

up semicontrolled situations. Experiments are conducted. Work standards are developed. If presented in detail, labor accomplishment using alternative layouts and methods may be predicted using these standards.

Such standards, however, need constant revision as new technology develops. Further, adjustments for differences among workers and in environment are difficult to make.

As an alternative to development of complete detailed time standards, Wilfred H. M. Morris of Purdue University and others have divided time requirements into fixed and variable components. This provides a tool for studying the effect of size of enterprise on labor requirements. Such data are helpful in farm planning and in budgeting alternative systems of organization and operation.

A word of caution, however: The value of time changes seasonally. An hour saved at the rush season may be worth more than a day saved when work is slack.

Technology in Homes

Earl C McCracken, Avis M. Woolrich, and
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A GENERATION ago many of us thought farm living was substandard living. Farmhouses lacked comforts and conveniences. Farm wives had few labor-saving devices. Farm families usually were isolated.

Today things are different. Most farmers have automobiles, good roads, and communication. Farm homes commonly have the same conveniences as city homes.

We can thank technological advance-

ment in farming during the 20th century for much of the improvement in farm living. Better ways of farming increased farm incomes, and farmers had the means to buy improvements for their homes. Mechanized farming lightened farmwork, and farm people got more time for educational pursuits and social contacts. Electricity improved farm operations and also made it possible to install water systems and use household appliances.

The story of the development of equipment for use in farm households is the story of household equipment in general. It would be uneconomical to produce equipment of different design for urban and farm homes, and there is no need to do so. A design with good operating characteristics will perform equally well anywhere. Any difference is in the size of jobs to be done and in the length of time during which the equipment is in use.

Some types of household equipment were adapted from the large-scale equipment developed originally for commercial and institutional use. This byproduct development so often became the "tail that wagged the dog" that development of appliances primarily for household use became an accepted practice.

First came equipment for maintenance of the home and its furnishings—the electrified sewing machine, powered clothes washer, electric hand iron, and vacuum cleaner. Of all other types of household appliances in use today, only the toaster and hotplate had their beginnings in the earliest stage of the development of household equipment.

A full line of electric cooking devices, including the frying pan, and flatirons was exhibited at the World's Columbian Exposition in Chicago in 1893. The heating devices blew up when put into operation, however, and were never sold to the public.

The real advance in appliances for home use had to await the development of the nickel-chromium heat-developing resistance wire and the universal-type small motor. Both came in

the first decade of the 20th century, and the technological revolution in household equipment was underway.

WASHING CLOTHES always has been a hard and tedious task. Manufacturers therefore have given much attention to equipment to remove the drudgery from laundering, and homemakers have accepted it eagerly.

The first practical motor-driven washer was introduced in 1908. A motor made for washing machines was put into production in 1913. For many years, however, power for washers on farms was furnished by small gasoline engines, which often were the same ones used for the pump jack when the windmill failed to produce a satisfactory supply of water.

As electric powerlines were extended farther and farther into rural areas, the importance of the gasoline engine as a source of power for laundry equipment diminished. Today the gasoline-powered washer is almost extinct.

The early power washers simply substituted a motor or engine for the hand-crank. Galvanized-iron tubs soon replaced the earlier wooden ones, and the procession of change continued through copper to steel. Now porcelain enamel covers the metal tubs inside and out. Today's colorful laundry equipment is the result of many years of search for a paint that could be sprayed on properly.

The automatic washer, which reduced the homemaker's actual washing labor to a process of inserting soiled clothes and removing them cleaned, came on the market in 1935 after a relatively short period of development. Clothes driers were introduced in 1939. Combination washer-driers appeared in 1953.

One million motor-powered washers had been bought by 1919. More than 1 million have been sold each year since 1934. Of the estimated 50 million-odd wired homes in the United States in 1959, approximately 93 percent had motor-driven washers. Over five times as many automatic and semi-

automatic washers were sold in 1959 as of the conventional types with wringers and spinners. Partly because the water supply on many farms is not always reliable the percentage of rural electric customers who own automatic washers is not so high as urban homes.

Rural homemakers have wide choice in designs of washing equipment. They include washers of the conventional wringer type, semiautomatic and automatic types, and the combination washer-drier. No one type is consistently superior in ability to remove soil. No one type of washing mechanism—agitator, modified agitator, or cylinder—is consistently superior in soil removal.

Purchases of automatic clothes driers rose to 1 million annually in 1951, 12 years after they were introduced. Almost 18 percent of wired homes had driers by the end of 1959.

A report of a study of automatic clothes driers by research workers in the Department of Agriculture said that the most chemical degradation of the fabrics and the most graying and loss of bursting strength occurred in outdoor drying. Tumbler drying caused the greatest shrinkage and visible wear. Gas driers caused the most yellowing. Inside rack and electric cabinet drying usually caused the least change in any property of fabrics.

