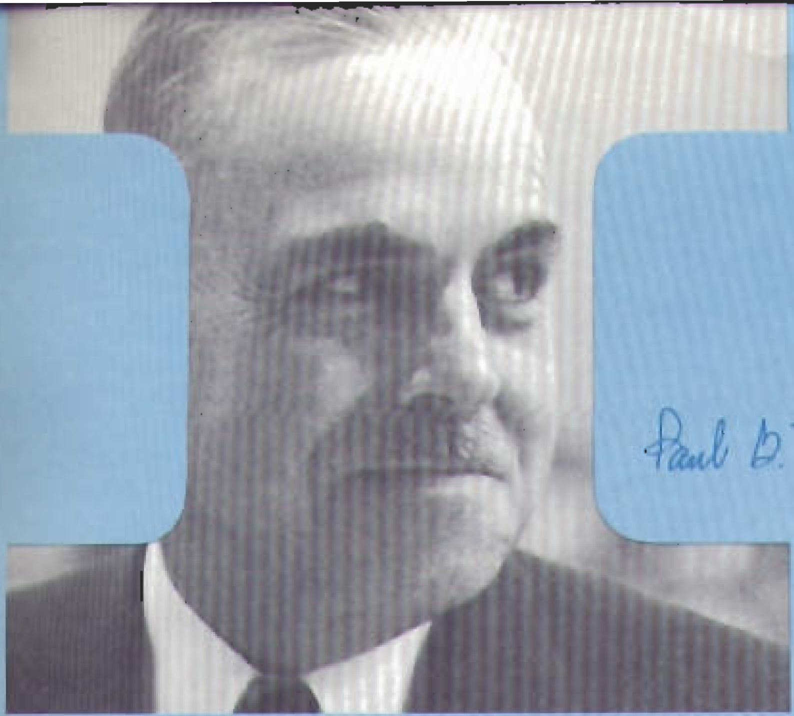
february 1960

Trade Winds

PUBLISHED FOR THE HOME HEATING AND AIR CONDITIONING INDUSTRY BY MINNEAPOLIS HONEYWELL REGULATOR COMPANY

OLD-TIMERS ISSUE



Paul B. Wishart | President

I AM PLEASED TO GREET

our friends in the home heating and air conditioning industry on the occasion of Honeywell's 75th anniversary.

This indeed is an occasion to be celebrated, especially since it coincides with the 75th anniversary of automatic heating. The progress all of us have made in this space of time has been considerable. Honeywell is proud to have had a part in this.

We are pleased with our accomplishments and have indulged in some self-congratulations. But we are not pausing very long to look back. Rather, at Honeywell we are looking ahead to our participation in the exciting decade at hand.

I frankly feel that this country of ours has a great and growing economy that statistics just can't measure properly. On this basis, I agree with those economists who feel our growth potential in the next 10 years probably is greater than we now visualize.

Although Honeywell has branched out into many significant fields, I believe the area of temperature control continues to present just about as good an opportunity for sales expansion as we have. I certainly do not think it's a static market.

I happen to think that residential air conditioning, for example, is "off the ground" now. I am not sure that I thought it was until I installed air conditioning in my own home. As soon as I got it into my own home, I realized what I had been missing. As far as I'm concerned, it's "off the ground." It's here today.

I believe that in the 1960s, residential air conditioning will be brought within the price level of more and more people.

I also expect residential air cleaning to become widespread in the 1960s. This trend will develop, not necessarily and exclusively because of the allergy problem, although this will be a part of it. But I think people want clean air. The story of air pollution in cities, I believe, will be dramatized in the next 10 years.

Another trend in the new decade will be a growing willingness by consumers to pay a bit for comfort in their homes. I think, therefore, that sales of zoned heating systems, indoor-outdoor thermostats and other modern comfort concepts will show a sharp increase.

I'm further of the opinion that before these 10 years are out, engineers are going to create indoor climate conditions that are not known now.

These are but the broad outlines of what the next years will bring to us. These will be exciting years.

With your continued interest and co-operation, we can make big strides together. So I greet you and congratulate you at this 75th anniversary and invite you to join with me in looking, not behind, but ahead.

CONTENTS

Trade Winds

Published by Minneapolis-Honeywell Regulator Company for the Home Heating and Air Conditioning Industry.

C. W. (Bill) Nessell, Honeywell home-comfort analyst and chairman of the field research committee of the National Warm Air Heating and Air Conditioning Association, compiled and wrote most of the editorial material for this special issue of Trade Winds.

Volume 5 February 1960 Number 6

Write Trade Winds, Minneapolis-Honeywell Regulator Company
2747 Fourth Avenue South, Minneapolis 8, Minnesota

OUR COMMON CAUSE

By K. L. Wilson—Honeywell Vice President, Residential

Here we are—in the long-awaited 1960s.

This is going to be quite a decade. More specifically, this is going to be quite a year for the heating and cooling industry and for Honeywell.

A company's 75th anniversary is a proud occasion. And there is special cause for observance when a company's anniversary coincides with a significant milestone in the industry of which it is a part. You'll all agree, I'm sure, that the birth of automatic heating in 1885 was a momentous development.

But it is not enough on an anniversary to sit smugly and look back with pride upon the accomplishments over the years. Honeywell is a company that does not have the time or the desire to coast along on the good will and the momentum of the past.

We are living in an era of great change with the expectation of even greater changes to come. Unquestionably this is one of the greatest periods of progress and opportunity the world has ever known. A forward-looking industry like the heating and cooling business and a forward-looking company like Honeywell must translate their anticipation into action.

I firmly believe that the great potential of this decade will be realized by us all if we renew our faith and our efforts in industry service. There never has been a more strategic time for the heating and cooling industry to build and expand its role in the economy.

With the common goal of upgrading the stature of the industry as a whole, we can capitalize on the tremendous opportunity ahead.

Some months ago, I stated that Honeywell is irrevocably committed to industry service programs. I said:

"Our belief is very strong that the best way—perhaps the only way—for us to advance our own interests is to place our primary efforts toward expanding the entire market, with the hope of getting a fair share of the new or additional business from this expansion."

This common effort is paying off. I am aware of the programs that are under way among some of our associations, individual companies, manufacturers, wholesalers, utilities and dealers of our heating and cooling family. There is concrete evidence that the industry believes in the modern merchandising methods that are the only answer if the industry is to compete for its share of the consumer dollar.

In keeping with this philosophy, Honeywell's 12-point sales promotion and advertising program for 1960 again is an all-industry campaign.

And that market we serve is a rapidly expanding one. To share in its rewards, our common effort must succeed in creating in the minds of consumers a real appreciation of the benefits of good heating and air conditioning. This education program will be long and time-consuming. It is much too big a job for any one company or association.

Air conditioning, hydronic heating, warm air heating, electronic heating and oil and gas burner manufacturers all have the same common enemy in the apathy of the home owner toward more comfort.

Let 1960 be the year when each segment of the industry lays aside its individual difference, and with an overall campaign engages in promoting better heating and cooling.

We at Honeywell are convinced that this is a growing and profitable industry. We are continuing to expand our research and engineering that will lead to the development of new products which will make the home a better place to live.

We salute you on this anniversary, and we invite you to join us in our common objectives and to share with us in our mutual benefits.

Nessell Notes

WHAT'S SO GOOD ABOUT THE "GOOD OLD DAYS"

We hear a lot of talk these days about the "good old days", but I wonder just what was so good about them. In fact, I am getting just a bit bilious over that old nonsense. I thought that mother made the best apple pie that ever came out of a bake oven, and I was ready to argue about it if any one questioned it. Now I am beginning to wonder if that pie was actually as good as I remember it. Mother was a good cook, but I have had apple pie made by cooks that were a lot better than Mother ever was, and I have about concluded that mother's pie was better in memory than in fact.

I feel just the same way about heating in the good old days when Mother made the apple pies, and I was a little shaver in knee pants. Mother did her cooking on a wood-burning, cast-iron kitchen range. She had an uncanny knack for regulating the oven temperature by adding the right size stick to the fire at the right moment. The old stove also heated that portion of the house, and those rooms it did heat were as hot as a biscuit out of the oven when she was cooking for company, and cold the rest of the time.

There was an old-fashioned baseburner with mica windows in the "settin'" room that burned anthracite coal when Pop could afford it. It had nickel-plated foot rests on all sides.

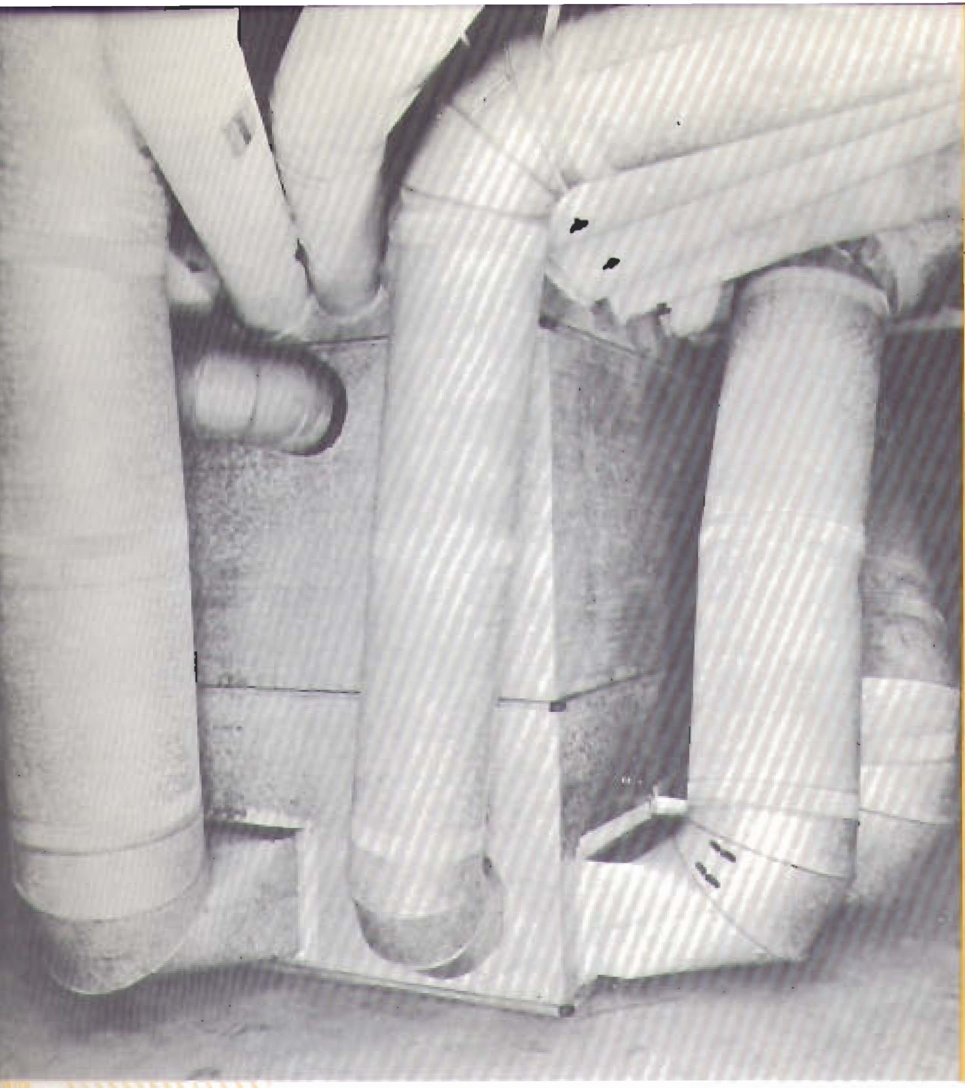
The family gathered about it every evening while the wind howled around the corners of the eaves, and the snow and sleet beat against the window panes. The ruddy glow of the fire through the mica windows bathed the room in a soft and mellow light while we ate popcorn and apples. I thought we gathered there every night because we loved to be together, but a suspicion lurks in my mind that the real reason was that it was the only room in the house warm enough to sit in. At that, we were warm only on the side facing the stove and decidedly chilly on the other side.

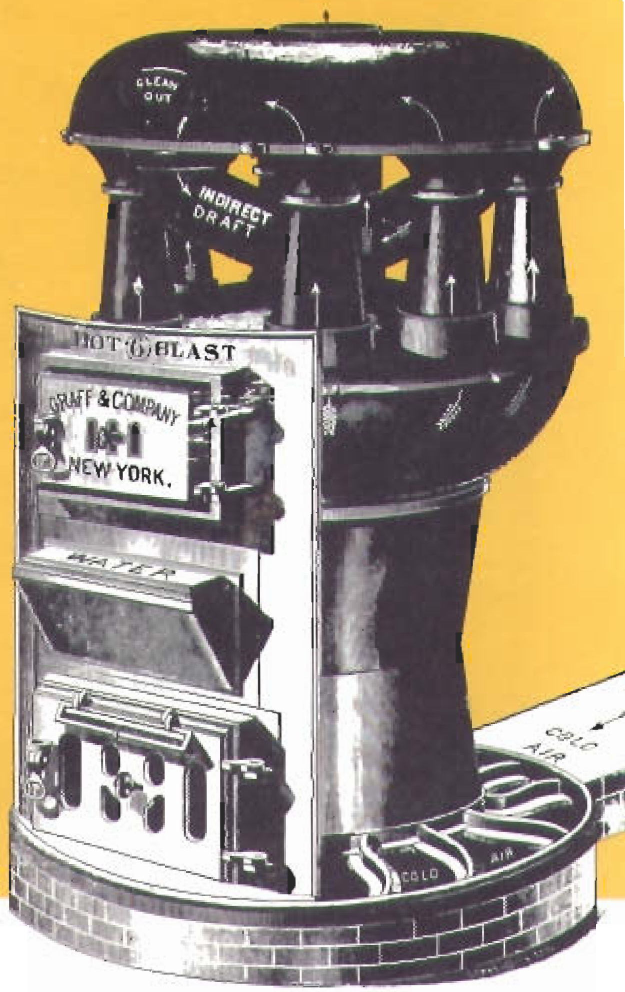
Our house had one of the first attempts at central heating—but only for one room. That was my room directly over the settin' room. The stovepipe from the baseburner went up through the ceiling and into a tight sheet metal drum in the room above on the way to the chimney. Usually it was as cold as a fish, but when the fire in the baseburner below was a husky one—well then look out. I discovered its potential the hard way one morning when I bent over too far while pulling on my stockings. I ate my meals for a month standing up by the sideboard.

