are not replaced when broken. It is best to buy bulbs in small quantities, rather than one at a time, and keep a supply of each of the common sizes on hand so that immediate replacement can be made. Failure to replace a bulb often results in serious accident.

Lighting fixtures need not be expensive. Very attractive and highly efficient fixtures may be purchased for a very reasonable amount. Efficiency of operation is more important than expensive shades and trimmings. Chandeliers and sidewall bracket lights should be of simple design with efficient shades. Any local distributor of this type of equipment can discuss this matter with prospective purchasers. The larger manufacturers have

prepared very instructive literature on this subject which is available upon request.

HOUSEHOLD APPLIANCES

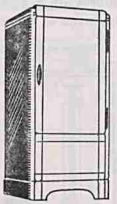
Electric Water System. Probably the first important piece of equipment for an electrified farm is a water pump. Water is so important in the daily life of the farm family that its abundant use makes life far more attractive. For household use only, an automatic electric water pump of sufficient capacity to care for the family's need may be obtained at a very low cost. These pumps have long passed the experimental stage and are practical, economical pieces of equipment for any farmer, with access to electricity, to install. They operate economically and efficiently and are automatic in that they require practically no attention, but will maintain almost any desired pressure. In ordering a pumping unit, certain conditions must be known. Your local dealer should be made acquainted with the various factors affecting water pumping and piping, such as depth of well, distances water is to be pumped, etc. Pumps of almost any desired capacity can be purchased and the cost of operating them is surprisingly small. The average shallow well pump supplying water to an average family requires only about five KWH per month whereas a larger pump supplying water to livestock may use from 20 to 30 KWH per month. It must be remembered, of course, that the conditions on each farm will vary and cause these figures to vary also. If gasoline or wind-mill-operated pumps are already on the farm, it is possible to convert them to electricity operated pumps at very small expense. With electricity available, a man who attempts to use his muscles to pump water is even more foolish than one who would attempt to compete with a horse in plowing. A small one-quarter HP motor operating at very low expense can easily demonstrate that man is very inefficient as a water pumper. It has been shown from time to time that 2 KWH of current can pump one thousand gallons of water. At 5¢ a KWH a man must be willing to pump 100 gallons of water for 1¢.



Water Pump and Motor

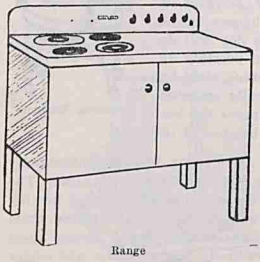
It is needless in this bulletin to go into detail regarding the desirability of an abundant supply of water, but one recalls that with water under pressure a farm home can have every sanitary convenience that any city home enjoys; namely, running water in the kitchen, in the basement, in the bathroom for lavatory, bath tub, and inside toilet, and then it is possible to have water-borne sewage, which is the kind recommended by all progressive boards of health. Running water means that a practical, efficient, septic tank system can be installed to remove household sewage. Absolute safety is assured when installations are properly made. Water under pressure is the first requirement, and this can be readily met at very low cost by pumping water with an electric pump.

Refrigerator. It has been stated that more than 40% of all the homes in America which have electric service are using electric refrigerators. Truly, this is a magnificent step forward in improving the standard of living,


Refrigerator

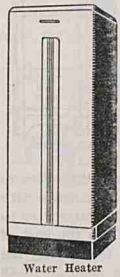
because no other form of farm refrigeration is so efficient and so dependable as that operated by electricity. An electric refrigerator not only preserves food and food-products and protects the health of the family, but it makes possible also a very much greater variety of palatable food. Furthermore, it simplifies and makes easier the task of the housewife in preparing wholesome meals for her family. The ability to purchase large supplies and keep them in the refrigerator as well as to adequately preserve left-overs means considerable savings in the family budget. On the farm where small amounts of dairy products and eggs, as well as some meat, are produced and sold, adequate refrigeration is an absolute necessity. The tendency has been, both with city and rural purchasers to buy too small a refrigerator. A frank discussion of your family needs with the merchandising concern should reveal the proper sized refrigerator to be purchased. It is false economy to use too small a box. While the cost of operating refrigerators will necessarily vary due to size of family and the various other factors involved in the cost, the average runs from 30 to 50 KWH per month. Compared to the actual delivered price of retail ice, this is indeed very reasonable. When the convenience and freedom from worry with electrical refrigeration is considered, there is no comparison between it and other types of refrigerators now offered for sale.

Electric Range. The preparation of 1,095 meals per year is probably the most important part of a housewife's many duties. Every possible assistance should be given her for this work and there is no appliance, either electrical or otherwise, which will tend to lessen the actual drudgery in connection with the preparation of meals that could possibly compare with a modern electric range. Undoubtedly, there is more genuine satisfaction in the preparation of wholesome, well-cooked meals than in any other work which the housewife does. A modern, electric range with its many conveniences will add hours of leisure time to her schedule. Its cleanliness, its convenience, its saving in time, labor, and worry make it worth all that it costs and more. There is no carrying of fuel and ashes, with the consequent untidiness which always follows. With the automatic features, the housewife may prepare the meal, place it on or in the range, set the correct temperature, and proceed with other duties without further worry over the satisfactory cooking of the food. With electricity reduced to its present cost, electric ranges can be operated at surprisingly low expense. An average family should be able to do the entire cooking for the month at from $3.00 to $3.25. Spending so small a sum as approximately a dime a day certainly cannot be longer considered an extravagance, when all the factors are considered. Another element which plays a part in the consideration of a range is the gradual reduction in the wood


Range

supply on a good many farms. This is particularly true in the tobacco raising area of the State where wood for the curing of tobacco is at a premium.

Electric Water Heater. One of the last, but by no means the least, electric appliance to be developed for home use is the electric water heater. With its automatic cut-on and cut-off features, water can be maintained at almost any desired temperature for household use. The convenience of having a plenteous supply of hot water for kitchen work or scrubbing or washing clothes and for the use in the bath room is undoubtedly one of the greatest conveniences which can be found in a modern home. The new type heaters with their insulated jackets can maintain water with practically no loss of heat over long periods of time, and this enables an economy in water heating not heretofore possible.

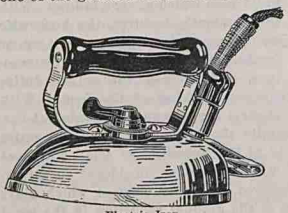


Water Heater

Washing Machine. Probably the phrase "Blue Monday" originally came from the feeling which most housewives had on Sunday realizing that the next day meant carrying water, bending over the wash tub, wringing the clothes, hanging them on the line, and removing them in preparation for ironing. If there is one task which is needlessly done by hand when electricity is available, it is that of washing the family weekly laundry. A washing machine is inexpensive, very efficient, and operates at a very low cost. A few cents worth of current per month is sufficient to do the family washing. Not only does the machine do a better job so far as cleanliness is concerned with the clothes, but it is actually easier on the clothes, removes fewer buttons, and the washing is done far more quickly than possible by hand. The biggest factor, however, is the saving in strength on the part of the housewife. A small motor operating for a few pennies a day will do more work than the strongest woman can possibly do in the same length of time. Starting the week right by doing the family washing with an electrically operated washing machine will certainly tend to improve the life and happiness of the farm family for the balance of the week.

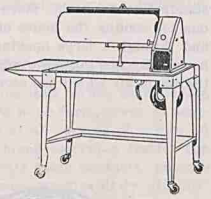
Washing Machine

Electric Iron and Ironing Machine. An electric iron is undoubtedly one of the greatest labor saving devices yet perfected for the housewife. The freedom from necessity of heating irons on the stove, carrying them to the ironing board, having them gradually become colder and colder until the quality of ironing is affected, and walking back to the stove for a hot iron is eliminated. Modern irons with temperature control, a convenient feature enabling delicate work of fine dresses to be handled properly as well as the rougher work quickly done, make an



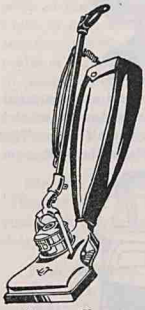
Electric Iron

electric iron almost an essential in modern housekeeping. Doing the weekly ironing with an electric mangle is still better. This is especially true with large families of children where bed linen, table linen, and other large pieces make a great task of the family laundry work. With an electric ironer the housewife can be seated and do a week's ironing in about one-half the time necessary if done by hand, and do it better, and, what is more important, with less fatigue.



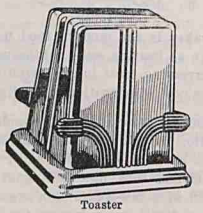
Electric Ironer, or Mangle

Vacuum Cleaner. The vacuum cleaner is another drudgery eliminator. Combining sweeping and cleaning in one operation, the rugs and carpets are quickly, effectively, and easily cleaned, and no dust is spread over the house, causing additional work as well as irritation to the people who must breathe the air. The vacuum cleaner is very reasonable in cost, requires very little current, and enables the housewife to do the work in a fraction of the time required for sweeping and dusting.



Vacuum Cleaner

Other Household Appliances. A group of electric appliances suitable for use at the family table is comprised of an electric toaster, electric percolator, and electric waffle iron. Each of these appliances uses relatively small amounts of current to perform an operation which is as well done at the table as in the kitchen, and enables the housewife to be at the table with her family instead of bending over a hot stove in the kitchen. Automatic features of these appliances insure excellent results and add to the convenience and feeling of efficiency

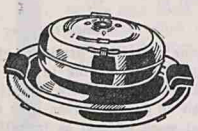


Toaster

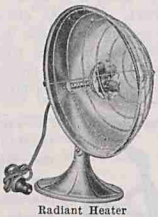
Percolator

which is so necessary to the modern housewife. An electric fan is an appliance which cannot be dispensed with if electricity is available. So many uses for it are found that it becomes a household necessity as soon as it has been tried out. Small fans for stirring the air in a room on a hot day and night of summer add much to the joy and comfort of living. A fan for removing the warm air from the kitchen or laundry is very desirable from the

standpoint of health. More lately there has been added to the list of fans one for cooling the house at night. Usually this fan is placed in the attic and through a large opening it draws the air from the lower parts of the house. By opening the windows, the cool night air can be drawn in to replace the warm air which has accumulated in the day time. Certainly a supply of

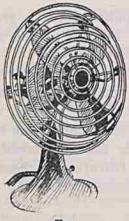


Waffle Iron



Radiant Heater

fresh cool air on hot summer nights is well worth the small cost required. Electric heaters for early morning dressing, or heating a bathroom, or sick room are very desirable and can be purchased at a very small cost. This is also true of an electric heating pad which is so desirable in the sick room.