The report further said that tumbler driers, in comparison with inside rack and cabinet driers, saved about 10 minutes of the operator's time in placing and removing the loads in the tests. In comparison with the outside line, they saved approximately 13 minutes. There is also a saving of elapsed time, which varies according to weather conditions and the work involved in carrying loads to and from the line.

More than a million hand irons have been bought each year since 1915. The steam hand iron appeared on the market in 1926. Models that could be used either dry or with steam followed shortly. More than 6 million electric hand irons were bought in 1959. Ninety percent of the Nation's wired

homes have standard electric hand irons. About 55 percent have steam irons of various types.

The electric ironer for home use was introduced early in 1908, but its acceptance has never been so high as that of most of the other major electric appliances. One million ironers had been purchased by 1935. Purchases had dwindled to 40 thousand in 1959 from the peak of 600 thousand in 1948. The steam iron and wash-and-wear fabrics seemingly have made the ironer the victim of technological advance.

A PATENT was taken out in 1859 for a cleaner that had all of the attributes of modern electric vacuum cleaners except the electric motor. Developments came fast after electric power became widely available.

The development of the balanced high-speed motor was a milestone in the attempt to produce a light, high-suction vacuum cleaner. A combination of beating, sweeping, and suction action was introduced. Lighter metals and plastics replaced heavy metals in many parts of the design. Attachments for regular vacuum cleaners and hand cleaners made their appearance.

Tank-type cleaners were followed by those of the canister type.

A report published in the February 1959 issue of the *Journal of Home Economics* said that for rug cleaning, sweeper cleaners (motor-driven brush or agitator) are superior to canister and tank cleaners and that cleaning efficiency of cleaners is lowered by an accumulation of dirt in the dirt bag—more for some cleaners than for others.

By the end of 1958, 72 percent of the wired homes had motor-driven house-cleaning equipment.

THE HOUSEHOLD REFRIGERATOR has done much to raise the standard of living.

It was one of the appliances that first was used commercially. Commercial refrigeration machines were attended by specialized personnel. Home refrigerators, however, had to be operated

by nonmechanics. They had to perform automatically the job performed naturally by the melting ice in the iceboxes they replaced and do so without service calls.

Perfection of the household refrigerator involved many hard problems, solutions to which have culminated in the sealed-unit compressor, thermostats and other controls, nontoxic and more efficient refrigerants, lighter and more effective heat-insulating materials, and the elimination of much operation noise. Ninety-eight percent of the wired homes had mechanical refrigerators in 1960.

The establishment of systems for the local distribution of the liquefied-petroleum gases made possible the use of gas refrigerators on farms. With this supply, automatic regulation of temperature was possible to an extent not available with the kerosene-powered refrigerator. The electric refrigerator had such a hold on the rural market, however, that the percentage of farm homes with refrigerators of the gas-absorption type is low. Manufacturers and consumers have shown greater interest in gas refrigerators, however, and it is to be expected that more and more of them will be adopted by farm families.

One million pioneer households had replaced natural refrigeration by mechanical refrigerators by 1928. In 1933, and in each year thereafter, more than 1 million mechanical refrigerators were purchased.

THE HOMEFREEZER, as it exists today, was introduced commercially in 1940. Many of the ideas incorporated in the early models were carryovers from the ice cream cabinet of the local store or soda fountain. One million units had been bought by 1948. About 1 million units have been bought each year since 1953.

The homefreezer market shifted to boxes of a capacity of more than 10 cubic feet in 1950. Fewer than 5 percent of the freezers bought in 1949 were of the upright type. Purchases of up-

right freezers exceeded those of the chest type in 1959.

The initial cost of an upright freezer is a little higher than that of the chest type of the same storage capacity. Whether one type of freezer is more convenient than another is largely a matter of personal opinion. In a comparison of 11 chest-type freezers of 5.5 to 18 cubic feet and 4 upright-type freezers of 5.5 to 28 cubic feet, little difference was found in the cost of operation between the two types.

A gap in refrigeration facilities on farms was that no commercially built home freezers were large enough to handle the sides of beef and large amounts of fruit and vegetables that some families wanted to freeze. Commercial locker plants were the answer for some, but many families wanted their own facilities.

Research workers conducted a survey of the existing large, custom-built, two-temperature, walk-in refrigerators on farms to learn the needs of farm people for such facilities and problems involved in their use and upkeep. Thereafter several experimental units were designed and constructed.

From this work came a design for a home-built, two-temperature refrigerator, described in Leaflet No. 320 of the Department of Agriculture. Working drawings (Plan No. 7102) are available from extension agricultural engineers at many of the State agricultural colleges. A farmer, with the help of a refrigerator serviceman, can build the refrigerator at a reasonable cost.