Here is some more about the good old days. Getting up in the morning was quite a ritual. Some one had to crawl out of a warm bed to "fix the fire". Pop tried to persuade Mom to do it, but she would not even think of it because it was a man's prerogative, and she was not about to do it if she had to stay in bed all day. Pop struggled into his pants, muttering all the while, and then proceeded down stairs to attack the baseburner. First he shook the living daylights out of it with a great rattle of the shaker handle and then the opening of the coal door and the clatter of the coal pouring out the sheet metal coal scuttle. The final movement was removing the ash pan and taking it into the kitchen with a fine trail of ashes behind him on the rug.

After a few moment of silence the performance was repeated on the range in the kitchen accompanied with a great clatter of stove lids. For the final chord of this early-morning symphony came the rattle of the coffee grinder. By that time even the sleepiest soul was wide awake and breakfast was served on time to all hands. Years later I asked Mother if she ever longed to go back to the good old days that seemed so sweet to me in retrospect. Her answer was a very short and unqualified *NO*. "You can have it if you want it, but not I."

When you look back, the good old days of heating were not





A TYPICAL gravity warm air furnace with a maze of pipes in the basement.

CAST IRON FURNACES like this one could weigh upwards of 1,200 pounds. Manufacturers did not spare the iron.

much good for anyone, including the homeowner and the heating dealer. Central heating systems were often sold to the reluctant homemaker on the strength of "we will take all the dirt from the fire in your living room and put it down in the basement where it belongs." She was not told that she would chase down the cellar stairs several times a day to throw coal on the fire, nor that some of the dust and dirt in the cellar would find its way back into the house. She was unhappy when she found out.

The early coal fired gravity circulation central heating systems brought a new group of troubles to the dealer. Women with gravity warm air furnaces in their homes complained that they were dusty and dirty, and so they were because they had no filters and the dust that did get into them was freely circulated through the house. Further, when the furnace was hot, some of the dust in the air stream would carbonize on the hot heat exchanger and release an odor in the house that no one liked very much.

Even women with gravity hot water systems in their homes complained. One such in a moment of bad temper accused the dealer of not "screwing the pipes tight enough" because dirt from the fire was getting into the water and was coming out through the iron of the radiator and smudging the walls above them. He never did convince her that she was talking through her hat.

No dealer will ever forget some of the troubles he had with central steam heating. While these systems could be made to work quite satisfactorily if properly installed, the catch was to have them installed and drained correctly so that water hammer did not develop when the steam wanted to go in one direction and the condensate in the opposite direction. When that happened, and it did quite often in spite of the better fittings and careful installation, the resulting clamor was indescribable. Many heating dealers spent hours and dollars to eliminate these "hammers of hell" from a heating system.

The advent of forced warm-air heating systems was supposed to eliminate most of the problems of the warm-air installation, but instead of reducing them they merely eliminated a few and added more. No one in the field seemed to know very much about the blowers used with a forced air system and so we were off to the races again for a while. Whenever a system would not heat a room properly, the common and accepted practice was to speed up the blower and whoop her up they did. They had air coming out of some of the registers at a rate fast enough to raise a woman's skirts well above her knees, not to mention drafts down the neck and cold air currents around the ankles. Blowers were not recommended for use without filters in the return-air side, but many took this recommendation lightly in the early days.

The ultimate was reached when a woman complained that the gas-fired furnace was blowing soot around the house—as evidence look at it in the bathtub. The dealer spent an anxious day on that one only to discover that the Christmas tree was standing over a return air intake in the floor and that the air stream was sucking in pine needles and burning them on the hot sides of the combustion chamber. That's where the soot came from and that was when filters went into the system.

Hot-water heating systems came in for their share of troubles, too. The early gravity circulation systems were characterized by large pipes overhead in the basement and these at best were a pipe fitter's nightmare. The circulation through the systems was often sluggish and the distant rooms did not get enough hot water to even take the chill out of the air. The valves and fittings had been greatly improved but they still too often plugged up with mud.

Some of these troubles disappeared when the expansion tanks were closed and the Honeywell Heat Generator allowed the system to operate under pressure and the 3-inch pipes could be replaced with 1½ or 2-inch pipes. But the hot water troubles did not get out of the serviceman's hair entirely until circulating pumps were introduced that would push the water where it *should* go instead of allowing it to move through the system where it *happened to want* to go. But the circulator pump was not a part of the "good old days." It is a part of the present.

Oil burners for the home appeared about 1917 and they brought problems and worries for the heating dealer that made all his earlier ones look like a Sunday school picnic. They also brought new worries and frustrations to the homemaker, the likes of which she never had seen before or since in anything relating to the heating of her home. It took a stout-hearted dealer and a patient home owner to live through them. Gas-burning home heating equipment appeared about the same time, but the dealers' problems with early gas-burning equipment were by no means as spectacular as they were with oil.

Proper controls for oil burners did not appear until about the middle of the "roaring 20's" and even then there was uncertainty as to what they should do—and how. This was not due as much to uncertainty on the part of the control manufacturer as it was to the simple fact that every oil burner manufacturer had his own idea as to how his burner should be controlled. His was "different" from the rest of them. Most of the early burners were simple affairs since the oil was burned in a pot or combustion chamber set at about grate level in the furnace or boiler. If the oil did not ignite when the valve opened and allowed the oil to enter the pot, the unburned oil would fill the bottom of the pot and drain out through a spill pipe into a trip bucket that would stop the oil flow when the pot got filled. Even many of the more advanced types of burners used this safety feature—if it can be called that—until the middle 30's.

The trouble was that sometimes the pot refused to work when it should, or shut down the burner when it should not have been stopped. Many a dealer on a service call of no heat in those early days arrived on the scene to find the basement floor covered with four or five inches of oil and the oil tank would be empty. The trip bucket had failed to work because a roller skate of one of the kids in the house had rolled under it or a block or brick accidentally or carelessly kicked under it. Few present day dealers can appreciate what a mess this would turn out to be unless they have had the experience themselves. And no housewife will forget the oil smell that lingered for weeks after it had been cleaned up, or the fire hazard that existed while the oil was on the basement floor.

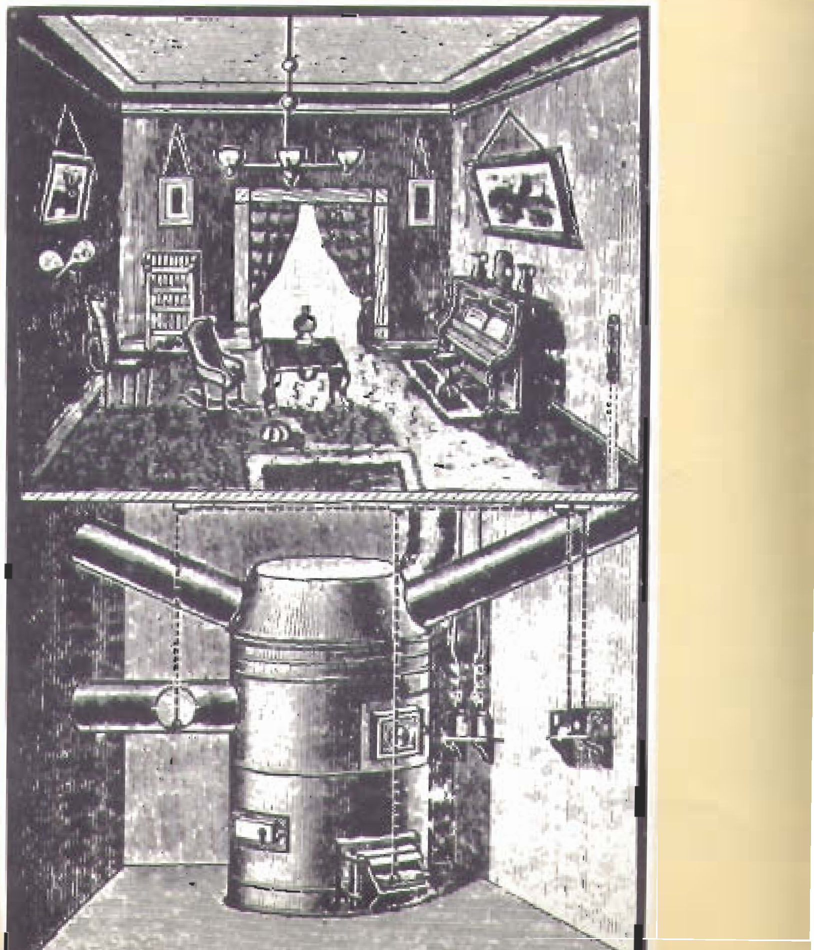
Sometimes the bucket would trip when there was no reason for it to do so and again the heating dealer had a "no heat" service call. One dealer had five or six such service calls in a row from the same house. The trouble always occurred at night and there was no heat in the morning. In sheer desperation he decided to spend the night in the basement and he did. At bedtime the owner opened the basement door, said good night to the service man and pushed the dog down the cellar stairs. The dog cavorted around the furnace a couple of times and his tail hit the trip bucket on the last cavort and off went the burner. That was it. The service man placed a screen around the burner, put on his hat and went home. The trip bucket disappeared with improved control methods and everyone breathed a sigh of relief.

Some of the early burners that used an integral combustio[n] chamber or pot had a trouble that was rapidly giving the dealers an[d] servicemen gray hair and causing them to lose sleep. This pot wa[s] made of an alloy steel that was not supposed to be affected by th[e] heat of the oil flame within it. The trouble was that it was affecte[d]. After the burner had been in service awhile the steel pot would crac[k]. The oil, or at least part of it, would flow through the crack into th[e] space at the bottom of the boiler or furnace instead of being burne[d] properly in the burner. After enough oil had been accumulated und[er] the boiler it took fire and then there was a good "boiler fire." The[re] was nothing much the service man could do about it except to watc[h] it burn with a fire extinguisher in his hands to try to keep it from spread-ing. When a service call indicated a boiler fire it was then a race to se[e] if the black truck of the service man or the red wagon of the fire de-partment would get there first.

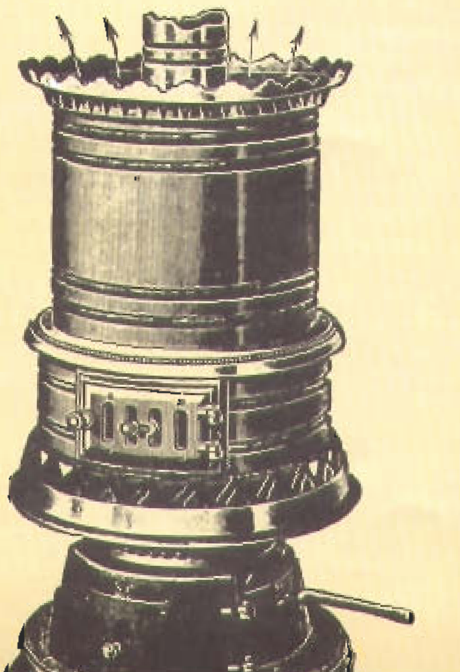
There were plenty of ignition troubles in the early days, an[d] these neither the homemaker nor the service man enjoyed. If the burne[r] did not light immediately when the oil started to move into it, the o[il] vapor would take off like a fireworks explosion when ignition did tak[e] hold. These explosions were never identified as such but were know[n] as "puffs" even though the "puff" wrecked the basement wall an[d] tossed the firedoor into the next county. These occurred all too frequentl[y].

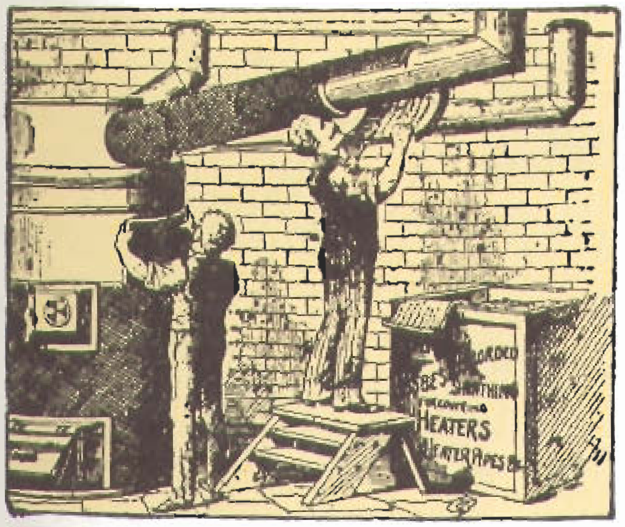
If nothing worse happened when a "puff" occurred, the boil[er] door usually was blown across the cellar and the smoke pipe torn dow[n] and scattered over the basement. But that was not all. Usually th[e] house was filled from top to bottom with a dirty, nasty oil smudge th[at] deposited oily soot on walls, windows, carpets, and furniture. Th[e] entire house had to be redecorated and sometimes the furniture re-placed. One dealer reports that he had been called in on a job whe[re] seven such shenanigans had occurred in a single month and the hou[se] redecorated after each one. While the dealer was usually insured again[st]

WARM AIR HEATING was advertised this way in the 1880s. The artist's conception was not so good. Neither was the heating.