Fan

Food Mixer

Still another convenience for the homemaker is the modern food mixer. It saves untold time and labor in such tasks as beating eggs, whipping cream, creaming potatoes, mixing cake batter, extracting fruit juices, grinding meat, and so on. The cost is reasonable, and the cost of operation is negligible.

The Radio. Perhaps no single invention has added so much to the enjoyment of the whole family as has radio. With electricity available every home should have a radio of some type or another. Modern, highly efficient sets, now selling at a small fraction of the cost of a few years ago, are available for home use. A radio is not a luxury for a farmer to own. Weather reports, crop reports, helpful information and instruction from such agencies as the U. S. Department of Agriculture and the State Agricultural Colleges are a few of the services which the radio brings in the way of profit-making ideas. From the standpoint of enjoyment of life, the fine programs

Radio

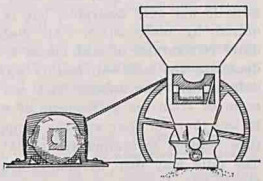
now common on all the broadcsting systems of America are as entertaining to the farm family as to city dwellers.

USES OF ELECTRICITY FOR FARM OPERATIONS

There are many forms of power used on American farms, each having certain advantages, but, speaking generally, there is no farm power so adaptable as electric power. It is the most versatile of all sources of power. A horse can be used to plow land, but it cannot brood chicks; a tractor can operate an ensilage cutter, but it cannot refrigerate dairy products; muscles of man's arm may separate cream, but they cannot sterilize dairy utensils; many other comparisons could be made showing the versatility of electricity. When one considers that electricity can, as a willing servant, readily begin work at the turn of a switch, and work silently with no dirt or waste, ready night or day, work with equal efficiency at small jobs or big ones, no maintenance or cost of upkeep except when at work, it has no competitor in the realm of farm use. The following are brief descriptions of some of the ways in which electricity can be put to work on the average farm in North Carolina, doing the jobs that are now being done by man's muscles or the muscles of animals or by gas engines or water power. The price of electricity is reduced by using large amounts of it, so there is relatively little excuse for having electricity available and not using it for every practical purpose.

Electric Equipment for the Dairy Farm. Beginning with the preparation of feed for the cattle and all the way through the dairy program, electricity can be used in the economical and efficient production of milk and dairy products.

Feed Grinders. There are many types of grinding machines on the market, nearly all of which can be operated by an electric motor. The automatic features of electricity often permit the farmer to fill a bin with various types of grain which he wants to grind, set the grinder to work, and an automatic switch will shut off the motor when the last bit of grain has been ground. Electricity is very efficient when operating a motor, and motors of all sizes are to be found on the most progressive farms of America today. In the dairy industry an enormous amount of feed must be ground for efficient feeding of high producing dairy cows. Bulletins regarding grinding methods and the feeding of ground grain are available from almost every agricultural college in the country.

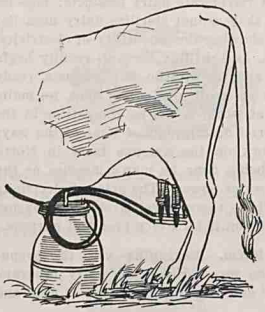


Feed Grinder

Hoisting Hay. Most dairy barns are provided with hay storage above the milking room, and the problem of hoisting the hay to the hay mow has always been a difficult one because of the enormous amount of labor involved. With an electric hay hoist this job has been reduced so that it requires only a fraction of the time and effort formerly needed. Convenient power outlets should be placed near the hay mow door so that quick motor connections

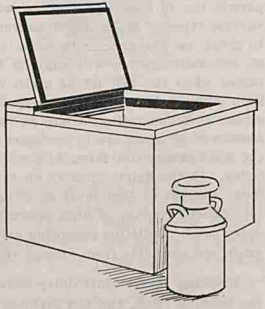
can be made. Baling hay, elevating grain, cleaning grain, and other feed preparation machinery may all be operated by means of an electric motor. The filling of the silo each year is a typical example of the use of an electric motor for heavy duty work on the farm. A portable 5-HP motor which can be transported readily about the farm will be found to be a necessity on a large dairy farm where there are so many jobs which can be efficiently done by a motor of this size.

Electric Milking Machine. The milking machine has come to play a large part in the production of high grade milk for the retail trade, and one operated by electricity is very efficient. The cost is low, the power is available at any time, at the throw of a switch, and the regularity of operation is not to be compared with any other type of power for a milking machine. Milking machines have reduced the drudgery of dairying to a great degree, and the most efficient and up-to-date dairies in the country are using milking machines. There are various types on the market, most of them very satisfactory, and by consulting your local dealer in such equipment, recommendations can be secured for an installation on your farm.



Milking Machine

Milk Coolers. For the production of Grade A Milk, rapid cooling or the removal of animal heat from the milk is not only desirable, but is required by most cities. An electric dairy refrigerator or milk cooler is undoubtedly the most satisfactory way of doing this. The animal heat can be removed from ten gallon-cans of milk in less than an hour and the temperature reduced to around 40° to 45° F. The milk may then be maintained at this low temperature until it is shipped or bottled.



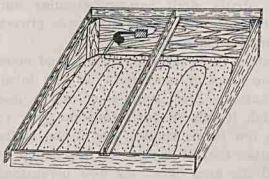
Milk Cooler

Dairying Sterilizers. A sterilizer for use with milk cans, milking pails, bottles, etc., is an essential in the production of high grade milk. A sterilizer operates efficiently and with the minimum of required labor at a time when labor is very rushed on the average dairy farm.

Dairy Water Heaters. The use of milking machines has emphasized the need of a device for quickly heating a small quantity of water at a time when labor is busy elsewhere. The electric dairy water heater is the best thing yet developed for this set of conditions. It can be secured in sizes ranging from three to ten gallons and the cost of operation, considering the convenience, is very, very, small.

Other Electrically Operated Dairy Equipment. A clipper for clipping the flanks and udders of the cows can be operated quickly and efficiently by means of an electric clipper. Electric fans in the dairy to remove foul air are very desirable, and reduce the bacterial count in the milk. Electric screens for killing flies about the dairy have proved their efficiency, and are recommended where the fly problem is a menace to the production of pure milk.

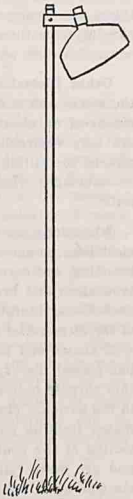
Electricity on the Poultry Farm. Second in importance to the use of electricity on the dairy farm, is its use on the poultry farm. The hatching, brooding, and care of baby chicks, is improved by using electricity. Electric incubators and brooders have long been known to progressive poultry producers, and literature on the better types is available universally. The use of the ultra violet ray lamp in the production of chicks in winter is becoming well known and has established its efficiency. The lighting of laying houses has passed the experimental stage and the economical use of electricity for this purpose is now being advocated by the most progressive poultry farmers in the nation. The small cost involved, compared to the increased production makes lighting poultry houses very practical. Burglar alarms for the protection of the poultryman against thieves are now coming into general use, and are quite reliable. In this connection, also may be found the use of electric water heaters to prevent freezing. The high water content of eggs means that hens have to consume an enormous amount of water and the egg production is curtailed definitely as they fail to drink plenty of water. Obviously, a hen cannot drink water covered by ice and a device for preventing the formation of ice and operated by electricity is almost an essential, if maximum egg production is to be maintained throughout the winter months. These are the months when eggs bring the highest price.



Soil Heating Cable

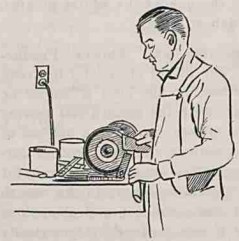
Vegetable and Flower Production. The use of electricity in green houses and in hot beds is spreading rapidly. With the modern *soil heating* cable, a farmer may have a hot bed of any convenient size and produce certain vegetables for his own use or for sale. This is no longer in the experimental stage, and a practical application of it may be found in practically every state in the union.

Other Uses of Electricity on the General Farm. The use of adequate yard lighting about the farm yard and the barn yard is very desirable. Lights mounted on poles and with the proper type of reflector should be placed so as to eliminate dark corners and adequately light a large area. The advantages of a lighted farm are many, chiefly those in connection with the reduction of thieving and accidents. Stock becoming loose at night can be easily seen and locked up. Convenience in going from one building to another after dark as well as safety, is to be considered when electricity is installed. The few cents per month necessary to operate lights of this type are repaid an hundred fold. Wood sawing with an electric motor is a pleasure compared to other types of power drive. Its convenience in starting and stopping and the steady power with which it drives the saw reduces the drudgery of this necessary job to a minimum. Shearing sheep with electric clippers is still another use for electricity. Electricity may also be used for the operation of seed corn testers, certain spray rigs, pumping water for irrigation, grading fruit, separating cream and churning butter.



Barnyard Floodlight

Electricity in the Farm Shop. Every modern farm should have a place where the farmer can repair his equipment and build new devices. A farm shop, warm and dry for winter and rainy weather use, and equipped with electric motor-driven tools provides an incentive for better work. With the increasing complexity of farm machines, it is necessary for farmers to have tools for repairing them close at hand. The gradual removal of the village blacksmith shop from the agricultural picture means that a farmer must either do his own repairing or carry it a long distance to a city mechanic. If parts are ordered in time and bad weather periods are taken to repair the machines, very efficient work can be expected of them. Electric motors for operating grindstones, drills, drill presses, circular and band saws, forges and lathes, have proven wonderfully efficient.

