ENGINEERING

Conserving Winter Fuel

The old home furnace will be in use for many more years despite the new type heating systems, therefore full heat value should be extracted from the fuel.

By A. C. MONAHAN

➤ THE old home furnace will continue in use for many years in spite of new heating systems developed and new and better smokeless furnaces which will deliver more heat from the fuel used than older types.

Some day the sun alone may heat your house, or perhaps you will gather your heat bit by bit from the little contained in the cold earth a few feet below frost-line. Both schemes are successful, but it will be years before they replace the local fuel-burning furnace, whether coal, oil, gas or wood.

The domestic fire belongs to an age of abundant coal, cheap labor and carelessness about social amenities, a British scientist recently said. His plea was for turning fuels into heat energy in central plants, where modern equipment is used and scientific firing can be carried out, and delivering the heat to homes in the form of steam, hot water, gas or electricity.

New Type Heating Systems

It is a dream of the future, but a practical dream already in operation in many places. Already in the United States and elsewhere a few homes are heated by the so-called solar energy of the sun. Also a limited number of homes are heated, on the refrigerator-in-reverse principle, by gathering up small amounts of heat from the cold earth below where it freezes, or from water in deep wells, or even from the cold outside air. The majority of home-owners, however, will still be shoveling coal this winter.

America has plenty of coal for centuries, and enough other fuels for many years, but their costs are rapidly mounting. Every item entering into the cost of mining and handling coal now costs more than formerly. Also, the supply of this fuel for domestic uses is not too great and probably will not be while great quantities are being shipped to help rebuild Europe's economy. The same situation is true of other fuels.

The answer in America is not a lack of sufficient heat in homes to insure comfort, but it is in getting the full heating value of the fuel used. It is a matter that rests with the individual house user. It means not only getting the most heat out of the fuel, but also preventing heat losses in the furnace itself or from the rooms of the building.

The way that most home furnaces are operated there are several heat losses. In ashes removed from them there is often much unconsumed material, because of improper firing methods. Much possible heat escapes up the chimney from the furnace either in the form of hot gases whose heat was not picked up by the furnace flues in which water or air is circulated, or of combustible gases not burned because of insufficient air to cause complete combustion.

Art to Proper Firing

As a rule the furnace is not to blame. The fireman is. There is an art and a science to proper firing. Some learn it by a trial and error method. A better plan is for the fireman to read instructions, copies of which can be obtained free from such organizations as the U. S. Bureau of Mines, the Department of Agriculture, state colleges of agriculture and engineering, or national associations of fuel producers.

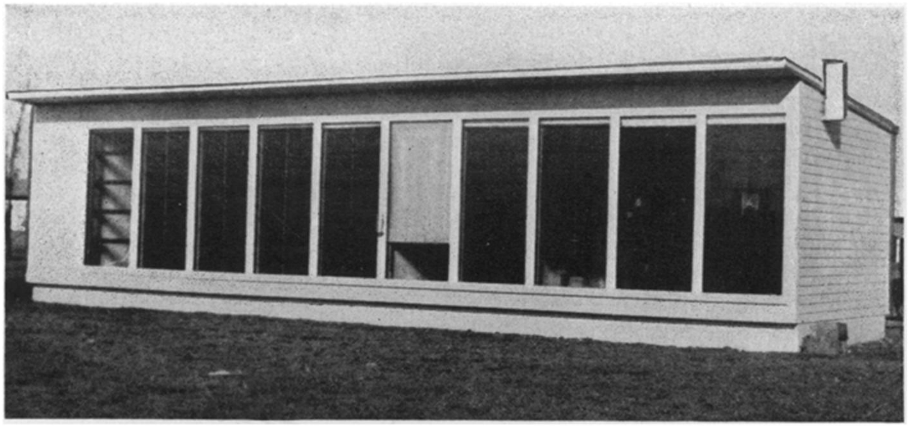
Soot and hard carbon deposits on the flues inside furnaces, being good insulation, prevent the passage of heat to the water or air used to circulate the heat to the house. They can cut the efficiency of heating as much as 30%. Any householder can keep flues clean. It means only a few hours work distributed throughout the season, using the wire brush furnished with a furnace for this particular job.