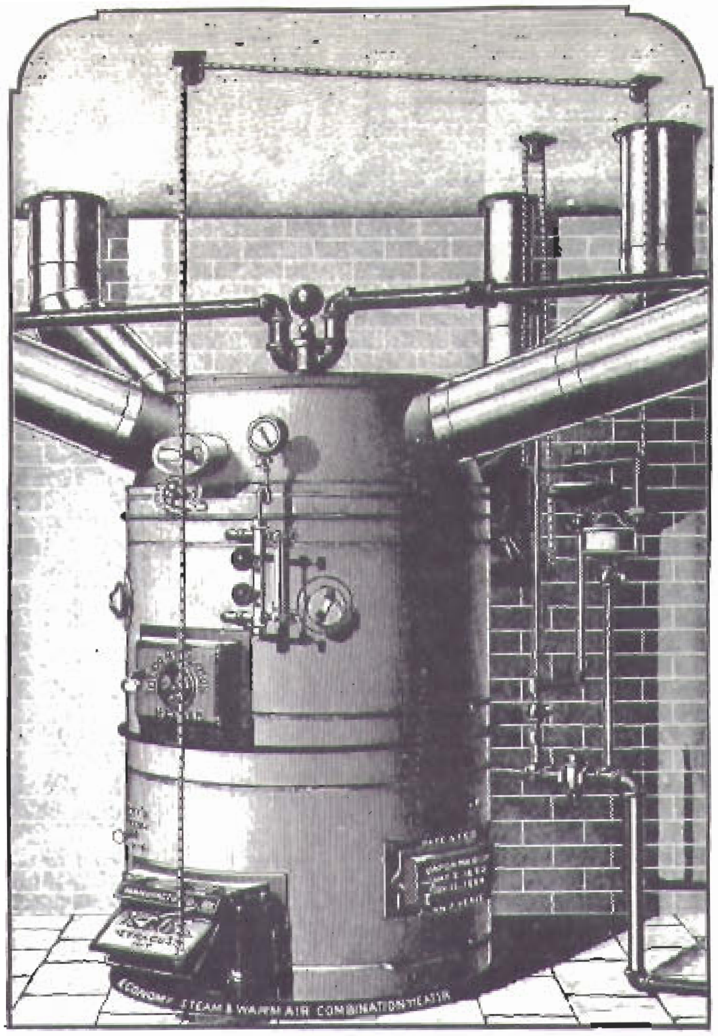


AN AIR CIRCULATING room heater of 1890.





BASEMENT FURNACE and boiler pipes alike were covered with asbestos insulation back in 1880.



COMBINATION STEAM and warm air heater in 1880. Warm air for the near rooms—steam for those more distant.

such an unfortunate incident, it is understandable that the insurance agencies began to take a dim view of such goings on.

All this was mixed with the humor and pathos of living. One service man had been called to a home where the oil burner had been "acting strangely." Just as he was about to enter the cellar the burner took off and a big cloud of black oily sooty smoke rushed up the stairs to greet him. When the smoke cleared, he saw a stout woman jumping up and down and howling incantations that made him wonder if she had been seriously hurt. No, she was not hurt. She had only been ironing men's white shirts all morning and had about 30 of them hanging on a line in the basement. And the shirts were covered with oily soot.

Many more stories of these early hardships may be told, but there is little need to tell them because they were all much alike and vary only in the degree of damage done to the furnace or boiler and to the house. But they do point to the fact that the service man in those days had to be a stout-hearted lad.

They also made oil burners more difficult to sell and the salesmen of those days were working against odds that the present day heating salesman never encounters. One exceptionally good oil-heat salesman would never let the conversation with the prospective purchaser of an oil burner get into the realm of burner incidents but instead concentrated on the wonderful comfort and carefree living of automatic firing. He covered himself, however, after he had the signed order by telling the folks that they had nothing to fear unless the hardwood flooring in the living room began to rise toward the ceiling, and then it was time to get outdoors.

There were problems with gas-fired equipment that the service man had to overcome too, but these usually were not as spectacular as they were with oil. Most of the very early gas-fired central heating units were controlled with a lever-type gas valve with the lever of the valve connected to the crank arm of a damper flapper mounted on a nearby wall. There was never much pilot trouble in those days because a standing pilot was used that was large enough so that it could not go out. The trouble was that the pilot alone was large enough to overheat the entire house in mild weather and the service man was asked "what to do about it."

But once in a while there was trouble with the gas valve. The damper flapper required electricity to open or close the valve. If the power was interrupted, there was no way to open or close the valve in response to what the thermostat said. Every once in a while, the power would fail with the valve in the open position and the burner operating. Then there was sure to be trouble if the home owner did not happen to be around the house. The house would get seriously overheated if some one did not close the valve manually, and along with it there was an ever present fire hazard.

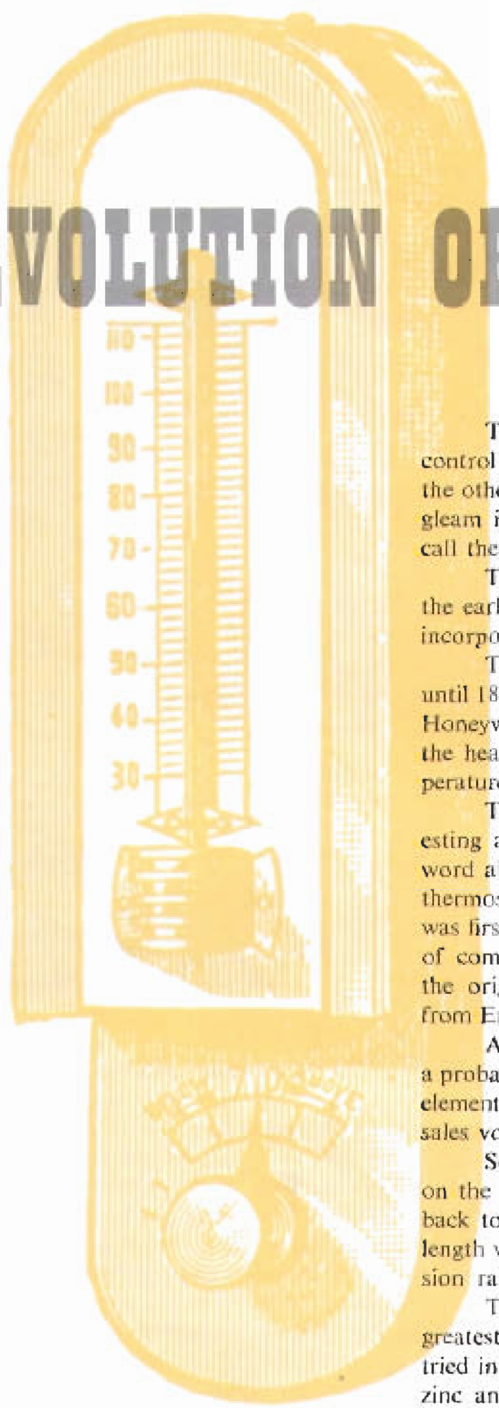
One service man was called and taken to task because the gas burner was regularly singeing the dog and sure enough it was. The dog had the habit, the service man discovered after watching the animal for several nights, of crawling into the ash pit of the furnace just below the burners and when the burners came on the dog came out with a few of his hairs burnt off. In another instance, the home owner had tied a long rag to a half-inch pipe for the bulldog to play with. The dog was frisky and strong and the pipe unfortunately was a gas line. When the dog broke the gas line and was asphyxiated, the service man was asked to explain "how come?"

Many homes in the days of early gas heating were heated with space heaters and most of them not vented to the outdoors. There have been numerous tragic incidents where the unvented heater used up most of the air in the house and began to spill monoxide into the room air, and with tragic results. The only heating equipment that some of the homes in those days had, particularly in the south and southwest was a gas jet in every room. The owner was expected to furnish a space heater for each of them and connect the heater to the jet with a hose. There have been many instances where children or animals played with these hose attachments and disconnected them accidentally, often with tragic results. Most of these arrangements have been outlawed by cities and by gas companies, but that is what we had in the good old days.

Do you still think you would like the good old days with heating equipment that was almost *primitive* in comparison with what we have today? Well, if you do, brother, you can have it. I like it the way it is now and even more so the way it will be 10 years from now. I don't want to risk my neck anymore with a burner "puff" or subject my customers to the inconvenience and peril that the heating man in the "good old days" was forced to do because there was nothing better. There wasn't much good in the good old days and you can have them.

THE LATEST and the first—1960 and 1885.

THE EVOLUTION OF THE THERMOSTAT



Thermostats are so integrated into an automatic temperature control system that it is impossible to talk about one without saluting the other. When automatic control of room air temperature was still a gleam in the eye of some starry-eyed inventor, devices that we now call thermostats had been in existence for more than 50 years.

True enough, it would require a bit of imagination to identify the early ones as anything resembling a thermostat, but in them was incorporated the basic principle upon which thermostats operate.

The birth of automatic heating itself, however, did not occur until 1885, when a small company that eventually became Minneapolis-Honeywell introduced the missing link between the thermostat and the heating system. This missing link was America's first home temperature control system known as the "damper flapper."

The development of thermostats over the years makes an interesting and fascinating story, but it would be incomplete without a word about the twisting, curling and moving bimetal that makes the thermostat come alive. Apparently no one knows for sure when bimetal was first conceived, but we do know that it was mentioned as a means of compensating a Chronometer for temperature variations before the original 13 colonies in America were considering divorcement from England.

About 50 years later a Frenchman came up with a "thermoscope", a probable predecessor of the thermostat, using temperature responsive elements of silver, gold and platinum. History is silent concerning the sales volume of this device, but it probably was not spectacular.

Some engineer or tinkerer back in the long-gone days stumbled on the bimetal principle that two lengths of dissimilar metals placed back to back and riveted, brazed or welded together for their entire length would bend or curl when heated because of the different expansion rates of the two metals used.

The problem was to find the two metals that would give the greatest amount of movement. A combination of brass and iron was tried in 1837, and brass and steel twenty years later. Combinations of zinc and copper, and of nickel and brass were tried in subsequent years. The first Honeywell thermostat, manufactured in 1885, used gutta-percha and brass riveted together.

Many of them worked after a fashion but there was one problem common to all of them. Both of the metals used in the combination became longer as they were heated, or as one old sage put it, "They growed." But the amount of curl or movement the combination gave depended upon how much more one of them "growed" than the other. Sometimes this was mighty little to go on.

Consequently bimetal assemblies had to be relatively long to get enough movement from them. They also had to have enough power to do some work, so a rather heavy piece of each metal was necessary to give it the necessary amount of push. That is why the early thermostats were large and cumbersome by comparison with those made today.

All this was changed about the turn of the century when an alloy of nickel and iron was discovered that did not lengthen when heated. It was called INVAR, a word coined from its expansion characteristic—*INVARiable*. From that day on the construction of bimetal and refinement of thermostats was off to the races.

Today we have bimetals using invar that have enough movement and push with minimum mass and length to make the modern thermostat possible. It comes in many forms and shapes. The ones usually used in thermostats are the flexing blade, the "U" shape, or the spiral coil that resembles the main spring of a small clock.

The early history of thermostats is a bit cloudy, but they were manufactured in considerable quantity prior to 1885. Up to that time they had not been used to control heating because the missing link between the thermostat and the heating system had not been discovered.

The first Honeywell thermostat appeared in 1885. It was a part of the "damper flapper"—a control unit that opened and closed the dampers on a coal fired furnace or boiler. This "damper flapper"—the missing link between the thermostat and the heating system—was hailed as a great invention because it eliminated the necessity for someone to dash to the cellar in response to flashing lights or the clamor of a gong.

Statistics do not indicate if this innovation had any noticeable effect upon the sale of various tinctures and emulsions for tired leg muscles. It did, however, have a profound effect upon the disposition of the homeowner and upon his heating comfort.

The first Honeywell thermostat was no great shakes as an ornament hanging on the wall of the old "parlor". It had a base slightly over two inches wide and nine inches high and ⅝ of an inch deep. The bimetal assembly extended almost the entire height of the base plate and was mounted on it right out in the open without benefit of cover like an undressed sea nymph on the beach.

It was not long before this nakedness was modestly concealed by a suitable cover except that the electrical contacts were left exposed, presumably so their occasional electrical spark would convince folks that it was working as it should.

A thermometer was mounted on the case for reasons not quite clear. It might have been for ornamentation or to prove to one and all that the thermostat was doing a good job of temperature control. Whatever the reason, the inclusion of a thermometer started an industry practice that the manufacturers lived to regret. The thermometer was a good one, but its accuracy and even the temperature control of the thermostat was forever-after unfavorably compared against the cheapest dime store thermometer in town. Subsequent efforts to eliminate them were unsuccessful and we still have thermometers on thermostats.