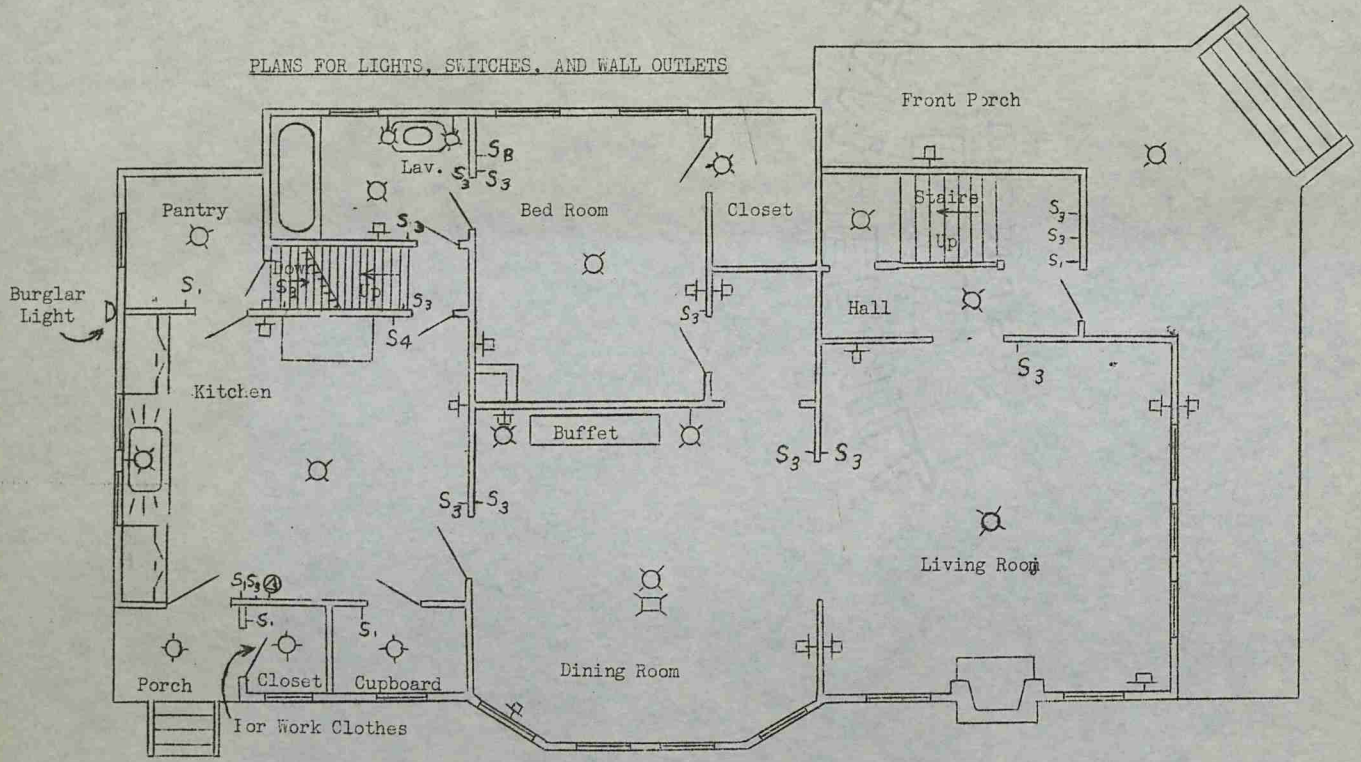


Farm Shop Use

Besides these more important and more common uses of electricity on the farm, there exists a great number of minor uses to which it can be put. One has only to visit a few farms making use of electricity to realize that it would be impossible to list all the uses here. As new inventions are perfected for the application of electricity to agricultural processes, its use will

be more than doubled. In considering the uses of electricity on the farm, the farmer should of course, take into consideration his every day practices and work out for himself those which may be more profitably done with electricity than any other way. He should bear in mind constantly that every possible use of electricity that he can make will have a tendency to reduce his cost per unit due to the method by which electric bills are calculated. Oftentimes, farmers are rendered bills which are such that additional uses of electricity for that month would be obtained at a very small cost. It should also be remembered that if all farmers would use electricity for all practical purposes, still more farmers could be added to the line along which they live. Rates are based on use and the more electricity used, whether by the farmer or the city dweller, the cheaper the rate will eventually become. America is electric conscious and efficient workers everywhere in industry and in agriculture are using electricity to their benefit. Be sure that you, as a producer of necessary commodities, are not overlooking a method of increasing effectiveness of your labor by using the latest equipment which has proven practical elsewhere. There are many agencies which will assist you in this matter and your State College of Agriculture will help you locate them.

PLANS FOR LIGHTS, SWITCHES, AND WALL OUTLETS



- Legend -

- Special Outlet for Electric Range
- S_1 Single Pole Switch Outlet
- S_3 Three Way Switch Outlet
- S_4 Four Way Switch Outlet
- Floor Receptacle Outlet
- Ceiling Light
- Bracket Light
- Wall Receptacle Light

WIRING ANALYSIS SHEET

TYPICAL INSTALLATION		INSTALLATION DESIRED
Service Entrance:	Cable - 3 wires, #6	Service Entrance: _____
	Switch - 60 Amp.	Switch _____ Amp.
Range Circuit:	3 wires, #6	Range Circuit: _____

	Typical Installation					Installation Desired				
			Switches					Switches		
	Ceiling Outlets	Bracket Outlets	Single	3 Way	Conven. Outlets *	Ceiling Outlets	Bracket Outlets	Single	3 Way	Conven. Outlets
Front Porch	1	Or 2	1		1					
Back Porch	1		1		1					
First Floor Hall	1			1	1					
Living Room	1	2		2	4					
Dining Room	1	2		2	2					
Kitchen	1	1		2	3					
Second Floor Hall	1			1	1					
Bath Room	1	Or 2	1		1					
Bedrooms (Each)	1		1		2					
Closets	1		1							
Attic	1		1							
Cellar	2		1		1					
Laundry	1		1		1					
Pump House	1		1							
Barn	1		1		1 P					
Dairy			1		1					
Milk House	1		1		1					
Feed Room	1		1		1 P					
Horse Stable			1		1					
Hay Loft	1		1							
Shop	1 or 2		1		1					
Poultry House (for each 100 sq. ft.)	1		1		1					
Yard	1			1						
Yard - near silo	1				1 P					
Silo	1		1							
Woodshed	1		1							
Garage	1			1	1					
Total										

* The letter "P" in this column indicates a 230 volt power outlet.

House wiring to be: Armored Cable _____ Non-metallic _____

Branch circuits for house: _____ Of #14 Wire _____ Of #12 Wire

Water pump circuit to end at _____ Wire Size _____

Yard light; one switch at house, one switch at _____.

Four-point switches at _____.

We, the undersigned residents in _____ Community, _____ County, do hereby petition the _____ for a rural electric line to serve proposed customers in the territory and along routes as indicated on the attached map. (Make sketch of route showing distances and location of homes.)

We will grant necessary easements on rights-of-way.

We will wire our premises and use approximately the appliances listed.

Correspondence should be addressed to: _____ (Name) _____ (Address)

Name	Address	Property Owner ?	List of Equipment	

N. C. State College, Raleigh
Home Demonstration Division

Specialist in Home Management
and House Furnishings

ADEQUATE ARTIFICIAL LIGHT FOR THE HOME

Common causes of artificial light injuring the eyesight and nervous system are:

1. Insufficient amount of light for close work - Have sufficient light!
2. Unconcealed (unshaded) sources of light - Have all lights shaded!
3. Working in shadows caused by poor distribution of light in the room. Have more than one light source!

Any light sourse: ei., oil, gas, or electricity, may be made to provide good lighting.

Kitches Lighting:

Kerosens - Best with 2 or 3 wall lamps (in light colored room) placed above the eye level and shaded to throw light upon work surfaces and also toward ceiling to eliminate objectionable shadows.

Electric - Either, One properly shaded 25 watt bulb over each work center (drop cords should be 7 feet from floor if used at all)

or

A 100 or 150 watt bulb in a central diffusing fixture placed high against a light ceiling.

Living Room:

Kerosene - Ordinary flat-wick lamps will not provide sufficient light for close work as sewing, nor for reading at a distance greater than about 18 inches from lamp.

Round-wick lamps provide for sewing on light material at an approximate distance of 18--20 inches. For reading to an approximate distance of 25 inches.

Gas mantle lamps provide for sewing on light colors at 20 inches from source and reading 3 feet or more.

Electric - For central candelabra use 15 watt frosted bulbs or more depending upon number, color of room, etc. Central fixture is not an adequate source of light for reading or sewing.

For reading - Table or floor lamp with 60 watt frosted bulb, shaded.
For sewing - Table or floor lamp with 100 watt and 150 watt frosted bulb, shaded.

Dining Room:

A well shaded light source placed above the eye of the persons seated at the table (ei., at least 2 feet above table top) and over center of table gives best lighting. Such fixtures may be secured for oil, gas, or electricity. Shades should throw a circle of light over the table but protect the eyes of persons seated at the table. Such fixtures are obtainable for oil or electricity.

Bedroom: Bracket lamps or wall fixtures for the dresser are placed 6 feet from floor and 5 feet apart. These with one table light near the bed gives satisfactory lighting.

Walls, Closets, etc.:

If lighted electrically, halls should have two or three way switches with ceiling lights. Closets should have pendant lights with chain pull socket. Small electric lights run by dry cell are safe and convenient for closets.

In lighting with oil lamps strong tables in all rooms are essential. Long halls need two tables to hold lamps. An easily handled lamp with secure chimney is a convenience for temporary lighting in out of the way places where it is unsafe to leave lamps.

Caution: Do not depend upon one opening in center of room as only source of electric light; it is entirely inadequate and unsatisfactory.

Have one double service outlet on each wall space large enough to accommodate furniture in the living room.

Have sufficient lamps, electric or otherwise, to accomodate all members of the family at one time.

Determine to have comfortable, adequate light for your home no matter what the source. This is mostly a matter of careful planning.

Vision is one of the divine gifts to mankind and is worth safeguarding by proper lighting.

Extension Division H.M.Leaflet #30 Home Management
N. C. State College, Pauline Gordon
Raleigh, N. C. Specialist

STORAGE FOR NORTH CAROLINA HOMES:

Facts influencing the storage problems in rural North Carolina are that half the houses are built without any closet space and that in the average home the quantity of material of any one class to be stored is small. The latter influences size rather than the variety of storage units.

Principles fundamental to good storage still remain:

(1) Articles should be stored at the points where used.
(2) Articles should be stored that each may be removed without handling any other article.
(3) The storage space should fit the size and shape of articles to be stored. Storage spaces should also protect the articles stored and conform to the stature of persons using them most.

It should be the aim of each homemaker to provide the home with such facilities as are essential to the care of material possessions, to ease in house care and to contribute to individual and group pleasure in the home. Because the need is great some of the storage devices provided might be permanent and some temporary. The following definitions of space requirements may be used whether building new houses, building closets in old houses or making temporary 'packing box' storage devices. The home agent should be consulted for details of plans for built-in storage.

Storage needed for:

Clothing: Coat closet (near front or back door or both) Clothes closet - at least one for each bedroom.

Linens: Closet near bedrooms. General storage for blankets and quilts when not in use. Table linens in dining room.

Cleaning Supplies: A closet convenient to all rooms on first floor, additional one on second if two stories.

