ENGINEERING

Save Fuel By Saving Heat

Closing cracks, insulating walls, and cleaning the furnace are ways of stretching the fall fuel supply. Results from heating research are told.

By A. C. MONAHAN

➤ FUELS for heating will dig deep into the family budget this year but, in the average home, increased costs can be offset by cutting fuel and heat wastage.

Smoke-belching chimneys show a waste of natural resources and family funds. Rattling windows and doors indicate the householder is trying to heat up the great outdoors. Proper furnace management will consume the smoke, adding to the heat for the house. A little carpentry, or even old rags, will close the window cracks that permit the rattling and at the same time let the heat escape.

Even in homes without smoking chimneys and rattling windows there are usually many invisible heat losses. Combustible gases generated in the fire pot, unless consumed in the furnace, pass up the flue and their potential heat is lost. Also, in most houses, there are hard-to-find crevices through which hot air escapes. There are tremendous losses through walls not properly insulated and windows without outer storm sashes.

Research on Heating

House heating, incidentally, if comfort and economy are major considerations, is not a simple matter. Scientists and heating engineers are devoting their lives to heating problems. Much money is spent annually in university and engineering laboratories to discover methods of construction which will insure greater comfort to occupants in summer and winter, and better ways to obtain full value of the fuels used.

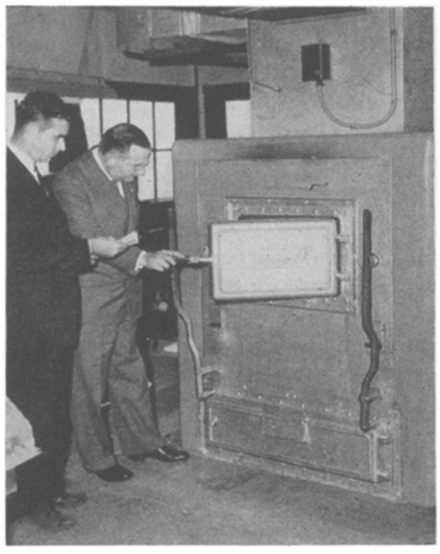
In recent years, with research pushed by fuel shortages, several fuel-saving furnaces and stoves have been developed, thermostatic heating controls improved, chimney construction studied, new fuels from waste products fabricated and heat distribution methods investigated. Most of the findings are for new homes, or future installation in old homes.

Present householders this winter will use the same old furnaces, with the same old fuels, in the same old houses. There are steps that they can take, however, to save fuel that will help out in this year's budget.

Any householder can get plenty of hints and suggestions for furnace management, heating and heat-saving from many sources, including government agencies. Associations representing heating and ventilating engineers, and others representing the anthracite, the bituminous coal, and the fuel-oil industries, give particularly helpful hints. The advice given is not hit-or-miss, but results from scientific studies and tests.

Fundamentals in home-heating economy include three often-repeated essentials that should be taken care of before the furnace turns from summer idleness to winter use. These are cleaning the heating surfaces within the furnace, filling the crevices in the building through which heat escapes, and having windows fitted with storm sashes.

Soot and hard carbon deposits on the flues within the furnace in which steam is generated or water heated can cut down the efficiency of the furnace as much as 30 per cent. Tight houses, with storm windows and doors, require up to 40 per cent less fuel than similar houses not so protected from heat losses.



FURNACE—Laboratory model of the new Williamson furnace, with draft system at rear, is being inspected.

Wall insulation, including insulation material in the roof and attic floor, is regarded by many as another essential, but one that the average home-owner can not install himself. University of Illinois scientists state, after several years of study and actual testing, that five times as much heat is transmitted through an uninsulated wall as through an insulated wall.

Experimental Houses

This Illinois state institution is among several that are making fundamental studies of home-heating. It has two houses on its campus used for the purpose, and at the present time is building a third. One is a two-story-and-attic colonial house, in use 22 years in studying warm-air heating. Another is heated with a boiler and radiators. The one under construction is a five-room one-story structure of the usual type being built today. It is to be heated by warm air.

The new home is a cooperative project of the University and the National Warm Air Heating and Air Conditioning Association. The university conducts the research; the association pays the bills. The house will be occupied by a non-research family so that it will get normal usage during the tests.

To show the thoroughness of the scientific studies made with these Illinois houses, each house has several miles of electric wiring built into it to connect 200 thermo-couples with a central switchboard. By these, temperatures are taken, not only in the various rooms, but within the walls, floors and roofing.

Chimney Construction

Chimney construction, it is found, has a definite bearing on furnace action. Various types of chimney materials and flue sizes are being investigated. The new house will have something new in chimney material; it will be made of molded asbestos instead of the customary brick, tile and mortar.