During the next few years thermostats became smaller and more attractive in appearance, and with a greater degree of sensitivity to temperature changes.

Clock thermostats came along about 1906. Unquestionably these were the answer to a real domestic need. Back in those days, perhaps more so than now, folks enjoyed a cool house at night for sleeping but understandably did not relish the chilly air in the morning. Perhaps the battle of the sexes started with the early morning arguments as to who was to get out of a warm bed and traipse down the cellar stairs to "fix" the furnace. Clock thermostats did away with all that.

They were advertised as providing "Cool Rooms To Sleep In—Warm Rooms To Dress In—and Fuel Saved Besides". Their sale went up like a sky rocket and then came a problem of getting clocks. Good ones were hard to get and the poor ones that were available did a most dismal job. Honeywell finally decided to make its own clocks and came up with the finest eight-day thermostat clock ever made.

The clocks used on the early models were hand wound. One-day clocks came first and within a year or two these were supplemented with eight-day clocks. In the early models the addition of the clock to the thermostat made them larger and more conspicuous and did little to make them a thing of beauty.

Perhaps the most bizarre of all of them was the one with two clocks that were hung on the bottom of the thermostat, one above the other. But before they were superseded by the electric clock about 1931 they had been designed and redesigned by Honeywell into a very attractive control.

One manufacturer announced a hand-wound clock for a heating system that would "operate the dampers or feed your horse", which no doubt was a handy arrangement for those gentlemen who cantered

to the office in the morning. Most of the present generation have at least seen a horse, but perhaps some of them do not know that a horse eats oats for breakfast.

This handy arrangement opened a flapper in the oats chute to the feeding trough at a preset time in the morning so the horse had an early breakfast and was frisky and rarin' to go when the owner opened the barn door. It was said to be particularly convenient for milkmen, grocers and draymen, not to mention the horse.

Honeywell again showed its industry leadership in 1935 when it announced a thermostat with "heat anticipation" at a time when the industry was in a jam. Oil and gas burning heating equipment, which had been introduced during the early '20s, was not getting satisfactory room air temperature control from the then current thermostat models. Such equipment was supposed to maintain room air temperatures with only a couple of degrees variation between cycles of the automatic burner, but the trouble was it didn't. The room air temperature swings turned out to be several times what the catalogue pages said they should be, a fact that disturbed Honeywell engineers and the heating people no end.

The reason was not hard to find. A thermostat is said to act in response to changes in room air temperature, but actually it operates in response to temperature changes of its bimetal within the case and there is always a temperature lag between the two.

Further, these new fuels added some complications to the scene. Heat was not delivered into the house the split second the thermostat called for it, nor did it stop instantaneously when the thermostat signaled it to stop. It required some minutes after the burner started for the furnace or boiler to get hot enough to deliver heat into the house, and when the burner stopped there still was a lot of heat in the furnace to be released into the house.

THIS THERMOSTAT of the mid 1930s was the first to use heat anticipation to eliminate temperature over-runs in the house.

AT THE LEFT is the first clock thermostat ever made. Tested in W. R. Sweatt's own home, it was the predecessor of all night temperature setback thermostats.

While all this was going on the room air temperatures could run riot, and usually did.

This problem of over and under-shooting of room air temperatures was eliminated by putting a little additional heat into the thermostat, a method that seems very simple by hind-sight but there was a heavy concentration of wrinkled brows and the burning of much midnight oil before it was accomplished. A small electrical heater, much like the one used to heat a bathroom on a chilly morning, was placed close to the bimetal, inside the case. The instant the thermostat started the burner, the heater started to heat the bimetal and warmed it just a bit faster than the heat from the furnace warmed the room air.

The bimetal reached the temperature of the thermostat setting before that temperature was reached by the room air, and it stopped the burner early enough to allow the heat remaining in the furnace to complete the job. This scientific application of heat to the thermostat became known as "heat anticipation" and is now standard in some form or other on virtually all domestic thermostats.

In 1952 Honeywell defied tradition by changing the shape of the thermostat. Up to then virtually all non-clock thermostats were rectangular or slightly oval in shape, and although they were attractively finished in bronze or silver, there was a growing dissatisfaction on the part of the American housewife over a mid-Victorian thermostat on the wall of a modern living room.

Honeywell changed that by announcing a round thermostat, an action that was accompanied by the hoots, jeers and snide remarks of those who did not know. But the new thermostat caught on. The women liked it. It had been designed by an industrial designer to fit into the decor of any room. It was small and could be decorated to match the wall on which it was mounted and consequently thermostats became pleasing to look at and inconspicuous for the first time in history.

The hooting and jeering gave way to respectful silence and before long almost all non-clock thermostats, no matter who made them, were appearing in new shapes with new clothes. Further, this new round thermostat incorporated so many engineering advances that make thermostats better that it set a new standard of performance for them.

Special thermostats for special needs became necessary from time to time, and Honeywell made them as the need developed. One of these was the semi-automatic clock thermostat that permits the owner to manually establish the night set-back temperature at the time he retires and then automatically restores the day-time temperature at the desired hour in the morning. This is a great boon for those with irregular sleeping habits or for those whose homes are unoccupied during the day.

Another was the thermostat that automatically does away with the chilly feeling indoors when the outdoor temperature drops and the inside surfaces of the walls and windows become colder. The temperature setting of this thermostat is automatically adjusted to compensate for the changes in outdoor weather that cause indoor discomfort. This is done through the weather-watching of a slave thermostat outdoors. Owners can now keep comfortable throughout the winter without becoming "thermostat diddlers." The outdoor thermostat does the "diddling" for them.

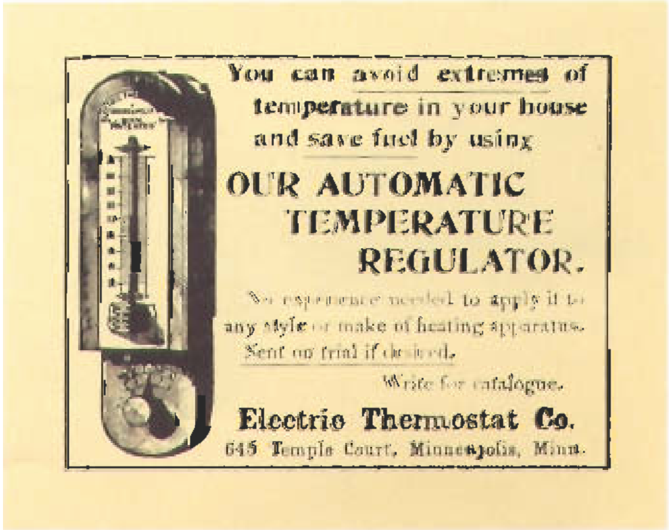
Residential summer cooling systems also introduced some thermostat problems, but not for long. Honeywell soon came up with a thermostat that would control either heating or cooling, each with the same degree of smoothness, and if desired could even determine if the house should be cooled or heated and automatically adjust the operation of the system accordingly. Some of them are literally a control center for the heating and cooling operations, in addition to measuring and controlling the room air temperatures.

These are the major highlights in the development of the domestic thermostat from its humble beginning to the present, and the present is only a wayside stop on its journey to what it will be in the future. The years of experience and research by Honeywell have resulted in many engineering and design improvements, including trouble-free electrical switches, better bimetals with greater sensitivity and faster response, steadfast calibration, and electronic circuits that threaten to replace bimetals entirely in thermostats.

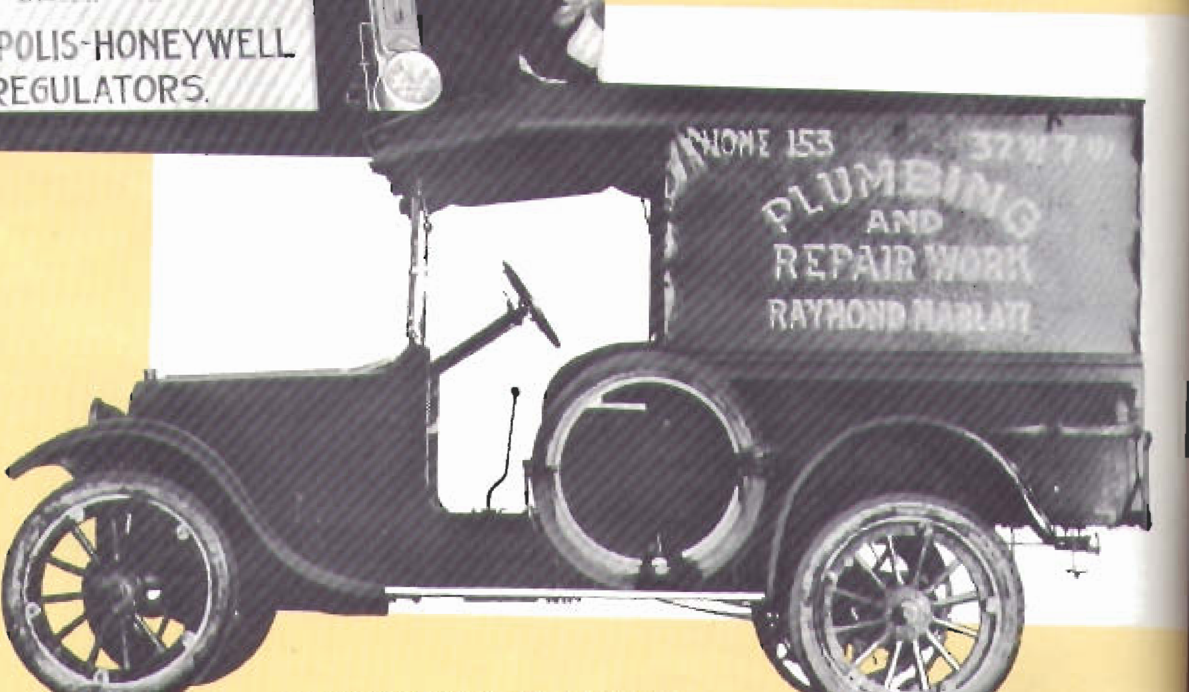
Already an electronic thermostat is available that uses a tiny bobbin of wire instead of a piece of bimetal.

The changes in thermostats over the years did not just happen. They came about because Honeywell was dedicated to the job of bringing greater indoor living comfort to more and more people every year through better heating. That dedication has become a fixed policy that will continue.

ADVERTISEMENT in Century Magazine, August, 1893.



THERMOSTAT EXHIBIT in a bank window in 1926 following one of the first Home Shows.

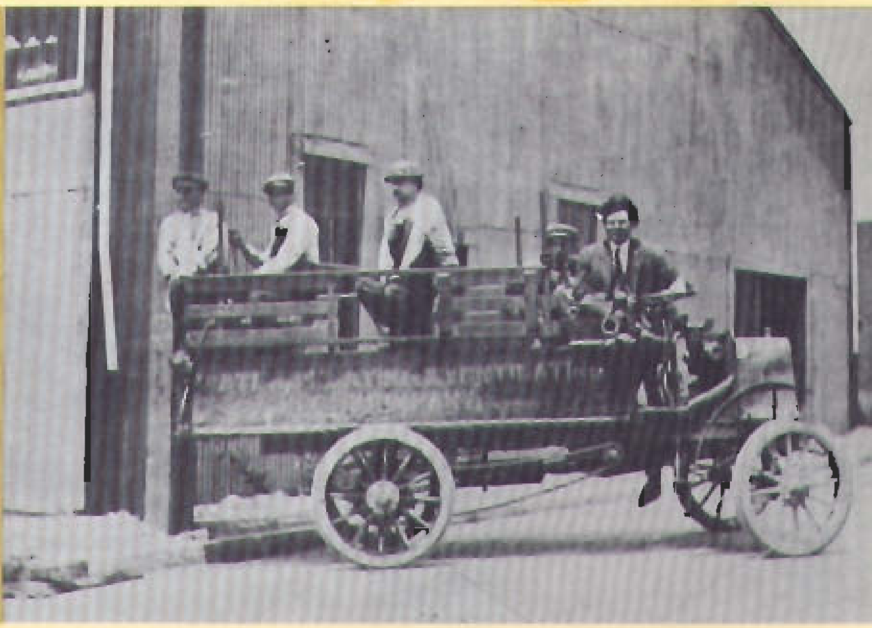


A 1918 DEALER service truck with side curtains and hard tires.