Toys and Hobby Articles: Stored in any room depending on place used by child or adult for play and recreation.

Medicine Cabinet: Away from toilet article cabinet.

Bathroom Cabinets: For toilet articles - near lavatory.

Dishes: In kitchen, dining room or in cabinet opening into each room.

Cooking Utensils: Kitchen cabinets, preferably built in to fit articles to be stored.

General Storage: For large articles, seasonally used equipment, etc., may be located on back porch, in large hallway, in attic or dry basement.

All the above are preferably built-in. Bookshelves and storage for musical instruments may be movable or built-in. Magazine racks and desks are usually movable.

CLOTHING STORAGE - (Adapted from study by Maude Wilson in Cooperation with Bureau of Home Economics and C. W. A.

Studies show that the needs of the average adult farm dweller are met by a closet containing 6 garment hooks, a rod 24" long for hangers, a hat shelf, 48" long and a space for 6 pairs of shoes.

The following measurements are a guide in planning closet space:

Rod

To determine the length of rod, for garments on hangers, allow space per garments as follows:

Men's and boys' clothing:	Inches	Girls' clothing	Inches
Suits	2	Wash dress	1-1/2
Trousers	3	Coat without fur collar	2
Overcoats	4	Coat with fur collar	3
Shirts	1-1/2		

Women's Clothing:	Inches
House and street dresses	1-1/2
Skirt	2
Jacket	3
Evening dress	2
Coat without fur collar	5
Coat with fur collar	6

Minimum distances from center of rod to wall:

	Inches
For adult use	12
For children 6 to 12 years of age	10
For children 3 to 5 years of age	8

Distance between floor and top of rod or wardrobe hook (assuming use of hanger which places top of garment 4 inches from top of rod):

	Inches
Garments of adults, general use	63
Short coats, skirts, shirts	45
Evening gowns	72
Garments stored in moth-proof bags	72
Garments of children 6 to 12 years of age	45
Garments of children 3 to 5 years of age	30

Distance between top of rod and bottom of shelf above it..... 2-1/2in.

Hooks

			Inches
Bedroom closet, hook to hook	7 in.	Hook to corner	3-1/2
Play coats, small children	9 in.	" " "	4-1/2
Chore coats, men	12 in.	" " "	6

Distance between top of hook and bottom of shelf above it....4 inches
Depth of space occupied by garments on hooks.....4 inches

Shelves

Article	Width of shelf front to back Inches	Length of space side to side Inches	Vertical height between shelves Inches
For a Man:			
Hat	14	12	8
Hat box	15	13	9
Cap	12	11	4
Shoes	13	9	7
For a Woman:			
Hat	12	12	8
Hat box	14	14	9
Shoes	10	7-1/2	7
For a Child:			
Shoes	6 - 10	5-1/2 - 7	6

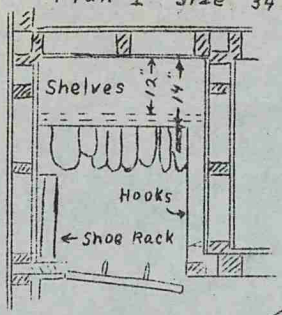
Shoes may be stored on low shelves, or shoe racks. The length of the shelf or rack should be 14 inches, 18 inches, or 21 inches, to allow for 2 or 3 pairs of women's or men's shoes.

Activity Areas

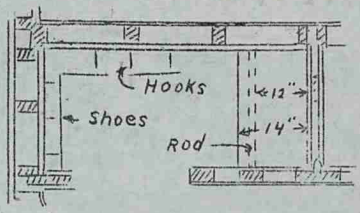
Minimum width of opening of closet.....24 inches
Minimum free space in closet of walk-in type.....a 24 by 24 inches

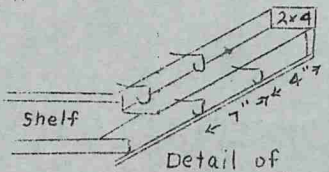
Bedroom Closets

Plan I size 34"x42"



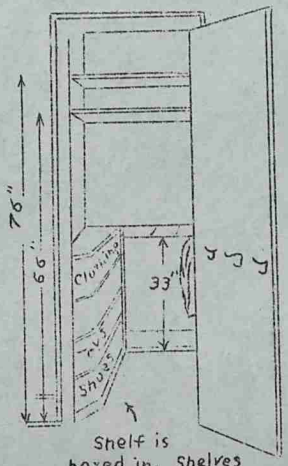
Plan II size 24"x54"



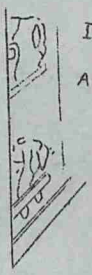


Detail of Staggered Hook Arrangement.

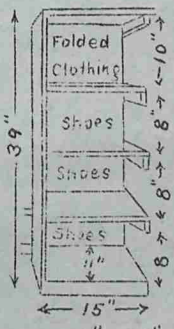
Arranged for child.



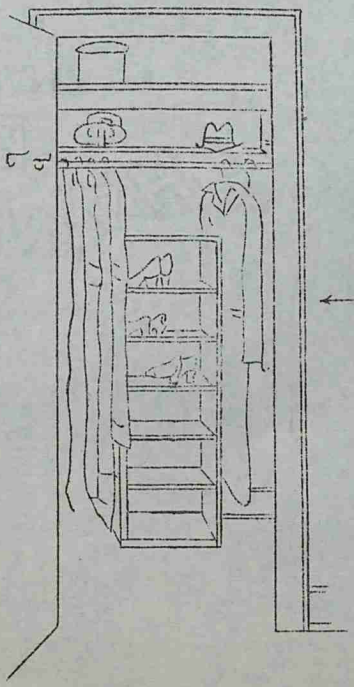
Shelf is boxed in. Shelves are 8" apart, 10" wide.



Detail of Shoe Arrangement in Plan I

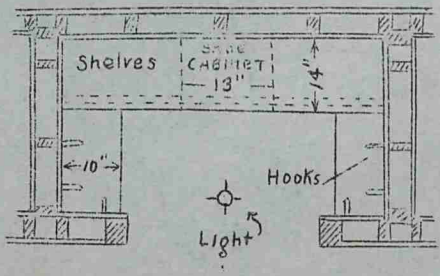


Size 36"x66"

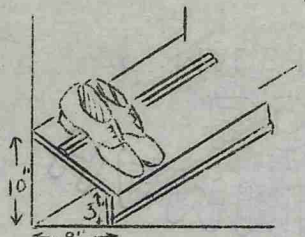


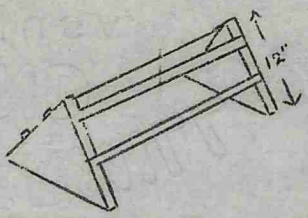
Plan III

Walk in type; for two persons

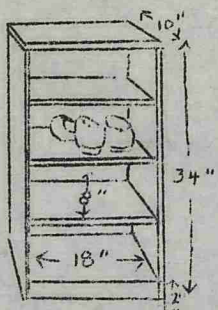


SHOE RACKS



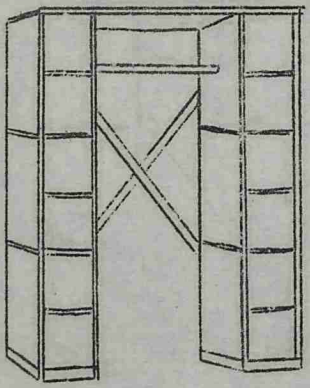


SHOE STORAGE ON FLOOR UNDER GARMENT LEVEL

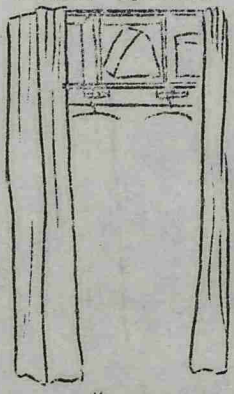


FOR USE ON FLOOR
TWO PAIRS OF SHOES
ON EACH SHELF

CLOSETS MADE FROM BOXES

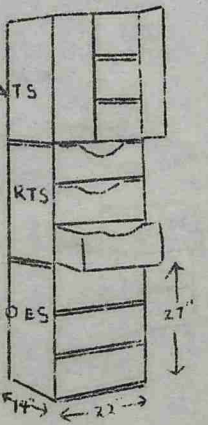


6 CRATES, BEAVER BOARD TOP, DIAGONAL BRACES, ROD FOR HANGERS, AND CURTAIN OR SHADE.

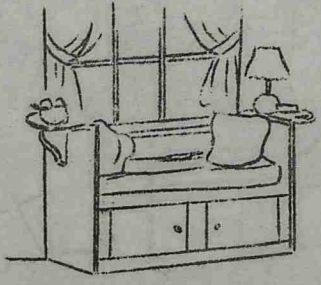


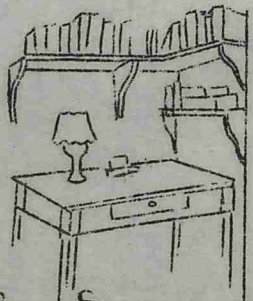
1½ CRATES FASTENED TO WALL

MEN'S WEAR STORAGE UNIT



WINDOW SEAT STORAGE UNIT





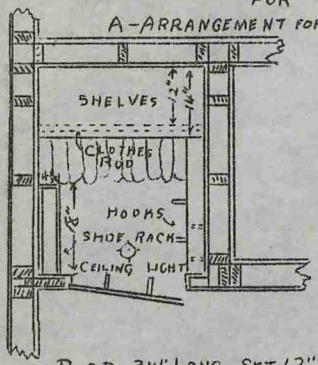
BOOK STORAGE AND WRITING UNIT

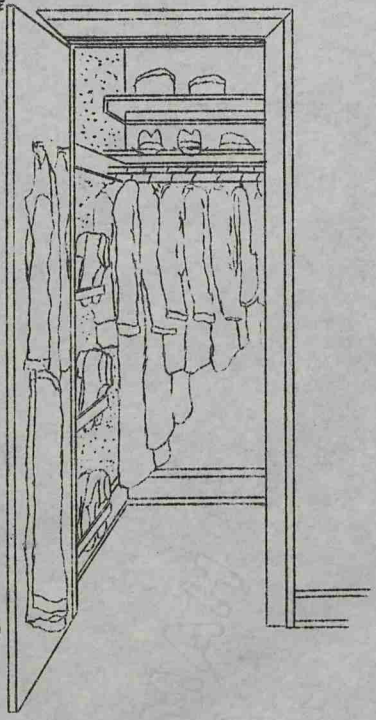
BEDROOM CLOSET

PLAN I — SIZE 3'4"X2'