All studies in home-heating at the University of Illinois are not made in these special houses; some are made in mechanical laboratories. One develop-

ment to come from the engineering department is a smokeless bituminous coal furnace. It can be used with warm-air, steam or hot-water heating. Nearly 100 of them have been built by a manufacturer, and are now being tested in homes throughout the United States. Later, when testing is completed, it will be produced commercially.

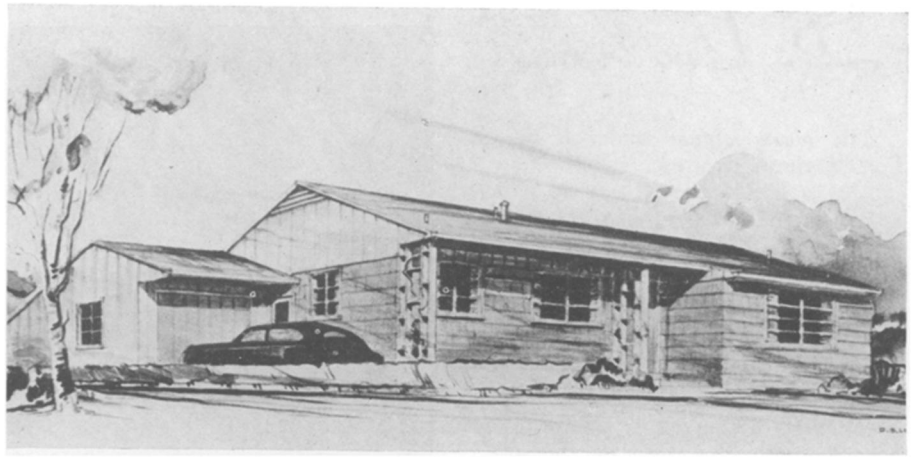
Another smokeless furnace, developed by scientists of the Williamson Heater Company, employs principles identical with those employed in the production of coal gas. In this furnace, the gases released by heating and partial combustion can escape only by passing downward through the hot fuel bed, and thence upward through a series of so-called Venturi tubes positioned at either side of the grate. Secondary air, entering these tubes, insures complete combustion.

Other Houses for Study

The model houses at the University of Illinois, erected for home-heating studies, are not the only structures of the kind in the country. Commercial homes constructed by building companies have been used by national organizations of heating engineers in studies made under their sponsorship. Some houses, identical otherwise, were built with or without wall insulation, storm windows and other heat-saving measures, so that relative heat losses could be determined. One notable structure is a special home-like building erected to study automatic heat control.

This is a penthouse on top of one of the main buildings of the Honeywell Regulator Company's plant at Minneapolis. It is a two-story structure, 30 by 30 feet, built of average housing material, with 120 thermocouples buried in the walls. This penthouse experiment has resulted in a new automatic control system that regulates temperature within the house.

Heating engineers have long recognized that human beings are unsatisfactory detectors of temperature changes within a home. Control thermostats are in general use in houses heated by fuel oil or gas. Their use with coal burning equipment is much less common. These thermostats, located in a theoretical heating center of the house, work on the on-off principle. When the house is too warm, they shut off the flow of oil or gas; when too cold, they open up in full. The new type eliminates the on-off method, raising or lowering the heat delivery to give constant inside temperatures that vary only a fraction of a degree.



LABORATORY—New house is being built at the University of Illinois' Home Research Center in Urbana-Champaign to study warm air heating in a typical modern one-story house.

Saving fuel in the home not only decreases the cost of living, but also helps preserve America's natural fuel resources. If 10,000,000 coal-burning homes save a ton a year each, it means a saving of 10,000,000 tons. If 1,000,000 oil-burners each use one barrel less, fuel oil for diesel power plants will be more plentiful, and so will be the supply of gasoline, because this essential aviation and automobile fuel can be made from fuel oil.

Petroleum Reserves

How long the known petroleum reserves of the United States will last at present rates of consumption is a matter of opinion, but estimates by experts vary from 15 to 50 years. Coal reserves will last many hundreds of years, geologists claim, but this does not mean that the better qualities will be available long. It is for this reason that scientists are so active in developing ways of satisfactorily using the poorer grades of coal and lignite.

Scientists are also active in preparing for use as home and factory fuels materials formerly regarded as wastes. As an example, sawdust and wood wastes from the great lumber mills are now being fabricated into blocks with a tar binder.

Waste coal "fines" are also being briquetted. Peat, now little used in America, may become a common fuel. In a European process, peat is masticated in water and formed into tubes which, when air-dried, become a clean fuel suitable for use in homes.

Saving fuel to conserve natural resources for future generations may not be such an appealing argument to many home owners, but saving expenditures from the family budget is another matter.

Science News Letter, October 19, 1946

Tons of pure *fluorine* were produced for war purposes by the development of an electrolysis process, and special containers were made to store it; this chemical element in the past had defied man's efforts to harness it.

A *high-protein* diet of powdered milk and powdered eggs will bring starvation cases to health more rapidly than any other diet now known.