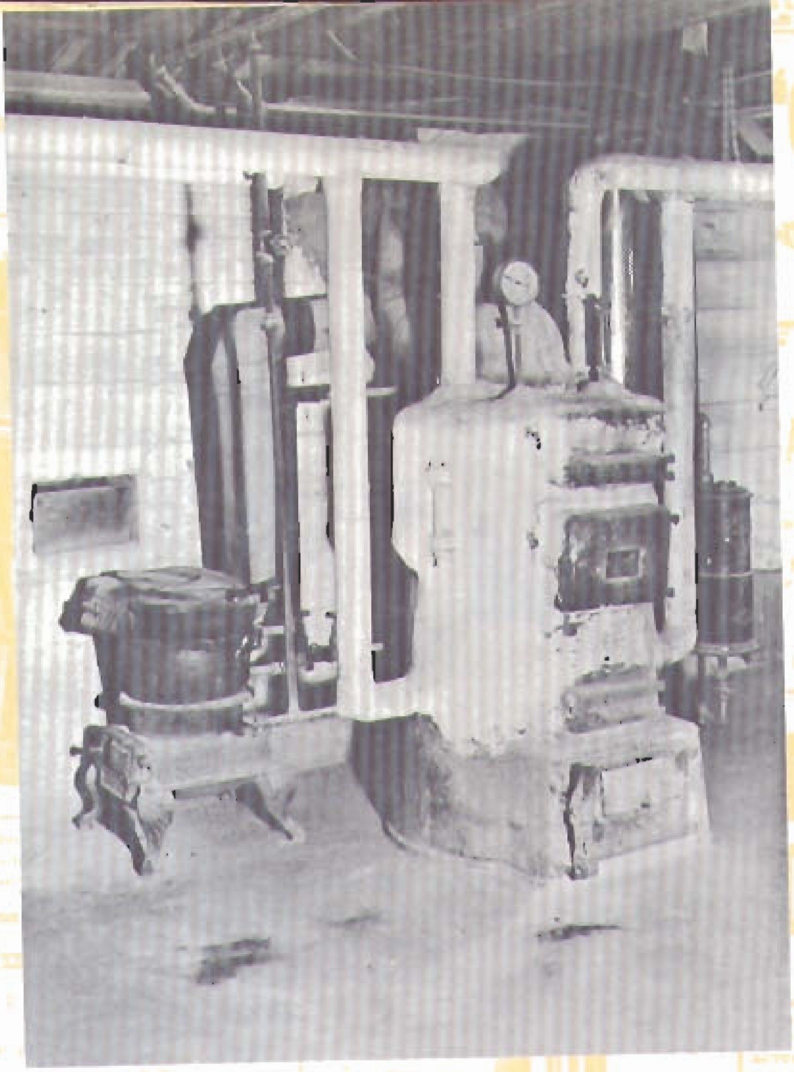
PHOTO ALBUM

Styles have changed but the need for heat remains. Today even drivers of heating equipment trucks can keep warm. At right is a business street in 1883. The tall building is the home office of a stove manufacturer.

HOT WATER and steam radiators around the turn of the century were always large and often ornate. This was advertised as one of the most beautiful.



A HEATING EQUIPMENT truck in 1908 with chain drive and no headlights or windshield.



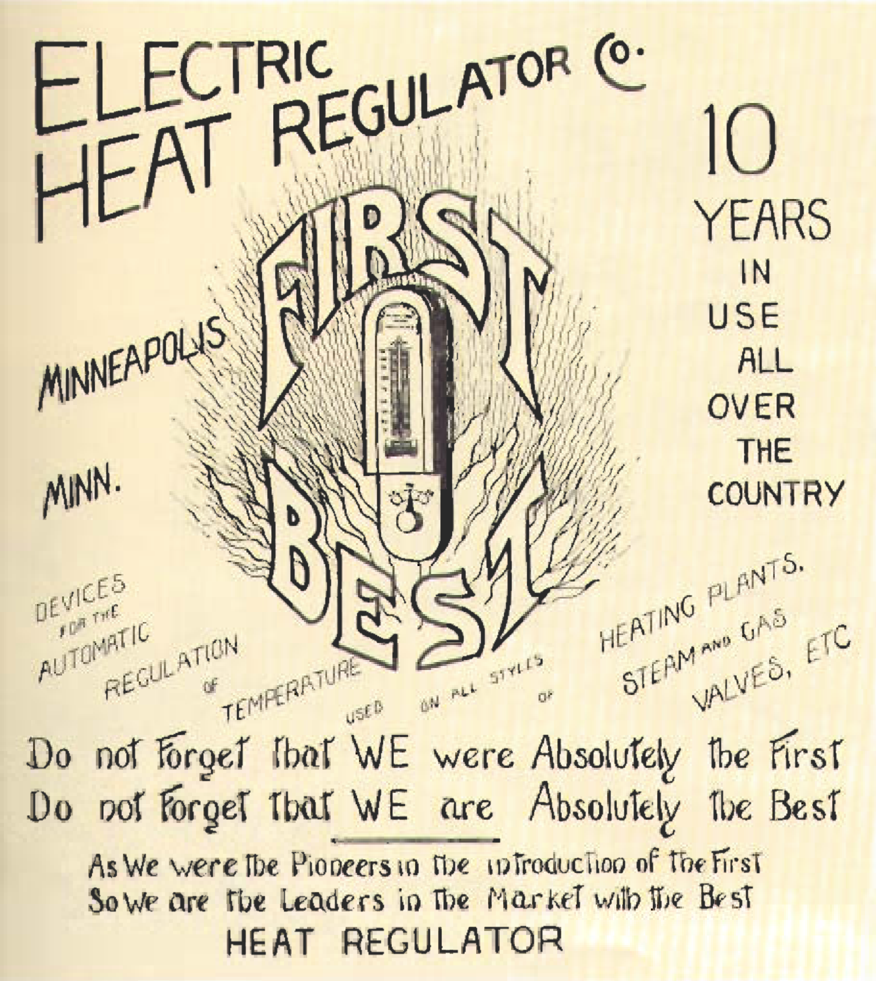
A COAL FIRED hot water heating system boiler about the turn of the century, with auxiliary coal and sidearm heaters for domestic hot water.

HARDWARE STORES about the turn of the century also sold heating equipment, mostly stoves.

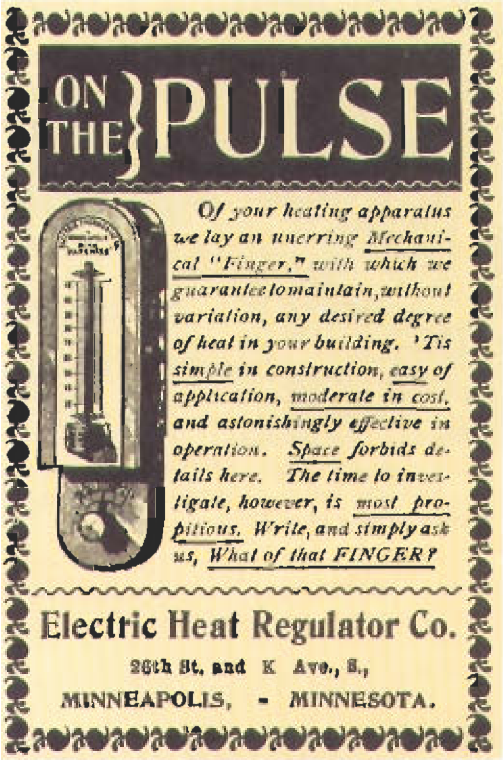
THIS PARLOR of the early 1930s was heated with cabinet radiators in front of the windows.

ONE ROOM SCHOOLS about 1910 were heated with "School Room" hot air heaters, considered to be the latest for health and comfort.

THE HEATING SALES department of a hardware store about 1910 showing wood fired space heater, kitchen range and combination heater.



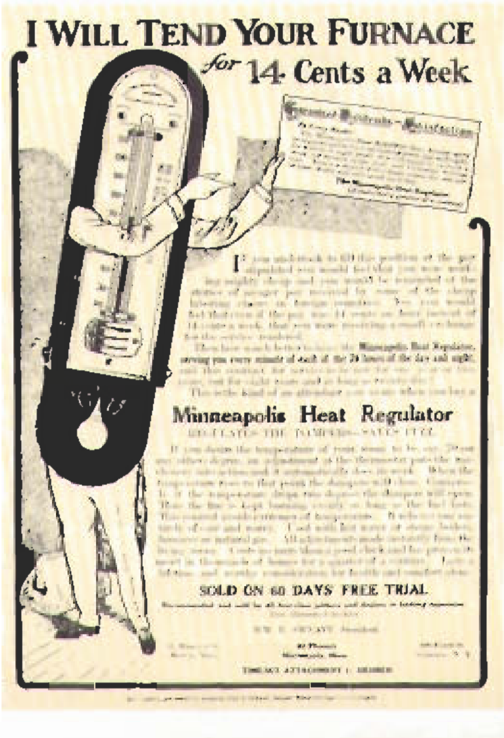
ADVERTISEMENTS on this page are typical of many that appeared in early copies of consumer magazines. At the left is one used in 1895.



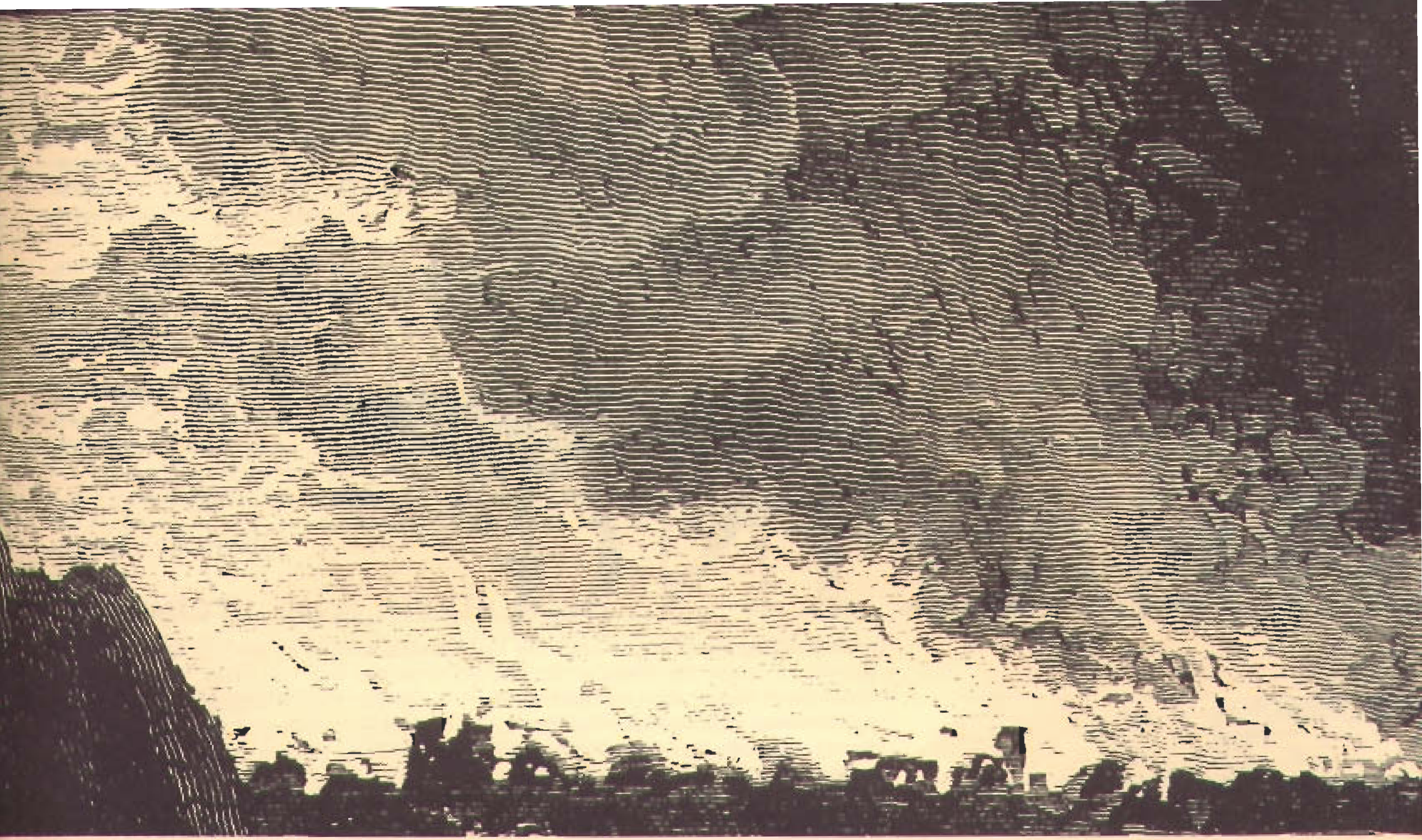
COSMOPOLITAN and HARPERS, December, 1894