SINGLE CLOSET, MINIMUM PRACTICABLE WIDTH FOR WALK-IN TYPE

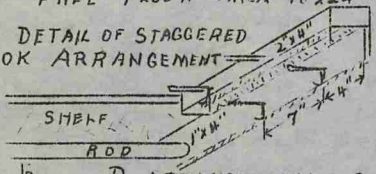
A-ARRANGEMENT FOR ADULT USE



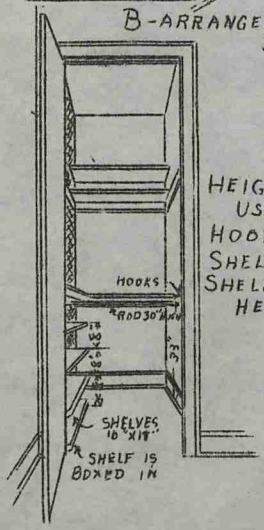


ROD - 3'4" LONG SET 63" FROM FLOOR
HOOKS - 6
SHOE RACK
2 SHELVES 14"X3'4"
FREE FLOOR AREA - 18"X24"

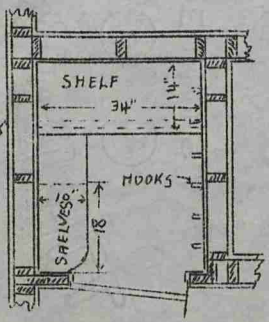
DETAIL OF STAGGERED HOOK ARRANGEMENT



B-ARRANGEMENT FOR CHILD 3-5 YEARS



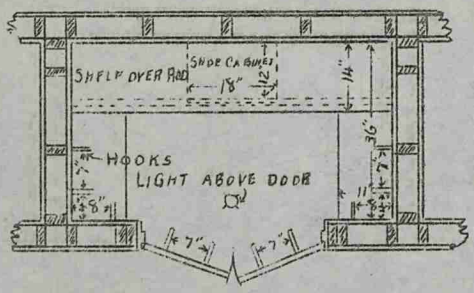
HEIGHT OF ROD 30"
USABLE ROD LENGTH - 24"
HOOKS 6 - HEIGHT 30"
SHELVES AT SIDE 10"X18"
SHELF ABOVE ROD 10"X28"+14"X28"
HEIGHT 33" FROM FLOOR



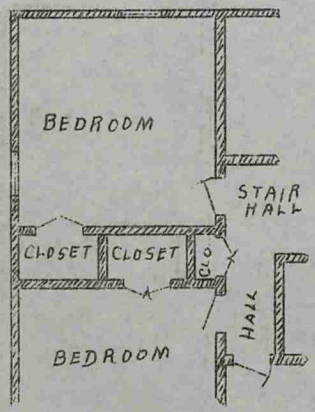
BEDROOM CLOSET

PLAN III — SIZE 36"x66"

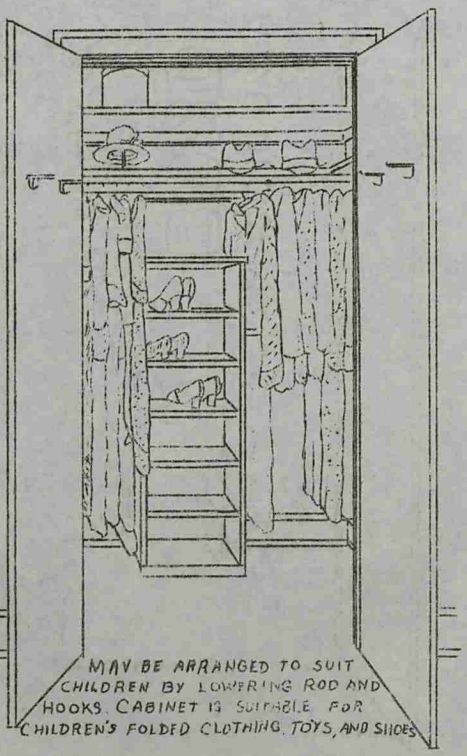
WALK-IN TYPE; FOR TWO PERSONS; INDIVIDUAL ROD SPACE



LENGTH OF ROD 66". HANGER SPACE 24" FOR EACH PERSON
DISTANCE OF ROD FROM FLOOR-63"
SHELVES ABOVE ROD-11½" WIDE. 66" LONG
SIDE SHELVES OVER HOOKS EACH 11" WIDE. 22" LONG, PLACED AT SAME HEIGHT AS SHELF ABOVE ROD.
MOVABLE SHOE CABINET-12" WIDE, 18" LONG, 48" HIGH WILL HOLD AT LEAST 12 PAIRS OF SHOES
6 HOOKS PER PERSON, PLACED 63" FROM FLOOR



DOUBLE DOORS ARE PREFERABLE BUT SINGLE DOOR 30" WIDE MAY BE USED. IF THE SINGLE DOOR IS USED IT SHOULD BE CENTERED.

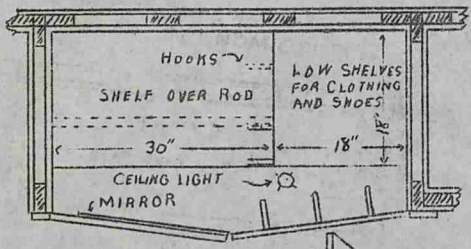


MAY BE ARRANGED TO SUIT CHILDREN BY LOWERING ROD AND HOOKS. CABINET IS SUITABLE FOR CHILDREN'S FOLDED CLOTHING, TOYS, AND SHOES

BEDROOM CLOSET

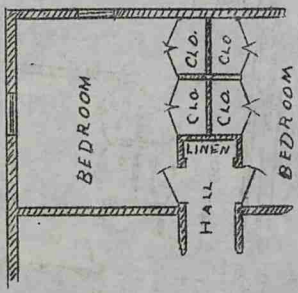
PLAN VI SIZE 24"x48"

WARDROBE TYPE FOR ONE PERSON, REPRESENTS MOST ECONOMICAL USE OF SPACE FOR STORAGE PURPOSES

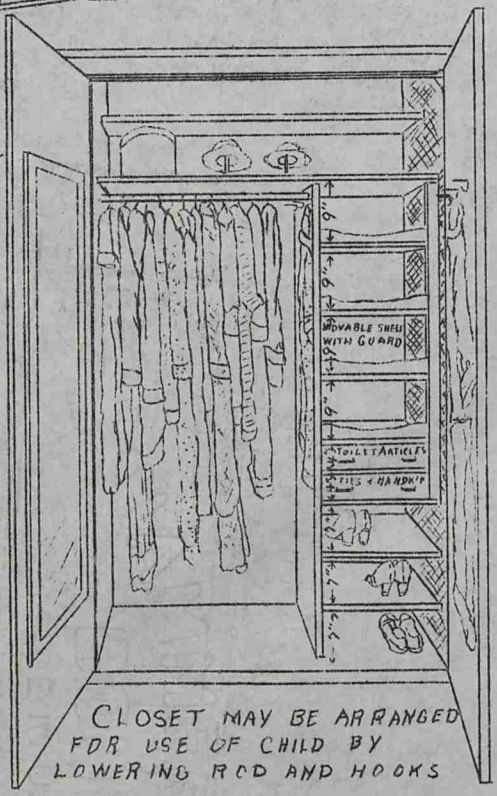


HANGER SPACE 24" LONG
ROD 63" FROM FLOOR IF FOR ADULT
SHELF ABOVE ROD. 18" WIDE, 48" LONG SET 66" FROM FLOOR
BASE OF CLOSET 2" ABOVE FLOOR
TIER OF SHELVES, TRAYS AND DRAWERS 18" WIDE, 18" LONG.
6 HOOKS, SET 63" FROM FLOOR IF FOR ADULT

DOOR FOR MIRROR SHOULD BE CHOSEN WITH RESPECT TO ARRANGEMENT OF ROOM AND DIRECTION OF LIGHT FROM WINDOWS



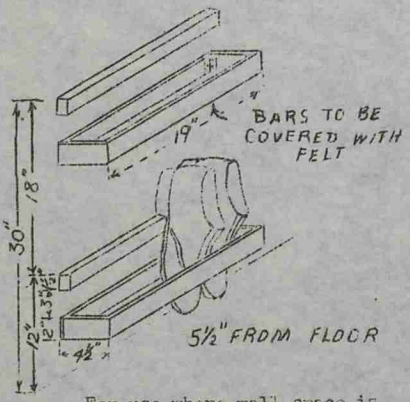
WARDROBES BUILT BACK-TO-BACK BETWEEN BEDROOMS AFFORD MORE STORAGE SPACE THAN TWO CLOSETS OF WALK-IN TYPE OCCUPYING THE SAME AREA.



CLOSET MAY BE ARRANGED FOR USE OF CHILD BY LOWERING ROD AND HOOKS

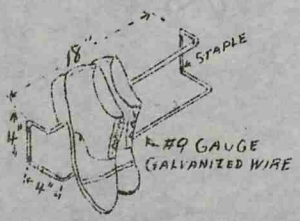
SHOE RACKS FOR BEDROOM CLOSETS

Type I



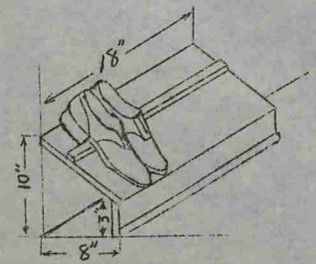
For use where wall space is less limited than floor space.

Type II



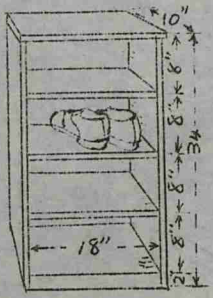
Takes more room space than type I but less than type IV.

Type III



For utilization of space below garments on hooks.

Type IV

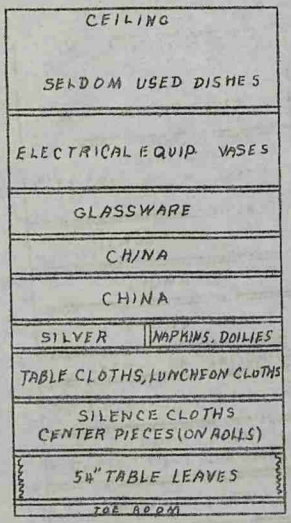


For use where floor space is available. Each shelf is long enough for at least two pair of shoes.