Factors in Heat Loss

Heat losses from a room are due to poor insulation, coupled with air exchange through visible or invisible cracks and crevices. The cracks and crevices are easily closed, with rags if necessary, but better with one of the special plastic putty-like materials now available for the purpose. They occur around window and door frames, under eaves and between the ends of floor joists.

Double sash on all windows, and special storm doors, can save up to 30% of the heat ordinarily wasted from rooms. The inside of a window pane feels cold to the touch when only a single sash is used. With the double sash it is about the temperature of the room. Insulation within walls and floors also saves much heat.

Heating homes by electricity from central power stations has much to commend it but is costly at the ordinary price of the electrical energy. Heating by gas is clean, relatively inexpensive where gas rates are low, and is generally satisfactory. At present there is much interest in getting heat from the cold earth and from the hot sun. Both



SOLAR HEATING—Experiments are conducted inside this structure in separated compartments where various methods of storing the sun's heat are tested at the Massachusetts Institute of Technology

SMOKELESS FURNACE—Scientists of the University of Illinois are checking its efficiency with technical laboratory instruments. With the same amount of coal it gives an estimated 50% more heat than a standard furnace.

are promising. One problem in using solar energy is the storage of the heat. This may soon be solved.

Solar Heating Experiments

A number of American technical colleges and universities are experimenting with solar heating. Among these are the Massachusetts Institute of Technology, Illinois Institute of Technology, Purdue University and the University of Colorado. All have experimental houses, and all have succeeded with satisfactory heating in winter periods of sunshiny weather. None of them, however, have solved the problem for economical storage of daytime heat for night and stormy days. None have yet developed an inexpensive installation making the cost of all-season heating less than by the use of coal. The future, however, is promising.

One principle employed in some of these experimental structures is that used in greenhouses. A glass roof covers the regular roofing with an air space between through which air can circulate. Within this space, in the Colorado experiment, glass plates one-third blackened are laid like shingles. The black absorbs the heat, which is then passed to the circulating air and through the house-heating air ducts.

In one MIT house, a blackened copper sheet under three air-spaced glass plates covered much of the building roof. Copper tubes, soldered to the copper plates, circulated water to a giant storage tank in the basement.

Another type of building has an all-glass wall on its sunny side. Double sash is used. Cement floors within absorb much of the heat and hold it for night use. Over the windows of these houses are projecting roofs that cut out the direct rays of the sun during the summer when the sun is high, and admit them during the winter months when the sun is low.

The focus on the solar heating problem at the Massachusetts Institute of Technology is directed toward economical storage of the heat collected. Water has been the most widely used storage material, but iron, concrete, marble and other materials have been successfully employed. Now, Dr. Maria Telkes of the MIT staff has found something that seems superior.

It is a chemical stored in sealed tanks which is a solid at ordinary temperatures but becomes a liquid at high summer weather. It takes a lot of heat to convert it from a solid to a liquid. This is what was once called latent heat but now known as the heat-of-fusion. It changes the physical condition but does not change the temperature.

One chemical found suitable for this purpose is Glauber's salt, a form of sodium sulfate. Its melting point is about 90 degrees Fahrenheit. When its stored heat is needed, air is circulated around the containers. The chemical begins to solidify, at the same time giving up its heat-of-fusion to the air.

The heat accumulation and depletion may be repeated indefinitely because the chemical is within a sealed can and never has to be replaced. The chemical compound can store at least seven times more heat than an equal volume of water. The tanks to hold it cost about the same as tanks for water.

Science News Letter, November 15, 1947

GENERAL SCIENCE

Finnish Institution Needs U. S. Scientific Books

➤ AN appeal for scientific and technical books and periodicals to rebuild the bomb-destroyed library of a Finnish institution has been made by Arthur E. Morgan, former president of Antioch College, Yellow Springs, Ohio, who recently returned from a trip to Finland.

Mr. Morgan reported that loss of its technical laboratory is handicapping recovery of Finland's technical institute, Teknillinen Korkeakoulu. Dr. Martti Levon, director of the institute, told Mr. Morgan that scientific and technical publications from the U. S. were needed to replace those lost in the war.

Gifts for the institute can be shipped to the Legation of Finland in Washington, D. C., for further shipment abroad, Mr. Morgan suggested.

Science News Letter, November 15, 1947

Zirconium and titanium may some day be used for tableware and jewelry; both of these so-called *rare metals* take a high polish and will not tarnish.