SCRIBNERS MAGAZINE, January, 1895

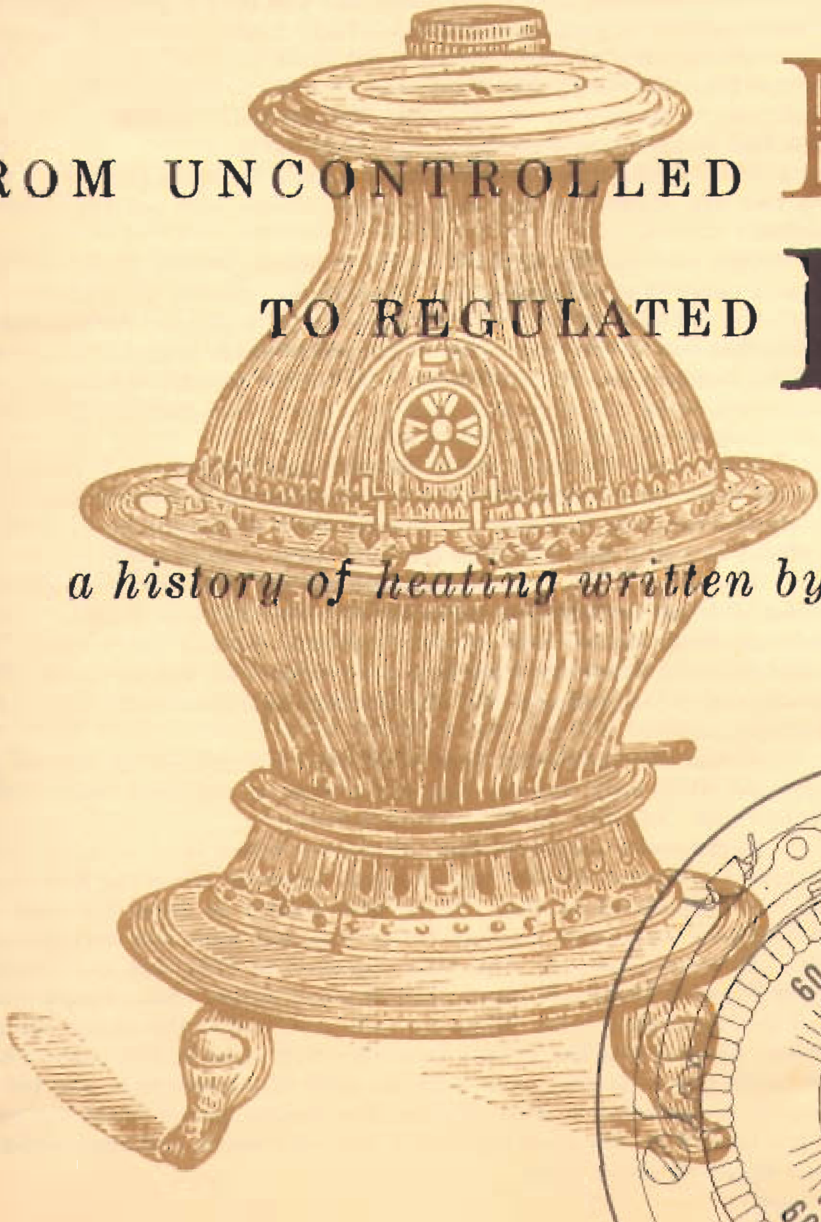
LITERARY DIGEST, January, 1910



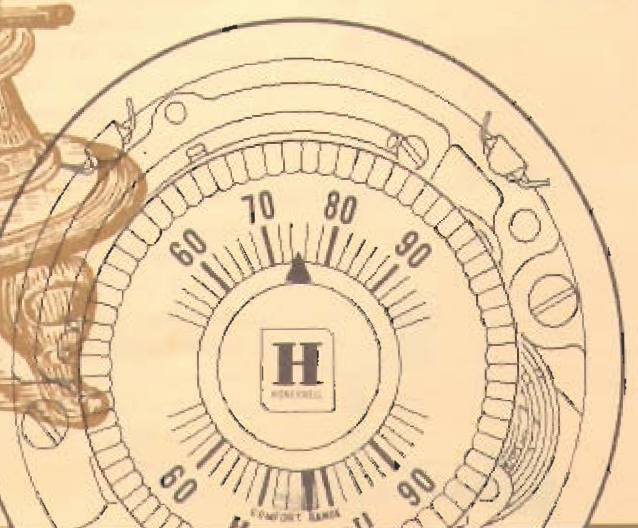
HARPER'S MONTHLY, November, 1905

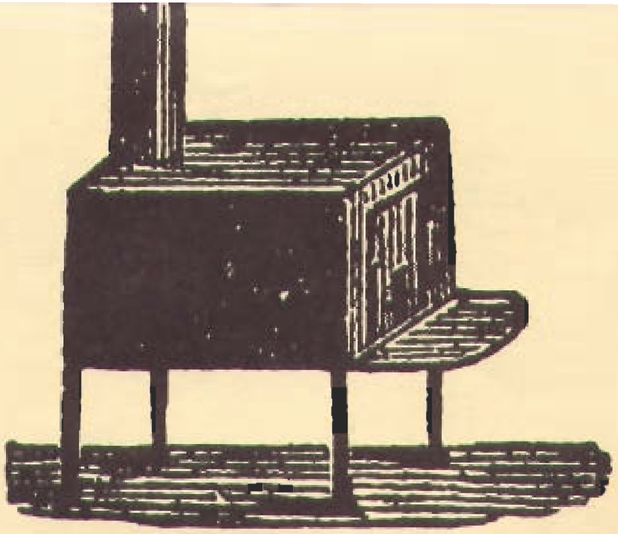


FROM UNCONTROLLED FIRE TO REGULATED HEAT



a history of heating written by | **BILL NESSELL**





THE HISTORY OF HEATING starts with prehistoric

man kindling a fire in his cave. He had no chimney, so he rushed outdoors occasionally to clear his lungs of smoke. Still, he did not complain because only a short time before that he had no fire except for that kindled by lightning or spontaneous combustion. The fire that resulted from some of these often was so terrifying and unexpected that he assumed it to be the avenging act of an angry deity.

It is little wonder the ancients worshipped fire in their religious ceremonies.

The first thing he learned about fire was that it gave heat, and heat could make his food more palatable and his body more comfortable. Little good it did him though because early man did not know how to start a fire when he wanted one. He could hardly adjust his need for a fire to the eruption of a volcano or for lightning to set near-by woods ablaze. He was aware that there were several things he had to learn about fire before he could use it.

Finally man discovered he could start a fire when he wanted one by rubbing two dry sticks together long enough. There were several varieties of this method.

One was the fire drill in which a round pointed stick was turned rapidly in a notch in another dry stick. Another was the fire plow. One dry stick was rotated in a groove in another stick placed on the ground. Perhaps the most interesting one was the fire saw used in countries where bamboo was grown. A piece of dry bamboo was split and filled with tinder. Another section of bamboo was sharpened along one edge and used as a saw to cut through the first. Hot sawdust dropping on the tinder set it afire.

Next came fire from stone. Ancient man fashioned his cutting tools from a hard silica stone called flint. One day someone hit a pyrite stone with a hit of flint. Sparks resulted, and man discovered that if he caught the spark in a hit of dry tinder he had a fire. Still later steel was used instead of the pyrite.

There were other advancements, but the methods remained crude. Since none of these fire-kindling methods was very fast and most of them uncertain, a fire once started was carefully hoarded. Almost every village had a communal fire, and fire-tenders watched over them. Fire was so precious to the community and to the civilization of that era that its maintenance became a part of the religious rites.

Eventually perpetual fires also were maintained in almost every dwelling, and when such was the case the women of the home were given the responsibility of "keeping the home fires burning."

Maintaining perpetual fires, no matter where they were, at best was a chore and a nuisance. All this was changed, however, when the first practical friction match appeared in 1827. These were known as Jones Lucifers.

There were other matches before this, but none was very popular or practical. All were expensive. One that appeared in 1781 was the Phosphoric Candle or Ethereal Match. It was a piece of paper tipped with phosphorous and enclosed in a tight glass tube. When the tube was broken the air set the match to burning. Another was the Pocket Luminary that came in two parts. One was a small bottle coated on the inside with an oxide of phosphorous, and the other part wooden splints tipped with sulphur. The match ignited when the wooden splint was rubbed on the inner surface of the small bottle and then withdrawn. This one appeared about 1786.

Probably the messiest and most dangerous match appeared shortly after 1800. It was the Instantaneous Light Box, also a two-part affair. It used wooden splints tipped with a mixture of potassium chlorate and sugar that was ignited by dipping it into a bottle of sulphuric acid—the bottle of acid being the second part of the combination.

It is difficult to believe that the "American Gentleman" would prefer moving about all day with a bottle of this violent acid in his pants pocket. These were sold at 50 matches, including the bottle of acid, for two dollars. None of these matches became very popular but they marked the beginning of the end of the perpetual fires.

The "Jones Lucifer" was an obnoxious but practical match. It was a wood splint tipped with a chemical compound containing antimony sulphide and was ignited by drawing it through the folds of a special paper furnished with the match box. The fumes given off by this match were vile and poisonous as well.

The prototype of the present day match came a few years later when a compound containing phosphorous instead of the sulphide was used for the tip of the match and it was a true friction match in that it could be ignited by striking it anywhere.

After man discovered how he could start a fire when he wanted one, he was confronted with the problem of what to do with it after he had it started. He had learned how to use it to make his food more palatable.

Equally important to him was just how he could use it to warm his body and supply him with a comfortable indoor environment when it was cold outdoors. Here he had some difficult problems to overcome. Fire always is accompanied by heat and smoke. Man wanted the heat but did not care for the smoke, but he had no way to keep the one and discard the other. So for awhile he had both. Chimneys were not used until early in the 15th century. They proved much more efficient than a hole in the roof.

The tepee of the American Indian was a good example of this. It had an opening at the top through which the smoke could escape. It also had a flap on the side through which the Indian could escape occasionally to rub the smoke from his eyes and fill his lungs with outdoor air.

The Romans took the lead in heating techniques and had a heating system in more pretentious buildings that was not unlike some heating methods used today.

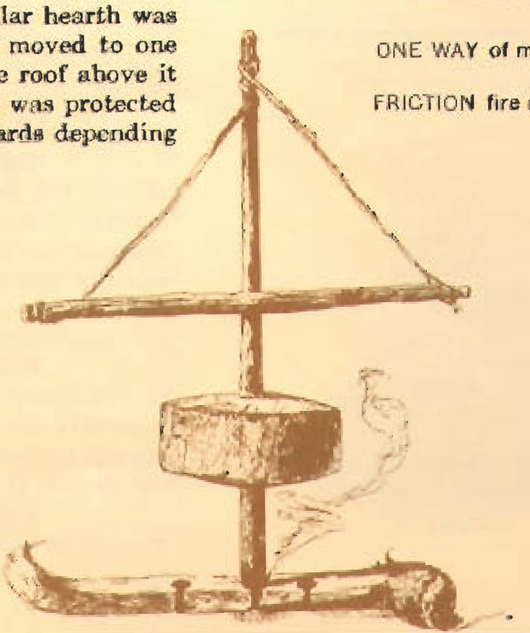
The ordinary method of heating a room in a Roman house was by open fire pans or braziers in the center of the room. They were usually a highly ornamented bronze tripod with legs and were moved from room to room. Sometimes the brazier had a small pan filled with perfumed water to sweeten the smoke.

Wood and charcoal were the most common fuels. Imported woods were used for special occasions. The wood was soaked in water and then dried and perfume added.

Furniture was changed twice each year. One set was used during the heating season. When the heating season ended more ornate furniture came back into use. A number of braziers burning simultaneously as might be the case during parties or banquets would release a substantial amount of smoke. It was said that a passer-by could judge how big a shindig was going on by the smoke coming out windows and through the roof.

ONE WAY of medieval heating.

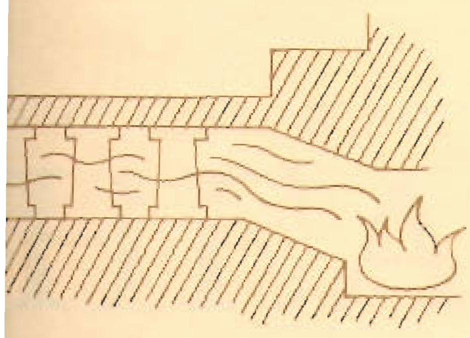
The average British family in the ancient days had one place for a fire, and that was a hole in the center of the floor. Later a regular hearth was constructed in this same location and still later the hearth was moved to one side of the room. But no matter where it was, an opening in the roof above it served as an escape hatch for the smoke. Later this roof opening was protected from the weather by an ornamental turret or a set of louver boards depending on the family's wealth.



FRICTION fire drill for starting a blaze.

Early Persians had a unique method of warming their buildings. They provided an opening in the floor in the center of the room and sunk an iron stove in the earth beneath it. A fire was kindled in this stove. After the room had become well heated and the fire reduced to glowing embers, a low table with a quilted cloth cover was placed over it. The cover extended to the floor on all sides and people gathered around this table for additional warmth. If one was just moderately chilly he could put his hands and arms under the cover, and if this did not suffice he could put both arms and legs under it. If he was still cold he could crawl under it.

The most advanced method of heating in those days and for centuries to follow was the Roman Hypocaust, which was a form of floor panel radiant heating. The area of the building to be heated was erected over a series of flues or heating chambers directly under the floor. These in turn were connected to the furnace through a large flue. The furnace was a large circular or rectangular room with suitable arrangements for burning the fuel, usually wood. The hot products of combustion flowed into the underfloor heating chamber and then up a series of flues on the inside surfaces of the walls.



FIRST RADIANT floor panel heating—the Roman Hypocaustum.

A modification of this sytem did not use the underfloor heating chambers but instead all the products of combustion flowed directly up the flues in the walls from a furnace outside the building. Not only was this system the first radiant floor panel method of heating, but it was also the predecessor of modern warm air heating.

Heating by the underfloor method was usually confined to the sleeping quarters and to the baths, the latter being the favored rooms of the Romans. They even heated water for the baths with bronze pipe coils placed in the connecting flue between the underfloor heating chambers and the furnace. But this method of heating was extremely expensive, even for the Romans. This method of heating was only for the rich, and his less favored brothers continued to use the open fire in the room.

INDIRECT HEATING of Roman baths.

In spite of the progress that had been made, man was not happy with his domestic heating. In England and in some of the colder climates of Europe there was much sickness and the prevalence of "consumption" or tuberculosis gave rise to much concern. Most of these ills, it was asserted, was the result of inadequate and uneven heating of the home.