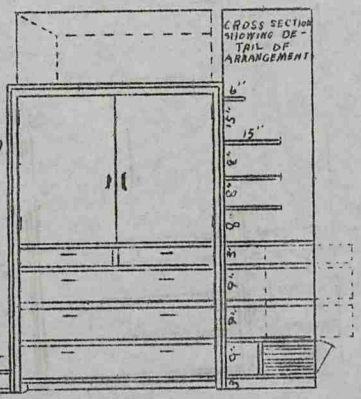
DINING ROOM STORAGE FACILITIES

PLAN I — WALL CLOSETS

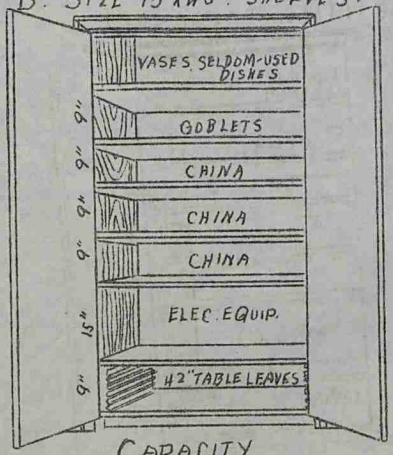
A. SIZE 24"X56" DRAWERS AND SHELVES



CAPACITY
4 ELECTRICAL APPLIANCES.
CHINA, GLASSWARE, LINEN AND SILVER TO SET TABLE FOR 12 PERSONS
6 TABLE LEAVES
LOWER COMPARTMENT MAY BE ARRANGED FOR SHORTER TABLE LEAVES BY MOVING ONE SPACER.
FRONT OF COMPARTMENT FOR TABLE LEAVES IS HINGED AT BOTTOM.

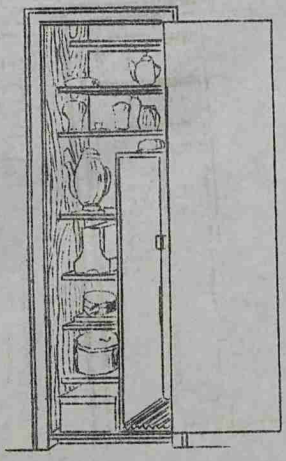


B. SIZE 15"X45". SHELVES.



CAPACITY
4 ELECTRICAL APPLIANCES
CHINA AND GLASSWARE TO SET TABLE FOR 12. 6 TABLE LEAVES.

C. SIZE 15"X24"

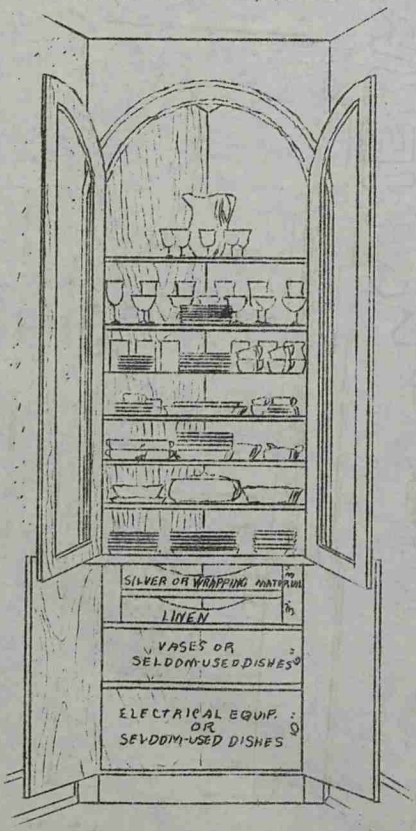


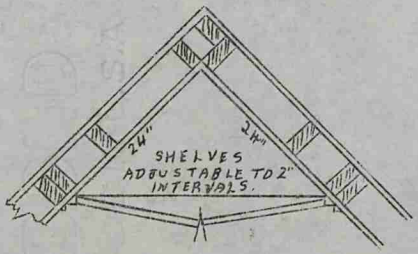
4 ELECTRICAL APPLIANCES. SELDOM-USED DISHES. TABLE DECORATION. SEVEN TABLE LEAVES. COMPARTMENT MAY BE MADE TO ACCOMMODATE LEAVES OF VARYING LENGTHS BY PUTTING SPACER AT BACK

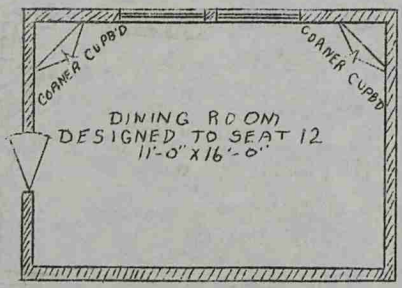
DINING ROOM STORAGE FACILITIES

PLAN II — CORNER CUPBOARDS

SHORT SIDE 24". HOLDS CHINA, GLASSWARE, SILVER AND SMALL PIECES OF LINEN REQUIRED IN SETTING TABLE FOR 12 PERSONS.







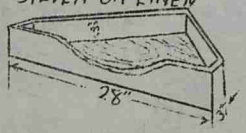
CAPACITY OF TWO CUPBOARDS

CHINA — 94-PIECE SET.
GLASSWARE - 60 PIECES
SILVER - 75 PIECES, ALSO CARVING SET.
LINEN - 2 SETS NAPKINS; DOILIES.
COFFEE URN; PITCHERS;
FLOWER CONTAINERS.

METHOD OF STORING

HALF OF CHINA AND GLASSWARE STORED IN EACH CUPBOARD.
PLATES OF SAME SIZE STACKED.
CUPS STACKED TWO DEEP
HEAVY STACKS OF DISHES STORED ON LOWER SHELVES
SILVER KEPT IN CLOTH ROLLS.

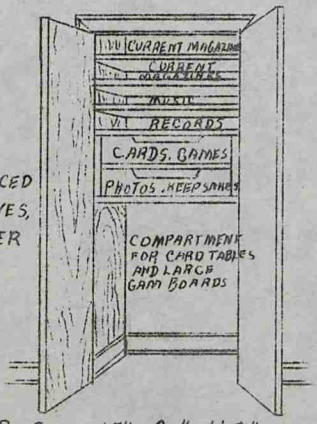
TRAY USED FOR SILVER OR LINEN



LIVING ROOM STORAGE FACILITIES
PLAN II
CABINETS OR SHALLOW CLOSETS

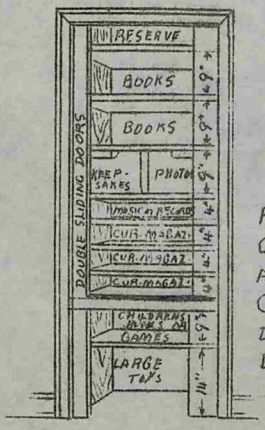
A. SIZE 12"x15"x35"

UNITS MAY BE PLACED UNDER BOOK SHELVES, OR SIDE BY SIDE OVER CARD TABLES.

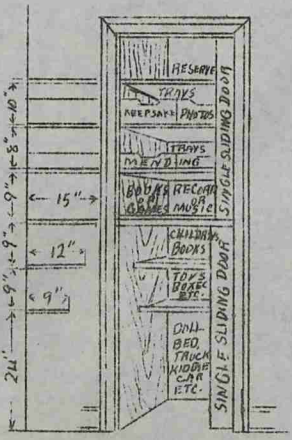


B. SIZE 12"X30"X6'-8"

C. SIZE 15"x24"x6'-8"



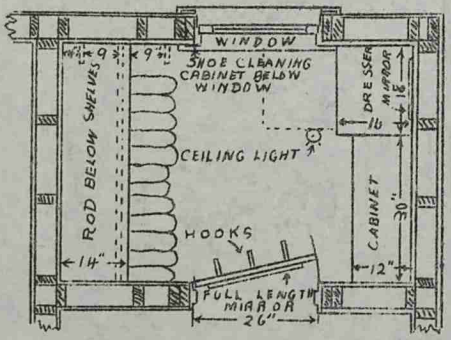
FOR USE OF SMALL CHILDREN AS WELL AS OLDER PERSONS. CLOSED BY SLIDING DOORS ABOVE AND BELOW.

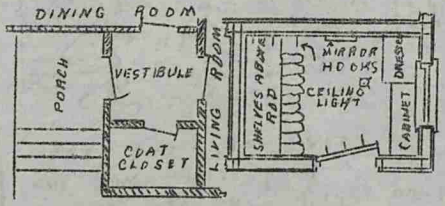


COAT CLOSET

PLAN III — SIZE 42"X72"

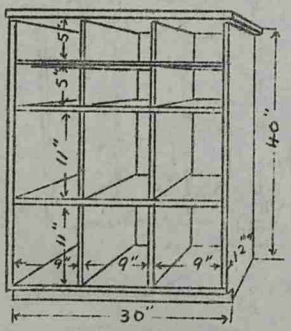
FOR WRAPS, OTHER THAN CHORE CLOTHES. WALK-IN TYPE; ARRANGED FOR USE OF CHILDREN AND ADULTS.



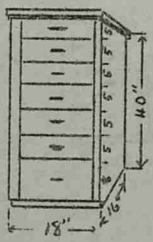


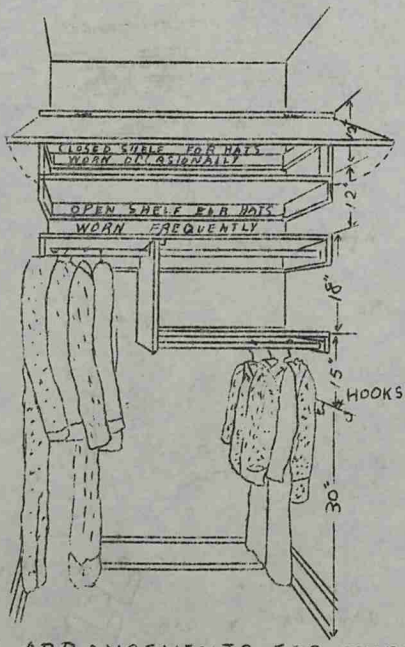
AREA AND ARRANGEMENT ARE THE SAME WHETHER THE WINDOW IS OPPOSITE OR AT RIGHT ANGLES TO DOOR