These home-built, on-the-farm installations are particularly valuable on farms far from locker plants. They make it easier to feed the family well. They may help in recruiting seasonal laborers, who are known to choose the farms where they will work on the basis of how good the meals are.

THE MODERN RANGE has thermostats that replace guesswork to determine the temperature of the oven. A regulated heat supply makes unnecessary a knowledge of wind direction in regu-

lating dampers. No need now to stoke the stove. Still, cooking practices have not changed so much as other practices have with the purchase of new types of equipment.

It is a little ironic that the farm wife, with a fine range, has fewer men to cook for than her mother, who was called on at harvesttime to feed a threshing crew but had primitive equipment to do it with: Technology in the kitchen paralleled the development of laborsaving farm equipment, which reduced or eliminated the need for large-quantity cooking.

The development of the nickel-chromium resistance-wire element in the early 1900's made possible practical cooking units. The electric range, which has surface, oven, and broiling facilities in one unit, was introduced commercially in 1909. By 1914, seven companies manufactured them.

In the early days of electric ranges, utility companies feared the effect of an extra electric demand at mealtimes, and insisted that ranges be designed to operate continuously with stored heat. Economically, however, it was found better to take electricity from the line and put it into food in the form of heat as needed. Investigation revealed that the demand of a range did not exceed 700 watts and that many ranges did not impose a load of more than 600 watts each, even at the time of peak demand.

A load-balancing switch and three-wire systems were developed to remove radio interference caused by ranges.

When LP gas began to be delivered in rural places, farm homes could have controlled-temperature ranges that use a fuel other than electricity. Many farmers replaced their wood-coal or kerosene range by the cleaner, faster, and better-regulated gas range.

Thermostats of one kind or another have been used on ranges almost from the beginning. Their development through various types and stages has resulted in the hydrostatic type that is used to control the temperature in ovens and also as the dominant feature

in thermostatically controlled surface units.

One million electric ranges had been sold by 1930, and 1947 was the first year in which 1 million were purchased. More than 1.7 million standard gas ranges were purchased in 1959.

The built-in electric or gas oven, paired with one or more sets of separate surface units, is a newer development. It is adaptable to various kitchen layouts. Many women like it. In a few years after they appeared on the market, built-in electric ranges were installed in 4 percent of wired homes. More and more separate gas ovens are bought each year; the total was nearly 360 thousand in 1959.

After the cookstove had evolved into the electric or gas range, more and more of its functions began to be duplicated in specialty items—electric roasters, hotplates, coffeemakers, toasters, and sandwich grills. Rare is the home that does not have at least one of them.

The water heater and sewing machine, the dishwasher, food mixers, ice-cream freezers, and many other items improved household operation and family living on American farms. Scarcely a household activity has not felt the impact of a growing technology in equipment, and scarcely a year goes by but that another hand-operated piece of equipment joins the ranks of the mechanized.

For more details on this and related points, we refer the reader to the October 1952 silver anniversary issue of *Electrical Dealer* and the golden anniversary issue in July 1957 of *Electrical Merchandising*, from both of which we have drawn ideas, expressions, and information for this chapter.

CREDIT for the relatively rapid development of household equipment goes to manufacturers who designed new equipment or adapted existing commercial equipment for home use, laboratories that tested and suggested, organizations that participated in standardization activities, the utility companies that supplied the concen-

trated power to operate the equipment, home management and other extension workers, and the dealers who made the equipment directly available.

Every purchase of household equipment uses money that otherwise would be available for other purposes. The cost of an appliance is always restrictive, regardless of its value. So manufacturers design and redesign to reduce production costs and to suit the equipment better to its task.

Standardization is a benefit we are not always aware of.

There were as many types of plugs in the early years as there were manufacturers. Cycle frequencies varied from 16 to 133; voltage, from 90 to 220. The success of the first attempts to standardize plugs and voltage dispelled manufacturers' initial fears that standardization would curtail their individual freedom of construction and design.

Knowing that sales of their appliances depend on acceptance by consumers, manufacturers of gas and electrical equipment have established departments in which home economists perform various functions. They prepare information on the best ways of using their company's products. They advise the research and engineering departments on features and construction that would improve the appliances.

The utility companies through the years have made engineering improvements to serve consumers better. An example: Electric clocks use only a minute amount of electrical energy, but generating systems were regulated to accurate frequency to assure correct time readings.

A large manufacturer, before adding an electric range to his line, asked several thousand homemakers and scores of dealers what they did not like about present ranges and what they wanted in an ideal range.

Although it was evident that the homemakers usually had had experience with only one range—because the responses were primarily “don't like”—the manufacturer was able to put on the market the first range based,

to any extent, on expressed homemakers' needs.

Later, as home economists with special training in the testing of household equipment were hired as home-service employees of the public utilities, as research workers for Government, industry, and college laboratories, and as household management and household equipment specialists in Extension Service, the need for extensive homemaker surveys became unnecessary.