When chimneys were invented, man made his first break-through in separating heat from smoke. It was a step forward but much still remained to be done. While he was able with the chimney to separate smoke from heat, he wasted more heat up the chimney than he was able to save for heating. Probably less than 20 per cent of the heat was used.

No one knows who invented chimneys nor precisely when they first appeared. There is some evidence that the remains of a chimney were found in an English castle built in the 12th century. It was not until the 16th century that chimneys were in general use in England.

With the coming of the chimney, also came the fireplace. This was the principal method of heating for many years, not only in Europe, but also in America. The idea came over with the Pilgrims and fireplaces are still much in evidence today even though they no longer are used for heating.

Once the chimney became established, the open fireplace became the standard method of heating. Wood and charcoal were the universal fuels through the 16th and early 17th centuries. Coal did not come into general use until the later part of the 17th century and then only because of a threatened shortage of wood.

The old English fireside has been glamorized in poetry and prose but it was certainly no great shakes as a heating system.

There was still a lot to be learned about the design and construction of both the fireplace and the chimney. As a result they were usually large and massive affairs. The fireplaces were inclined to smoke badly because of poor chimney design, particularly if there was a lack of combustion air. This, in turn, was responsible for heavy soot deposits on the inner passages of the chimney flues. These had to be cleaned occasionally and thus was born the then new trade of "chimney sweeps."

In order to get out of the draft and near the heat, it was necessary for the family to get as close to the fire as possible without getting scorched. Consequently the early English fireplaces were built with huge chimney breasts large enough to encompass the entire family and guests. The cozy seats in the chimney corner were given to the aged and infirm, and the favored guests were next in line.

They burned large quantities of fuel and that in turn required a large amount of combustion air which entered through every possible open area and

THE TRADITIONAL open fireplace where people toasted in front and chilled behind.

from every other open room in the house. Drafts of chilly air whipped across the floor and through the room en route to the fireplace, chilling the backs of those seated in front of the fire while the heat from the fire baked the front of them.

To overcome this discomfort, an English settle was placed in front of the fireplace. This was a piece of furniture that was merely a wooden bench with high side arms, a solid high back, and the space between the seat and the floor completely enclosed. This stopped the discomfort of the chilling air from the back but did not reduce the scorching and baking from the front.

Although a number of improvements had been made in the fireplace over the years, it still remained an unsatisfactory method of heating. Its successor was the stove.

The early history of stoves is a bit cloudy. The ancient Chinese had one made of brick. It retained heat long after the fire had become a bed of embers, so it was used to heat the rooms during the day and the top of it served as a warm bed at night. The cold European countries, such as Germany, Sweden, and Russia, had stoves made of brick, earthenware and tile.

Some old stoves heated two rooms instead of one. They were built through a partition, with half in the living area, and the other side in the kitchen or servants' quarters where the firing was done. There were some ornate cast iron stoves in Germany during the 18th century made with a cast iron base and yellow and brown or blue and white tiles above it.

The stove as we know it today started with the Ben Franklin stove. It was designed primarily to replace the fireplace and the early models actually were nothing more than a cast-iron fireplace. These appeared during the middle of the 18th century.

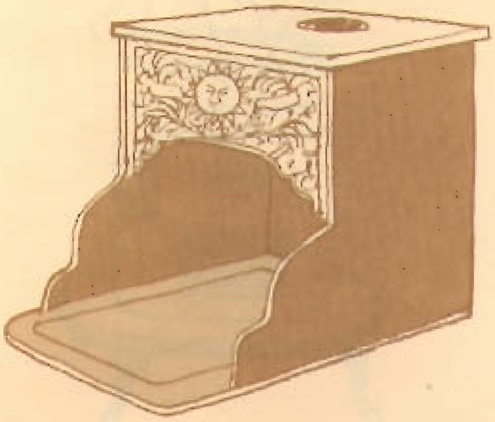
Originally it consisted of a cast-iron stove stuck in the fireplace opening with the front end projecting out a short distance into the room. Since the stove was usually smaller than the fireplace opening, the open space around it was bricked in. The upper part of the stove front was enclosed, but beneath this the open fire burned on an iron hearth. The smoke, after passing through a modified type of diverting flue, entered the fireplace chimney. Soon it was redesigned as a free-standing stove connected to the chimney with a smokepipe and the front enclosed with doors. Many variations of this stove were built in the succeeding years.

Box stoves probably were the prototype of the modern stove. They were just what their name implies—a box-shaped stove made with cast-iron sides, top and bottom. There was a fire door in front and a smoke pipe connection at the back. Since the early ones burned wood, they had no grates and no ash pan. It was not long before they were available with an ash receptacle and improved draft control by means of an adjustable opening under the fire. These appeared about the start of the 19th century.

The early stoves were not very efficient because they lacked heating surface, so the stove designers increased the heating surface by using unique and ornamental designs. To enhance their beauty—if a cast-iron stove could ever

THIS GERMAN yellow and brown tile stove made in 1760 was almost 12 feet high.

AN EARLY Ben Franklin stove made about 1750.



be a thing of beauty—the surface castings were decorated with flowers, fruits, garlands of leaves and vines, and pure baroque.

One model of this Box stove was known as the "Four o'Clock Stove." It was a small model that was designed for heating a bedroom. The fire was started about 4 p.m. to take the chill out of the bedroom air. Another was the Fireplace stove. This was a conventional Box stove so arranged that wide doors in the front of it could be opened and left open after the fire had been well started to give occupants the illusion that they were sitting before an old-fashioned fireplace.

Later in the 18th century came the Cannon stoves, so called because they were round instead of square. They were used to heat meeting halls, churches and court rooms. Their use in homes increased in a few years. During this time the use of wood was giving way to anthracite coal, which was abundant in Pennsylvania and other eastern states, and greater emphasis was placed on design of stoves for this fuel. A result was the good old Baseburner with illuminated front and sides.

One feature of a Baseburner was that a sufficient supply of coal could be placed to last an entire day. The front and sides had windows covered with mica so the burning coals cast a ruddy glow. The coal was stored in a magazine and the coals burned around the base of the magazine. That was good in theory but improper design and venting of the magazine resulted in accumulation of gas. The explosions which resulted were somewhat disconcerting to the home-owner.

The Baseburner we recall came at the turn of the century. It was square and highly decorated with nickel-plated trappings. The front and sides had mica covered windows and nickel plated foot rests, and on the back was a place where a pan of water could be set to evaporate to supply humidity.

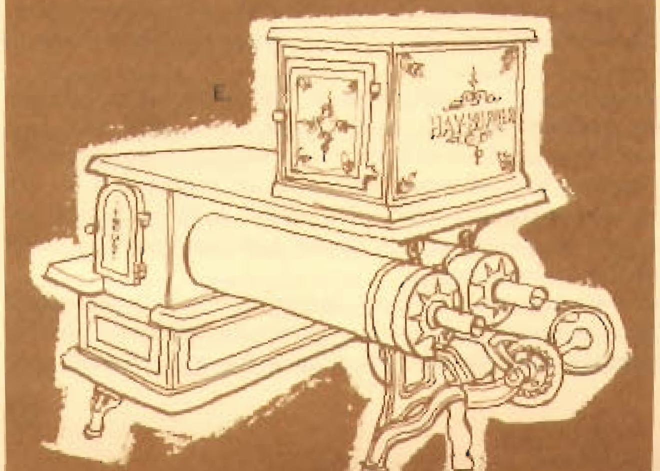
A number of other stoves should be mentioned. One is the Air-tight stove, introduced about the middle of the 19th century and widely used until the early 1900's. They were cylindrical and made of Russian sheet-iron with cast-iron base, feet, and doors. They had two doors, one at the base of the stove for removing the ashes (they had no grates, the fire burning directly on the cast-iron base) and one higher up in the front for tossing in the wood. They would get red hot at times but gave a cozy warmth.

We usually think of a horse as a "hay-burner" but there were stoves especially designed for burning hay. It had a rather unusual construction and shape and the hay was introduced into it in tightly wound rolls through a couple of tubes leading into the firebox. In the west, stoves were adapted to burn buffalo chips, corn cobs and in the Northwest one that would burn sawdust.

Replacing the stove with a central heating system brought about many big changes in family living, as well as in the architectural arrangements of the house and the furnishings used.

The old-fashioned parlor that was used only for weddings, funerals, and when the preacher called, gave way to the living room. The stove with its ashes and fuel was dirty, but the central system took that dirt out of the living area and placed it in the cellar.

Better furnishings, finer fabrics, lighter and brighter decor followed. At best the stove never was a thing of beauty. No one who has lived with a stove can forget the sheet metal reflector in the corner behind it nor the zinc-covered



A. "FOUR-O'CLOCK" stove of about 1850.

B. ONE TYPE of cannon stove made about 1760

C. TYPICAL COAL-FIRED baseburner in use at the turn of the century.

D. "AIR-TIGHT" wood burning stove made of Russian Sheet Iron about 1875.

E. TWO CYLINDER hay burning stove made about 1870.

"stove board" under it that kept the floor from getting too hot or a stray coal from burning a hole in the rug.

Also gone is an element of family life that resulted because the stove could heat only one room well. The old parlor stove usually was placed in the "settin' room," and since that was the only comfortable room in the house, that was where the family gathered after supper dishes were done, and played games, told stories or read until time to retire.

The central heating system dispersed that group into their own individual well heated rooms and some of the family oneness and unity disappeared, too.

Anyone who has lived with a stove never will forget the morning ritual of "fixing" the fire. Alarm clocks were not needed to arouse the family. The early riser first would shake the gizzard out of the baseburner in the "sittin" room," and then came the clatter of coal as it was poured from the scuttle into the stove. That performance was repeated on the kitchen range with the added rattling and banging of the stove lids. Everyone was usually on time for breakfast.

Just when central heating systems first appeared is not quite clear, nor is it clear whether the first such systems were warm air or steam. There is reason to believe that the first experiments with central heating by steam dates back to the invention of the steam engine. Watt made the steam engine practical in 1769, but there had been considerable work done on it during the preceding fifty or sixty years. Steam heating did not come into general use until about the beginning of the 19th century.

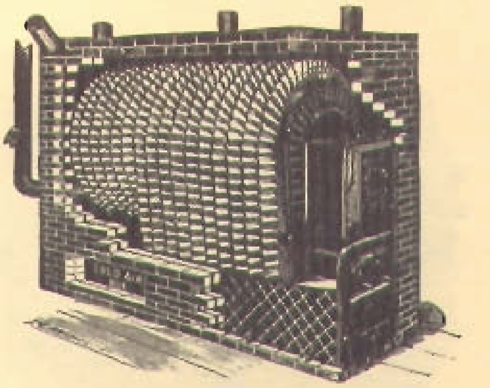
On the other hand, the stove was used to heat most homes, along with the fireplace, during the 18th century, and the word "stove" was rather loosely used with respect to its use. There is little doubt that some stoves were used as warm air furnaces during the 18th century but there is no record as to who first tried it or when. It probably would be safe to assume that central heating systems by stoves used as furnaces and by steam boilers were started in a limited way about the same time.

HEATING an upstairs room from stove with air circulation attachment.

Hot water central heating systems were developed during the early part of the 19th century and came into general use about the middle of that century. They were developed as a replacement for the then called hot air furnace which had fallen into some disrepute. They were said to be "pernicious" because the high temperatures of the stove furnace surfaces "deteriorated" the air.

The forward march to better heating started in earnest during the first half of the 19th century. Better stoves were developed, and while the development of central heating systems may have appeared to lag at times, it was only because the early steam, hot water, and warm air systems were too costly for the average home. By the middle of the 19th century much of this problem had been overcome, and central heating systems appeared in more homes as well as public buildings. With few lapses, that forward march toward better indoor comfort in the home has continued to this day.

A BRICK encased stove used for central warm air heating about 1890.



The first warm-air heating system using a furnace appeared in England about 1792. It was described as one using a "Cockle stove" and a system of pipes and flues to heat a large cotton factory. The Cockle stove today would be called a heat exchanger, direct fired. Actually it was an ordinary stove adapted by size and shape to heat a larger building. The air circulation through the system of flues and pipes was entirely by gravity.

The Cockle stove was made of cast iron and constructed with thick and heavy walls—top, bottom and sides, or in other words a cast-iron case to enclose the fire. This case was called the cockle, and in turn it was enclosed in a brick casing with a minimum of 3 or 4 inches between the inside surface of the casing and the cockle or heat exchanger, to provide air circulation. Openings at the bottom of the brick enclosure allowed cold air to enter. The heated air was conveyed in pipes and flues to the rooms to be heated from the top of the enclosure.

Another warm air system in the early 19th century was the "Bernhardt System of Heated Air for Warming and Airing Buildings." This very early warm air furnace consisted of a long, flat stove set adjacent to a high brick enclosure that served as the hot air chamber. The flue pipe from the stove entered the chamber and then passed on through the chimney. Outdoor cold air was piped into the bottom of the enclosure and warmed by passing over the flues. It then was delivered to the rooms through pipes entering the brick chamber at the top. While it was an elementary system, it had the necessary parts for a gravity warm air system.

The early warm air furnaces came in for much criticism of a sort that unfortunately continued into the 20th century. The heating surfaces of the stoves or heat exchangers within the furnace assembly became very hot—1,000 degrees or more. It was claimed that when air passed over such high temperature surfaces, it deteriorated and was not fit to breathe. It was pointed out "any system that has a tendency to vitiate or decompose the air must be highly prejudicial to the health of every person within its influence."