DETAIL OF CABINET FOR GLOVES, CAPS, AND OVERSHOES



DETAIL OF DRESSER

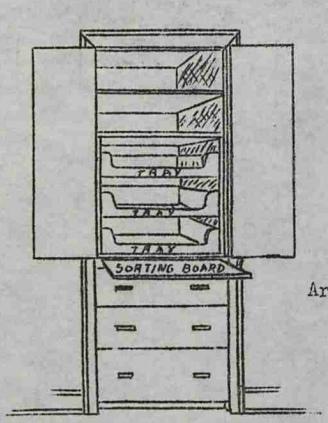




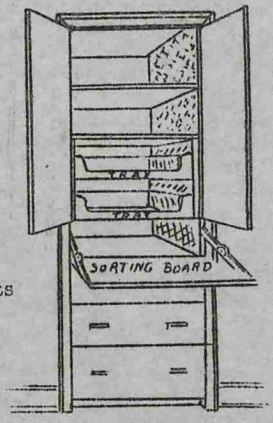
SHOWING ARRANGEMENTS FOR STORING COATS AND HATS. LOW ROD, HOOKS, AND SHELF SHOULD BE READILY REMOVABLE

CLOSETS FOR BEDDING AND LINEN
PLAN II

For bed covers, bed linen and towels. Shows arrangement of space 36" long

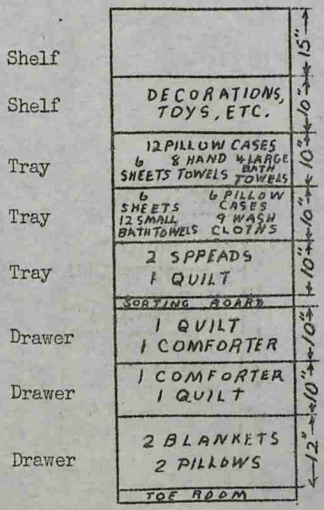


Closet Arrangements

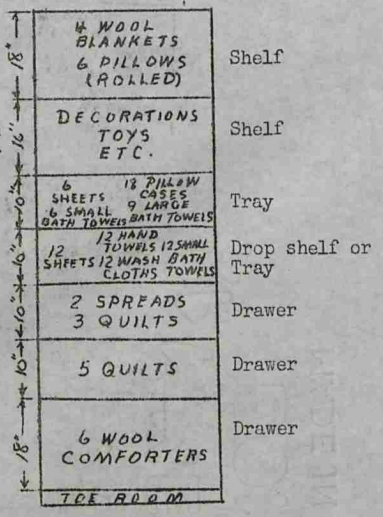


Capacity, Dimensions and Methods of Storing

A.- SMALL- SIZE 18"x36" B.-LARGE - 24"x36"



Dimensions given do not allow for construction.

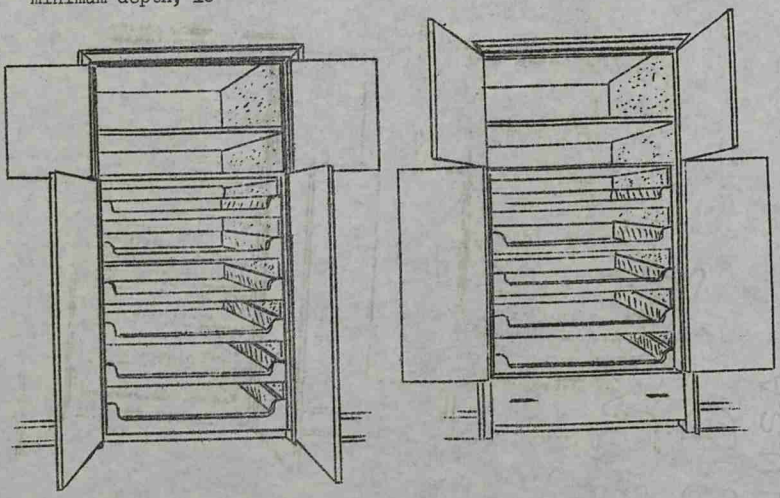


CLOSETS FOR BEDDING AND LINEN

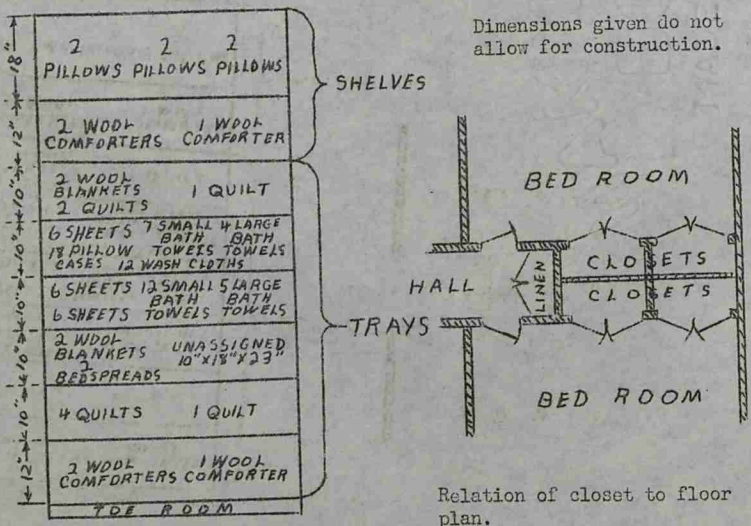
PLAN II

SIZE 18"X51"

For bed covers, bed linen, and towels. Show arrangement of space of minimum depth, 18"



Capacity, Dimensions and Method of Storing.



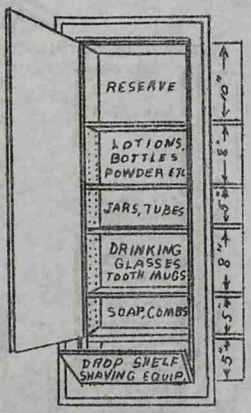
Dimensions given do not allow for construction.

Relation of closet to floor plan.

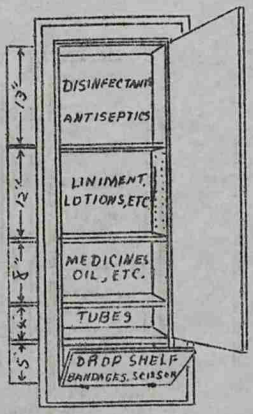
PLATE I – BATHROOM STORAGE FACILITIES
WALL CABINETS

BUILT BETWEEN STUDDING. FACE FLUSH WITH WALL. ADJUSTABLE SHELVES.

PLAN A – CABINET 14"x45". BOTTOM OF CABINET IS 36" FROM FLOOR.



1. Distances between shelves when used for toilet articles



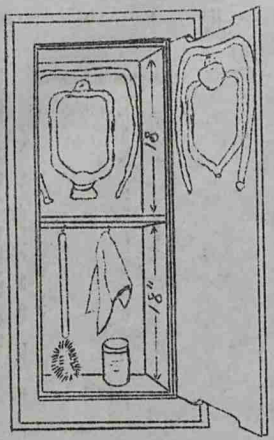
2. Distances between shelves when used for medicines

PLAN B – COMBINATION WALL CABINET. SIZE 30"x45"

Divided by shelf into two compartments. Upper part used for hot water bags and attachments. Lower part for articles used in cleaning bathroom fixtures.

Cabinet may be placed below cabinet for toilet supplies or medicine.

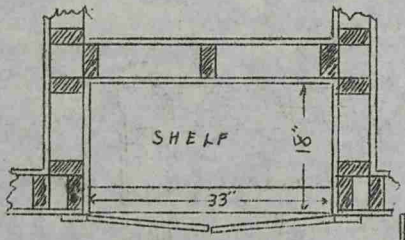
PLAN C – WALL CABINET 14"x36"



CLEANING - CLOSET

PLAN VI

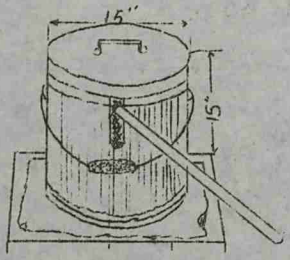
SIZE 18"×33"



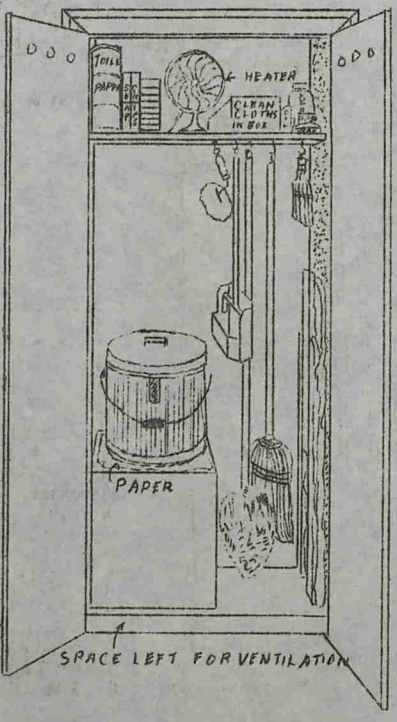
PLAN FOR UPSTAIRS CLOSET FOR HOUSE HAVING NO DUST CHUTE

DUST CONTAINER IS IN POSITION FOR INSERTION OF DUST MOP

PLAN OF CLEANING-CLOSET



CONTAINER IS MADE BY CUTTING OUT BOTTOM OF A GARBAGE CAN, AND CUTTING SLOT IN SIDE OF CAN FOR INSERTION OF DUST MOP. HEIGHT OF BASE OF CONTAINER SHOULD SUIT HEIGHT OF USER



CLOSET CONTENTS
DUST CONTAINER
IRONING BOARD
3 HOOKS FOR LONG ARTICLES
3 HOOKS FOR SHORT ARTICLES
1 SHELF 14" DEEP 33" LONG
HEIGHT OF BASE 2"
67" FROM FIRST SHELF TO BASE

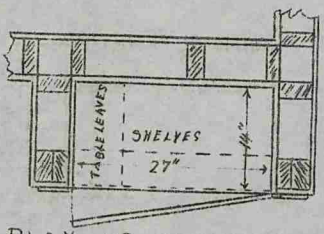
CLEANING-CLOSET VARIATIONS

		INSIDE DIMENSIONS DEPTH	WIDTH
A	OMIT DUST CONTAINER	16"	15"
B	OMIT IRONING BOARD	18"	29"
C	OMIT DUST CONTAINER AND IRONING BOARD	14"	11"

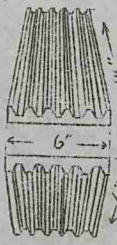
CLEANING - CLOSET
PLAN II

SIZE 14" X 27"