From these home economists came the first indications that specific performance requirements were just as important to users of equipment as features of construction and appearance.

The need for standardization of consumer goods, including household equipment, was early recognized by the American Standards Association, Inc., an association providing means by which organizations and others may cooperate in establishing voluntary American standards in those fields in which engineering methods apply.

Under the jurisdiction of the Consumer Goods Standards Board of the American Standards Association, sectional committees made up of representatives of manufacturers, distributors, consumers, and groups with a general interest in the commodity were charged by the Association with the development of standards for refrigerators, ranges, water heaters, flatirons, hotplates, roasters, toasters, and other equipment.

The initial standards developed by the sectional committees were chiefly standardized test procedures, which are used by manufacturers in developing new designs and by testing laboratories interested in the engineering performance characteristics of different designs of equipment.

Few performance requirements have been developed or even proposed for how well the equipment does the work it is intended to do.

One exception is in the field of household electric range ovens. On the premise that the function of an oven was to bake foods and bake them

satisfactorily, a subcommittee of the American Standard Electric Range Committee formulated performance requirements based on standardized tests of the baking ability of an oven. The degree and evenness of browning and the time limits for achieving an acceptable degree of doneness of four baked products—bread, biscuits, and two kinds of cakes—are included in the criteria for evaluating the performance of an oven. Criteria of cake-baking ability also include the factors of evenness of rising and degree of shrinkage of the cake from the pan.

The tests were submitted to a sectional committee of the American Standards Association for approval and inclusion as performance standards in a pamphlet, "American Standard for Household Electric Ranges." If these baking test procedures with oven performance requirements are included in the procedures used by manufacturers in developing electric ranges, they will form a common basis for predicting oven performance of an electric range and can be used as a basis for an informative label stating that the range oven meets the performance requirements of the American Standards Association.

Performance requirements for gas range ovens have been in effect for many years. The American Gas Association in 1925 assumed the responsibility, under the American Standards Association, for developing standards of construction and performance for all gas equipment, including household appliances. By and large, standards for gas household equipment include more performance requirements than do those that have been adopted for electrical appliances. The gap is being narrowed, however, as data are being made available from all groups concerned with and working with electric household equipment. The American Gas Association maintains an extensive testing and accrediting laboratory, which in 1960 had no counterpart in the electrical industry.

Underwriter's Laboratories, Inc., has

done much to take away from the use of household equipment and appliances the fear of personal safety from electrical shock and fire. The UL approval on electrical equipment is proof that they meet the latest standards of safety.

Home economists and engineers in the laboratories of women's magazines, commercial testing and trade associations, and universities have contributed to the betterment of household equipment through their analyses to determine whether a manufacturer's statements of performance were correct and to compare construction and performance with that of competing makes.

Federal and State-supported laboratories have done research on household equipment a long time. One of the earliest studies, done in connection with ice refrigerators—to determine a performance characteristic based on the temperatures required to keep various foods—was carried on in a laboratory of the Department of Agriculture.

Ice then was the only refrigerant generally available to farm families. Their problem of selecting food-cooling equipment was one of choosing between iceboxes of different makes. Both gas (liquefied petroleum usually) and electricity were generally available by the early 1950's for refrigeration and for cooking, and heating of water as well. The problem of choice was between "fuels," rather than among appliances using the same fuel.

Elizabeth Beveridge and Earl C McCracken of the Department made a comparative study of utilization of energy by electric and liquefied petroleum gas ranges, refrigerators, and water heaters. By applying local rates for each type of fuel to the data on relative efficiency of the appliance in utilizing energy, farm families can compare costs of operating equipment that use different fuels.

Miss Beveridge and Dr. McCracken warned, however, that operating cost is only one of the factors to be considered when selecting the fuel to be

used. Also should be considered the installation problems and costs, dependability and convenience of service, the anticipated uses of the fuel, and cost and choice of appliances.

The Government's interest in household equipment has continued through the years and includes participation in the program of standardization as well as research and dissemination of information on the selection, use, and care of all types of household equipment.

Another major contribution of public-supported research laboratories has been possible through close association with engineering and research representatives of industry. Through these contacts, suggestions for improving equipment are relayed more quickly by household equipment specialists to the manufacturers than by the method of waiting for complaints from home-makers.

THE PRESENCE of modern equipment and conveniences in the farmhouse is immediately apparent evidence of the impact of technological progress on the farm homes. Less apparent evidences are the changing patterns of living and housing requirements of farm families.

Because the methods of doing housework are related closely to the equipment and facilities used, an innovation in either usually calls for a change in the work process.

Often the rearrangement—even a relocation—of the activity area is required if full benefit is to be derived from new conveniences. Costs in time and energy of carrying on the activity by the new process or in the new arrangement often differ from those of the old.

Forces operating quite apart from the farmhouse itself also have brought about change in the way farm families live. Specialization in farming and the expansion of the size of farming operations have removed from the farmhouse some of the work formerly done there. Using the farm kitchen for preparing small lots of butter, eggs, and vegetables for local customers, for ex-

ample, is largely a thing of the past. Utensils connected with milk production are not likely to be cared for in the house, as they formerly were. The greater size and complications of farm business increased the importance of bookkeeping and has intensified the need for a place in the house to keep and work on business records.

Farm family ways with food have changed, too, partly because of changes in farming and partly in keeping with general trends in buying, preparing, and using foods.

Farm families still raise much of their food, but not nearly so much as they used to. They tend to have smaller gardens and grow smaller amounts of vegetables and fruit. They produce more meat for their own use, however. Altogether, the average farm family now gets about 40 percent (by value) of its food from its own farm, as compared with 60 percent in 1941 and 70 percent in 1923.

As farm homemakers used less and less home-produced food, they increased their use of prepared and partly prepared foods. A third or more of the food dollar of the average farm family now goes for prepared and partly prepared foods. This is a substantial increase over the 22 percent spent for such foods in 1941. These foods include items like commercially baked goods, mixes, ready-to-eat cereals, frozen and canned goods, and lunch meats.

Bread baking moved out of the home as incomes increased and access to food stores improved. In 1919, 94 percent of the farm women in 33 Northern and Western States baked their own bread. In 1955, only 22 percent baked any bread or rolls in a week. But though they buy most of their bread and some of their other baked goods, they still do a lot of baking and so need space and equipment for it. In 1955, 93 percent of the farm women made some baked goods during a week.

The introduction of the commercial freezer locker started a revolution in home food preservation, and the home

freezer fostered it. Most farm women continue to can foods, but in smaller amounts than before. The average was about 500 pounds of canned food in 1951 but probably no more than 300 pounds now. But they more than made up for the difference by freezing an average of 333 pounds, compared to a negligible amount in 1941. A large proportion of the food frozen by farm families is meat.

All these changes in practices connected with feeding the family have had their effect on the design of farmhouses planned to fit the functions of family living. Changes in other areas of household production and patterns of living have occurred also. The proportion of farm women who do home sewing—three-fourths or more—is large enough to make it important to consider them in planning farmhouses.

Practically all farm homemakers do their own laundry work, or most of it. Because this work is common to most farm homes, we use it as an example of how changes in the processes and supplies involved and the equipment and utilities used affect the space required for a task and the house design.

A homemaker's bulletin on home laundering procedures, published by the Department in 1919, listed 49 pieces of equipment, from clothes boilers to wooden spoons, for doing the laundry. The equipment was to be supplemented by some 20 kinds of supplies, such as soaps, bluing, and stain-removal chemicals. Water usually had to be carried to the house. If there was a water pump, it was usually in the backyard or farther away so it was handy for watering livestock. The welfare of the livestock was of primary consideration, because it was a source of income for the family.

The washing procedure consisted of getting water into the tubs—a hose connected to the yard pump was recommended—then warming it with water heated on the cookstove. Clothes were soaked, scrubbed on the board, and boiled to "sterilize" and remove as much of the remaining soil as possible. Rinsing—more water was carried and

heated for it—was next. The final step was to hang the clothes on a line indoors or out for drying.

Small wonder that in many homes laundering was done in the kitchen, where a stove for heating water was nearby and the homemaker could dovetail the tedious, steamy, and smelly job with other household chores that had to be fitted into the day's schedule. Kitchens of the era were large—large enough to dispel the heat and steam arising from the stove and to permit several tasks to be done at one time.

The mechanical washer with wringer attachment made the laundry job easier. The clothes boiler and scrubboard began their journey into oblivion. Laundry supplies were improved. Some houses had piped hot water. But washing with a wringer washer was likely to be a splashy affair, and, regardless of the weather, clothes still had to be hung to dry. So the laundry area was moved out of the kitchen to a less obvious and roomier spot—the basement, porch, or shed. Relieved of this space-consuming job, kitchens were made smaller.

Within the past two decades, further changes in equipment and supplies have revolutionized home laundry methods and brought about further changes in housing requirements for the job. With automatic laundry equipment, no longer is there need for two tubs for rinsing and for baskets and carts to transport clothes from washer to line.

The list of equipment needed for laundering is just about one-third as long as the 1919 list. New finishes for counter tops and floors resist water damage and are easy to keep clean. Multipurpose washing compounds and easy-care fabrics have reduced by one-half the number of supplies needed in 1919 for laundering. The mess is gone, and with it part of the space that was needed to do the job. An area 6 feet by 6 feet, 8 inches, is sufficient for the entire washing and drying process.