CLOSET MAY BE 25" WIDE IF IT IS 17" DEEP



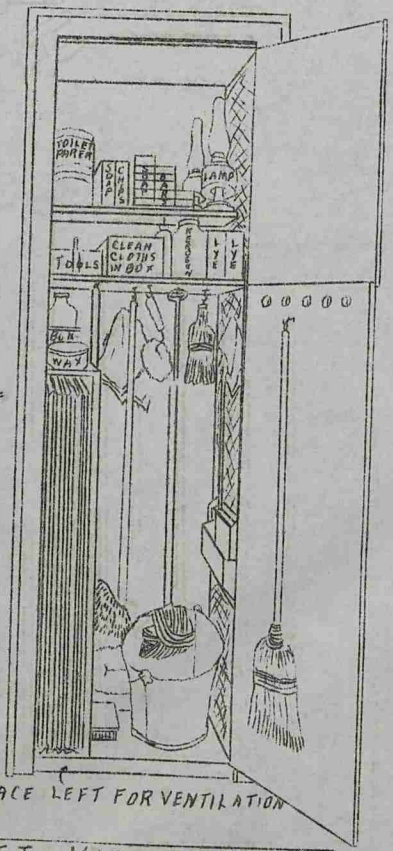
PLAN OF CLEANING-CLOSET



DETAIL OF BOTTOM TABLE-LEAF SPACER

DETAIL OF REAR TABLE-LEAF SPACER

GROOVES TO BE COVERED WITH FELT



SPACE LEFT FOR VENTILATION

CLOSET CONTENTS
5 TABLE LEAVES
WAXER
PAIL
5 HOOKS FOR LONG ARTICLES
4 HOOKS FOR SHORT ARTICLES
1 SHELF 14" DEEP 27" LONG
1 SHELF 9" DEEP 27" LONG
HEIGHT OF BASE 2"
67" FROM FIRST SHELF TO BASE

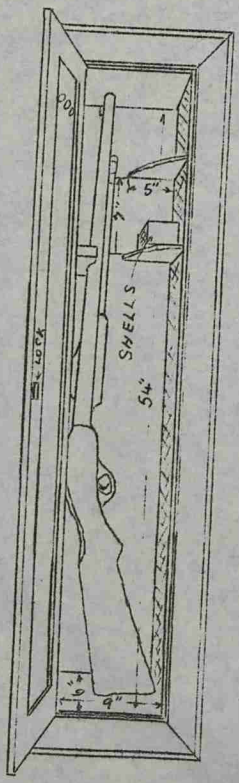
CLEANING - CLOSET VARIATIONS

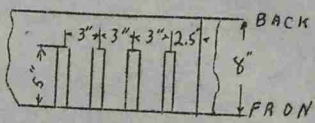
	CONTENTS	INSIDE DIMENSIONS DEPTH	WIDTH
A	OMIT TABLE LEAVES	14"	19"
B	ADD IRONING BOARD	17"	28"
C	OMIT TABLE LEAVES ADD IRONING BOARD	17"	23"

GUN CLOSETS

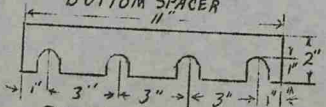
PLATE I

PLAN I



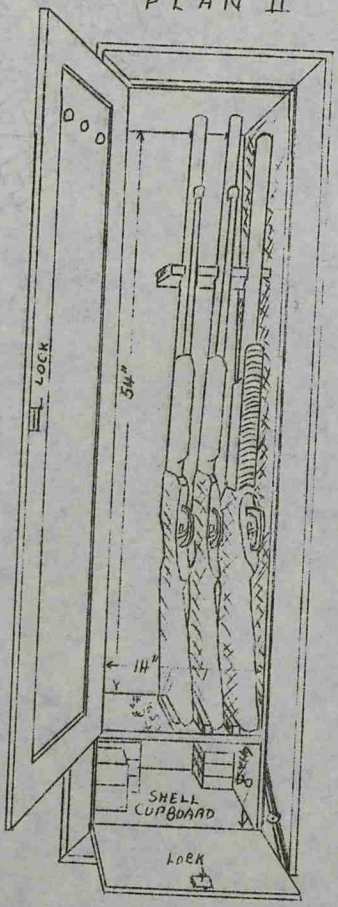


DETAIL OF GUN RACK
BOTTOM SPACER



DETAIL OF GUN RACK
TOP SPACER

PLAN II



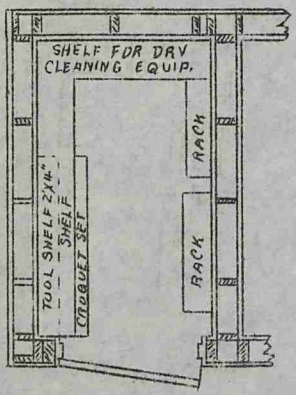
PLAN I 5"x9"x54" HIGH MAY BE PLACED BETWEEN STUDDING. HOLDS ONE GUN AND TWO BOXES SHELLS AAY HAVE COMPARTMENT IN UPPER CORNER FOR REVOLVER IF CLOSET IS MADE 14" WIDE

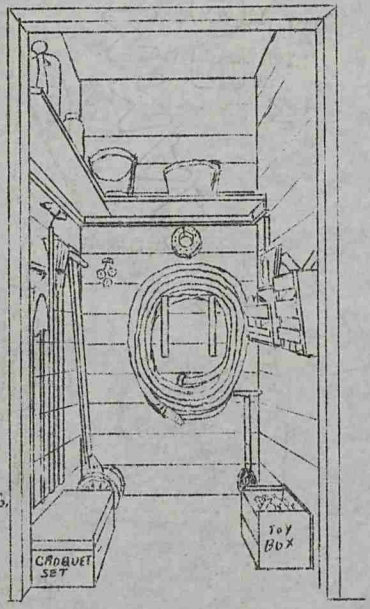
PLAN II 8"x14"x63" HIGH. SEPARATE COMPARTMENT WITH LOCK FOR AMMUNITION, CLOSET HOLDS THREE GUNS AND FISHING RODS, OR FOUR GUNS.

STORAGE OF EQUIPMENT USED OUT-OF-DOORS

PLAN I

SIZE 36" x 60"

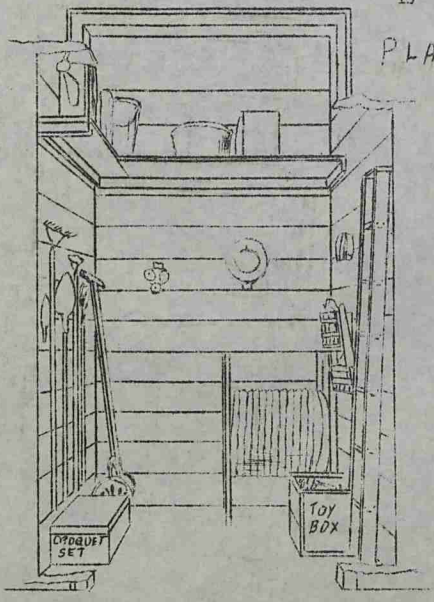


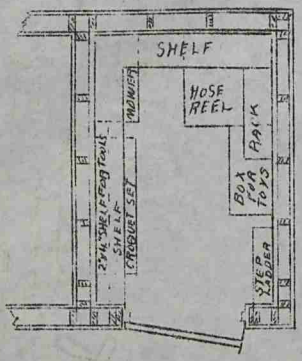


RACKS AND BOXES FOR CHILDREN'S PLAY EQUIPMENT, HOOKS FOR ARTICLES WHICH WILL HANG. WALL BRACKETS FOR HOSE. SEVEN FEET OF SHELVING.

PLAN II

SIZE 48" x 72"

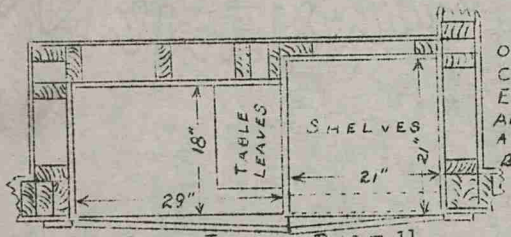




CLEANING CLOSET

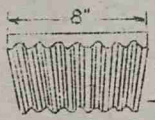
SIZE PART I 18" x 29"
PART II 21" x 21"

IT IS OFTEN ECONOMICAL OF SPACE TO PROVIDE TWO CLOSETS TO HOLD CLEANING EQUIPMENT, IRONING BOARD AND TABLE LEAVES SUCH AN ARRANGEMENT IS ILLUSTRATED BELOW.



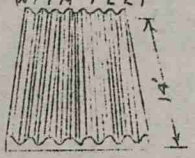
PART I PART II

PLAN OF CLEANING CLOSET

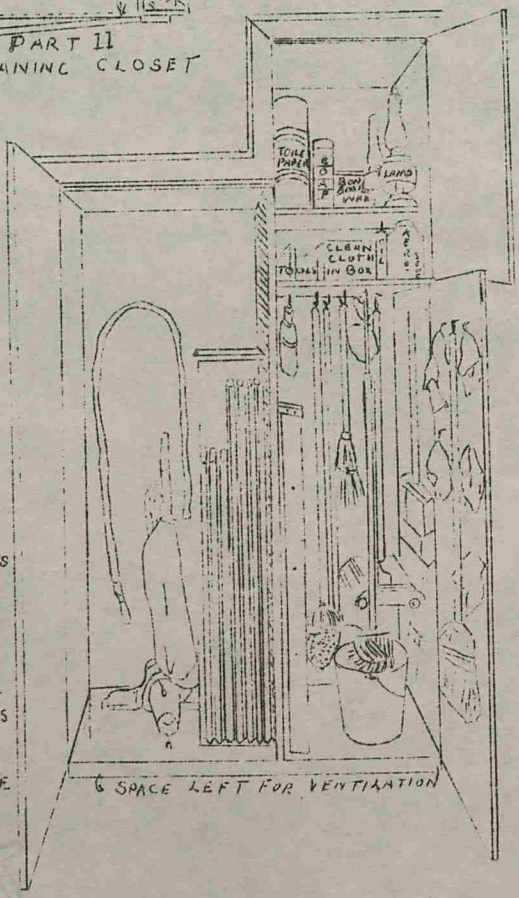


DETAIL OF REAR - TABLE LEAF SPACER

GROOVES TO BE COVERED WITH FELT



DETAIL OF BOTTOM TABLE LEAF SPACER



CLOSET CONTENTS

PART I

VACUUM CLEANER - ATTACHMENTS
7 TABLE LEAVES
IRONING BOARD

PART II

STEP LADDER
CARPET SWEEPER
WAXER
PAIL
8 HOOKS FOR LONG ARTICLES
7 HOOKS FOR SHORT ARTICLES
1 SHELF 21" DEEP 21" LONG
1 SHELF 18" DEEP 21" LONG
HEIGHT OF BABE 2"
67" FROM FIRST SHELF TO BASE