Freed of the limitations imposed by the old equipment and old methods, the laundry area has come out of hid-

ing and can be located anywhere. It is not unusual to find it close to the bathroom and bedrooms, which are the main collection points of dirty clothes and household textiles.

Most household activities have undergone changes similar to those that have taken place in the home laundering process. All such changes, taken together, have had influence on requirements for design, arrangement, facilities, and structural materials for the house.

MORE THAN any other consumer goods, houses have a lasting quality.

Created from durable materials, put together with mortar and nails, bolts, and mortised joints, a house is built to stand for 50 years or longer. Once the house is erected, changes in the design or in the spaces that the walls enclose do not come easily. But within the inelastic areas formed by walls are people who carry on a diverse program of household activities, whose tools for carrying on these activities are constantly changing as new equipment, new materials, and new facilities are introduced in their homes and whose needs and preferences for housing are ever changing.

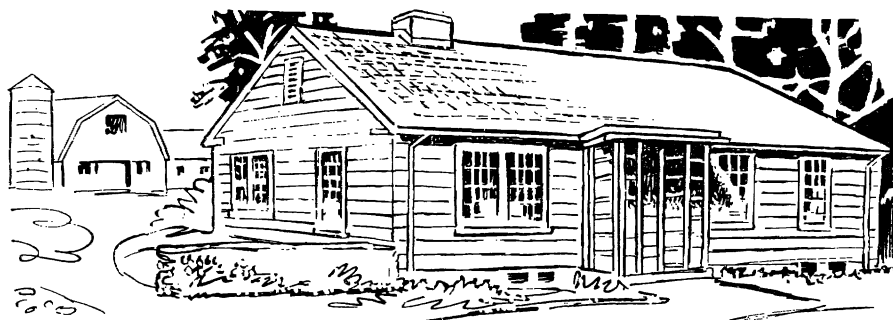
The conflict between the fluid requirements of families for housing and the static quality of their dwellings gives substance to the often-heard criticism that our farmhouses are obsolete—that they simply have not kept pace with present-day needs.

Are we really entering the Space Age with houses more suited to the horse-and-buggy era?

Are we merely refining old ideas and concepts of farmhouses instead of making progress in improving our farm housing?

Answers to these questions must be pieced together from a number of sources.

The 1950 Census of Housing and subsequent special studies describe in part our farmhouses of today. Generally, these houses are in good condition. For the United States as a



This plan, long the most popular in the Regional Plan Exchange Service, was redesigned to incorporate the changes in housing requirements brought about by new-style household equipment and family living patterns.

The Regional Plan Exchange Service is a cooperative operation of the Department of Agriculture and State agricultural colleges. Through it, plans for farmhouses and farm structures that incorporate the latest research findings on functional requirements, construction methods, and materials are made available to the public at nominal cost. The State agricultural extension services distribute the plans, generally through the office of the extension agricultural engineer.

whole, four out of five farmhouses have none of the faults that would cause them to be classified as "dilapidated." This represents an improvement over 1940—even with a more rigid definition in 1950 of what constitutes poor quality of housing. Nor is overcrowding a widespread problem if we accept the rule of thumb that there should be at least as many rooms in the house as there are persons living there. In no region is the average person-per-room ratio for farm dwellings equal to one. This varies with the size of the house, however; overcrowding in houses of one to four rooms is fairly commonplace.

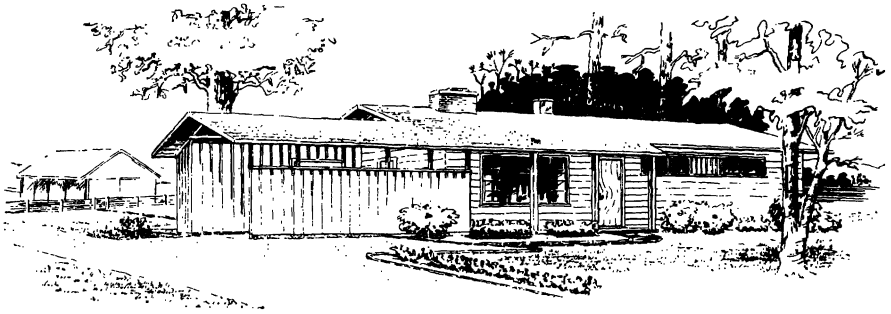
Electrification has long been of special significance in judging the adequacy of farm housing. Not only does it provide the farm family with the fundamental convenience of lighting. It also makes possible the conveniences of a water system and power for household appliances.

The 28-year span between 1930 and 1958 saw a tremendous growth in the number of electrified farmhouses, from 13 percent to 95 percent of houses of farm operators. Some areas, particularly in the Northeast and West, are completely electrified. Thus one of the most pressing needs of farm housing has been virtually eliminated.

With electricity, installation of a water system becomes a practical possibility. Farm families have taken advantage of it, although not to the extent that one might expect. Possibly the cost of installing a water system accounts for the lag. Almost two of every three farm operator families in this country had running water in their homes in 1956. The proportion varies from one of two in the South to nine of ten in the West. The houses of nonowners fared less well during this decade than did those of owner-operators, and running water in all farm homes is still an achievement for the future.

A substantial number of farmhouses in the United States are large, old houses. More than half of those in the 1950 Housing Inventory were built before 1920. During that period, houses of seven rooms or more were built oftener than any other size. Old houses are not necessarily out-of-date houses, though. They are more likely to be located on high- than on low-production farms. Houses on the better farms exceed the national average in respect to electricity, plumbing, and other modern conveniences.

Newer houses are smaller. More than half of those built during the 1940's had four rooms or fewer. Many were



Perspective of front elevation, revised design.

located on low-production farms. In these small houses, whether new or old, the need for improvements in farm housing is most apparent, because the smaller the house, the less likely it is to have electricity, or plumbing, or an adequate number of rooms.

Census data can tell us the number of rooms in a house. But adequacy of space cannot be judged on the number of rooms alone. The size, the arrangement, the uses demanded of each room, and the relationships of rooms to each other are the true keys to judging how successfully a house meets the demands for space and arrangement.

Likewise, a house may be in good condition structurally, be equipped with a bathroom and a mechanical refrigerator, have more rooms than there are members of the household, and show other evidences of modernity, yet it may be obsolete. Mere installation of a modern facility or piece of equipment does not in itself guarantee a house that measures up to the requirements of modern living.

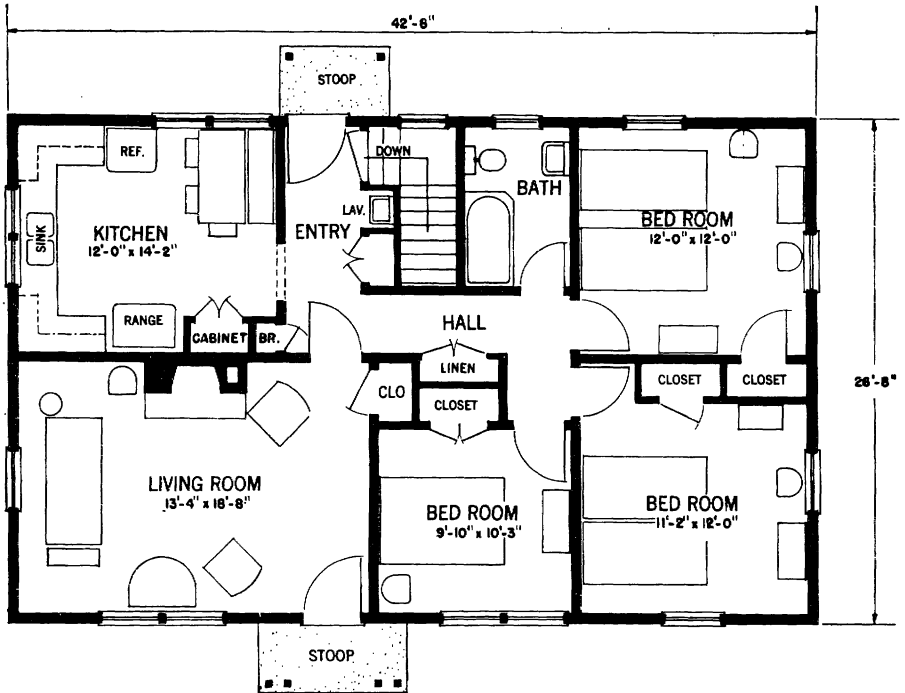
To meet functional requirements for housework, for family group life, and individuals' private life, it is generally agreed that the farmhouse must be so planned and arranged to provide for efficiency in household operation; protection and promotion of health, safety, and comfort of family members; and the development and nurture of the interests and talents of the family.

We do not have accurate statistics on

how well our farmhouses measure up to these livability standards. There are strong indications, however, that the faults are many.

With higher levels of living, more things have to be stored, and houses are straining at the seams to contain the greater number and variety of articles that families find necessary nowadays for their daily living. Data obtained in the 1948-1949 large-scale study of farm family housing needs and preferences showed that at least two-thirds of the houses in two regions had no closets other than clothes closets. Many houses in all regions had fewer clothes closets than bedrooms or no closets at all. Storage facilities in the kitchen were not determined in this survey, but probably they are more adequate than those in any other area of the house because of the educational program of the State extension services on labor-saving kitchens.

The arrangement of rooms and equipment has direct bearing on the time consumed and the human energy expended in carrying on household tasks. The survey, however, showed that rooms in present houses often are not satisfactory from the standpoint of the use that must be made of them. Many families now using the kitchen for washing clothes, cutting meat, ironing, and preserving food want to move those tasks to some other place. Fewer than one-fourth of the western women were content with the location of their



Floor plan, original design.

sewing facilities. One-fourth of north-central homemakers reported that they would like to be able to seat more people in the dining room than their present houses permitted.

Housing is an important segment of living costs of families and plays an important role in the satisfactions that the family derives from life.

Housing is of particular importance to farm families because, to a greater extent than in nonfarm occupations, it serves the farm enterprise as well as the business of living. In addition, the farmhouse must serve the family during its entire life cycle; unlike urban families, the farm family cannot shop around for a new house as their living requirements change.

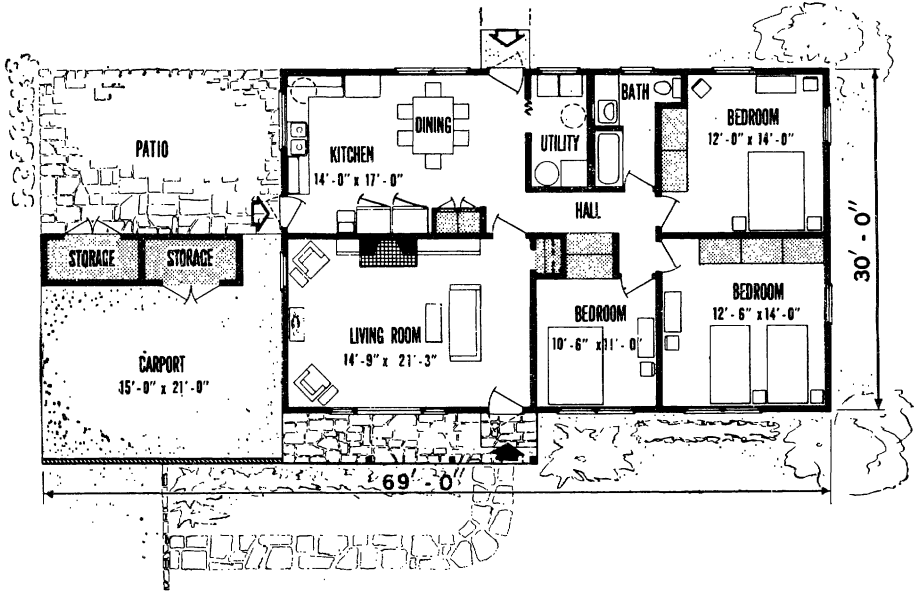
The Congress recognized the part that the farmhouse plays in maintaining a sound and prosperous agriculture and satisfying rural life, when, in the Research and Marketing Act of 1946,

it authorized "research relating to the design, development, and more efficient and satisfactory use of . . . farm homes" and "investigations that have for their purpose the development and improvement of the rural home and family life."

To carry out this directive, coordinated programs of research were conducted cooperatively by the Institute of Home Economics of the Department of Agriculture and the agricultural experiment stations in the four regions.

The persons most concerned with farm housing of good quality—the farm families themselves—were consulted during the first stage of research. This was done by determining the kind and extent of activities carried on in farm homes, preferred locations of activity areas, and kinds and quantities of articles for which storage is needed in the house.

Part of this information went to ar-



America on wheels brings the carport to the house in the revised plans. Automatic laundry equipment comes upstairs, and the freezer is established next to the refrigerator. Elimination of one wall increases space for dining in the kitchen. Storage spaces are of a size to accommodate the articles that farm families have to store.

chitects and others concerned with the design of farmhouses for immediate incorporation into plans for farmhouses.

By far the greatest amount of data became the basis for laboratory studies of space needs and efficient arrangements of space for household activities and storage. The findings of these studies are now being translated into graphic standards for home planners to use in designing new and remodeled farm dwellings.

Paralleling the studies of the need for space have been investigations of expenditures of human energy as related to the use of equipment and facilities of different designs and arrangements. A start has been made on studies of the influence and control of environmental conditions that are related to house design. The characteristics and performance of structural and finishing materials also are receiving attention.

Together, advancing technology and research are providing solutions to some

of the problems that have provoked the criticism that our farmhouses are obsolete. Farm families are spending more than 2 billion dollars a year to modernize farm structures. The farmhouse will claim a large share of this money, for attitudes concerning the value of good housing on the farm have changed as drastically as families' living patterns.

ON THE WANE is the practice of allocating to the farmhouse the income, if any, after needs of farm production have been met. More frequently now the farmhouse is holding its own in competition with farm machinery and farm buildings for a share of the family income.

This is as it should be, for the future ability to maintain competitive and family-type agriculture with trained and highly skilled labor and management is greatly influenced by the attraction of the farmhouse as an efficient and comfortable place to live.