Even back in those days there was complaint of room air stratification and uneven temperatures between rooms. It was observed that the air enters "the rooms at an elevated temperature" and that "it proceeds in a rapid direction toward the ceiling, making that part of the room where it enters uncomfortably warm and highly dangerous, impeding respiration, while the more remote parts are left cold and uncheered."

There was considerable concern about efficiency of the heating system. Some one had observed that the temperature of the gases in the smoke pipe were high and suggested that something be done to lower it. Heating engineers went to work and came up with a solution that heating engineers of a more recent era have rediscovered. The cast-iron case of the Cockle stove, which received heat from the fire, was covered with cast-iron ribs projecting three or four inches from the surface. These ribs increased the heating surface and thereby reduced the temperature of it.

The first warm air furnace along present day lines manufactured in the United States, it is believed, was in Worcester, Mass., in 1835. This was the start of a new industry in the country and it expanded rapidly. By 1850 there were a number of them producing furnaces. Some of these early furnaces were weird and quaint-looking affairs judged by today's standards. All were made of cast-iron and their designers went to great lengths to provide as much direct heating surface in their combustion chambers as possible. They used diverting flues, air tubes through the combustion chamber, four-inch long projecting studs cast into the firepot section, and fins at least four inches deep a part of the firepot section. One had the entire combustion chamber covered with steel shavings in such profusion that it resembled an overstuffed Christmas tree.

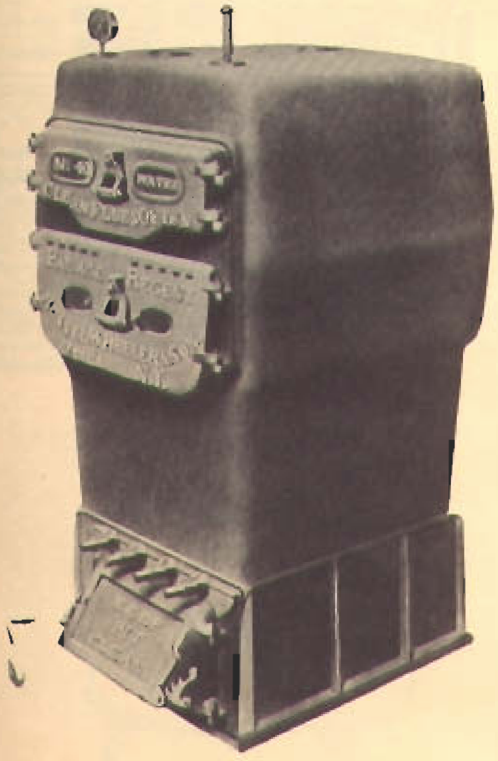
The industry grew rapidly between 1850 and 1900, but the mortality rate of manufacturers was high. Along with the increase in the number of manufacturers came new designs and some of them bordered on the fantastic.

Coal was the predominating fuel, and furnaces built to burn soft coal required considerations that anthracite furnaces did not need. There were fire pots with ribs inside and out, the internal ribs being slotted to allow air to penetrate more easily into a soft coal fire. Some had exaggerated corrugations in the fire pot wall much like the flounce on a woman's skirt. Among others was the Porcupine Pot with quills cast into the outside surface of the pot.

One novelty in furnace design was the "combination heater" that could heat part of the house with warm air and the rest with either steam or hot water. The lower sections of these furnaces were not much different from a straight warm air furnace, but interspersed within the combustion chamber and the radiator was a small boiler. It was a most complex-looking affair.

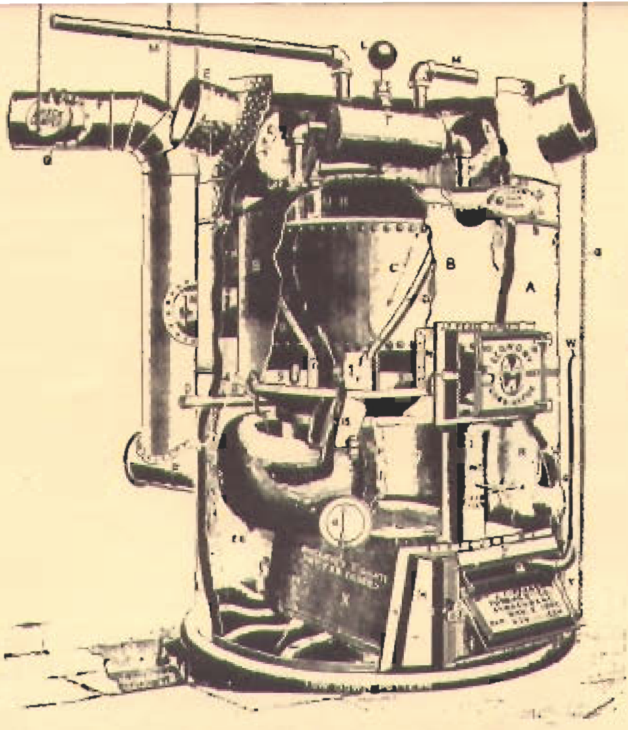
At first most warm air heating systems recirculated no indoor air but took all the air required for heating. Sometimes the furnace was set over a small tunnel in the floor that led to the "cold room." In other instances the outdoor connection was made through a large pipe or by a box laid on the basement floor. The "cold room," when it was provided, was a small room with an open window that usually was under the front porch. It was in this room that cold air supply pipes or ducts terminated. Because the outdoor air was dirty and the dirt not wanted in the house, a piece of cheese cloth was hung across the room to serve as a filter and some of these filters were as dirty a rag as one ever saw. Later the outdoor-air connection was eliminated. It is only recently that the industry recommends some outdoor-air be brought into the house through the heating system.

HEAVY CAST IRON hot water heating boiler of the 1890s.

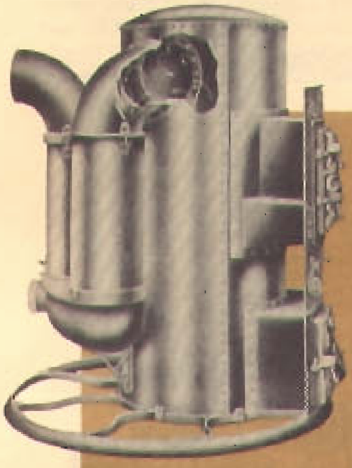


The principal requirement of a mechanic installing these furnaces was that of a strong back. They were made of cast-iron and the manufacturer did not spare the iron. Some of these furnaces for an average sized house of that day weigh as much as 1,500 to 2,000 pounds and some of the individual sections, particularly the radiators, 400 to 500 pounds. Lifting the upper sections into place in a confined space in a semi-dark basement presented difficulties that many old timers still remember.

Furnaces were rated by diameter of the fire pot and the cubic feet of space it would heat. The rated capacity in cubic feet was arrived at by a guess and by-gosh estimate and the rated capacity for identical furnaces made by different manufacturers would vary widely. No one knew how to design or install a good warm air heating system, and for a while it seemed that no one cared.



COMBINATION steam and hot air heater of 1880. Also available for hot water and hot air.



AN ALL STEEL hot air furnace of 1906.

The installation became worse. Manufacturers engaged in a price war. The construction of the furnace was downgraded and dozens of manufacturers went broke. The price war extended to the dealer and installer, and some installations were nothing short of a fraud to the public. As a result, warm air heating had a dismal reputation along about 1900 and it was evident that something had to be done.

Although the warm air heating industry started in 1835, it coasted along as a "don't-give-a-hoot" industry until about 1914.

Things had become bad and some manufacturers realized that something had to be done, particularly with the slap-stick method of rating furnaces. In 1906 the Federal Furnace League was organized with these objectives:

1. To supply the home abundantly and properly with fresh air.
2. That to do this and elevate warm-air heating to the position it rightfully deserved required a concerted effort toward education of the dealer.

Not announced but a part of the plan was to use a uniform method of arriving at the capacity ratings of gravity warm-air furnaces.

This association fell apart five years later. It is of interest that of the 34 manufacturers that were league members, only 14 of them were in business in 1935.

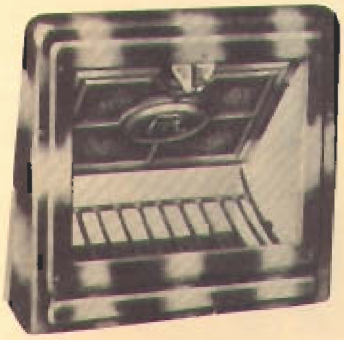
But the seed for associations had been planted. When the National Association of Sheet Metal Contractors, which is an association of contractors installing warm-air heating, suggested that they try again—they were ready to listen. As a result the National Heating and Ventilating Association was formed in 1914. The name was changed to National Warm Air Heating and Ventilating association and still later to the National Warm Air Heating and Air Conditioning Association and it is still operating under that name. They immediately set up a program of research at the University of Illinois and the first item on the program was that of determining a method by which coal-fired furnaces could be rated. This work was done in the laboratory, but in 1923 an appropriation was made for building of the first test house. The research program has continued without interruption.

Meanwhile, use of steel instead of cast-iron in the manufacture of furnaces had been increasing. There were several furnaces on the market made entirely of steel except for the doors and fittings. Eventually a number of manufacturers announced steel furnaces and that started a trend away from cast-iron to steel construction.

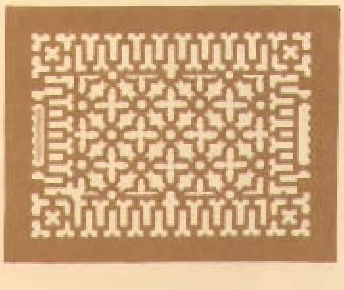
The pipeless furnace era was one that did the furnace heating industry no good. Almost from the beginning, a separate warm air pipe or duct was brought to each room in the house to be heated. However, about 1916 a new type of furnace was marketed. Advertisements claimed it could heat an average house with a single warm air register and one return-air inlet, even though the house had two stories.

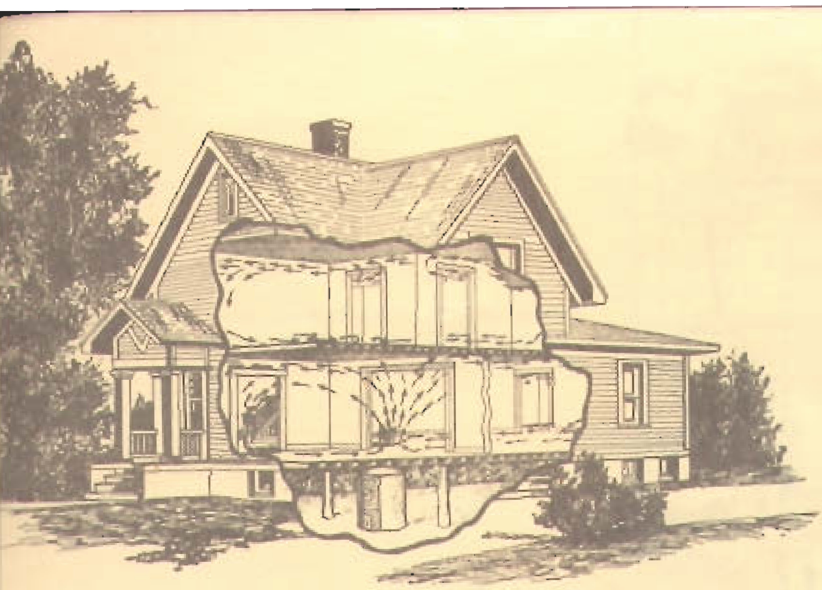
It looked good on the printed material. Many thousands bought these furnaces on the strength of the advertising—only to find out that they did not heat as they were supposed to.

WALL REGISTER convenient for cold feet.



EARLY hot air floor register.

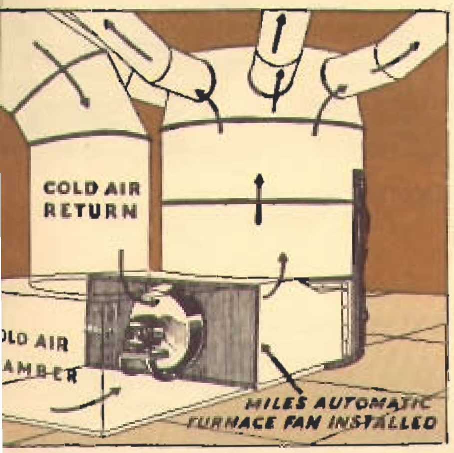




PIPELESS FURNACES were the rage about 1916, but the warm air seldom went where the arrows pointed.

Practically all installations up to this time were gravity systems, but occasionally some enterprising and alert dealer would add a forced air blower to a furnace to make it heat a large house adequately. These were the exception rather than the rule. It soon became evident that gravity circulation might become outmoded on furnaces for the more modest homes. Architects, builders, home owners and occupants in general were not happy with the large ducts of the gravity system. The houses were becoming more spread out, and there was difficulty in getting air to some of the more remote rooms. Forced circulation of the air through the heating system was beginning to receive serious consideration.

The first general step in this direction occurred when a furnace fan, placed upon the market about 1920 or 1922, was especially designed for small and medium-sized furnaces. It was a propeller type fan that was placed in a housing in the return-air duct connection at the furnace. It quickly became apparent that this type of fan could not move enough air against the static pressures that were encountered in many instances. This type fan gave way in the march of progress and the advancement to the centrifugal blower.



THE FIRST forced air furnaces were gravity furnaces with a propeller fan in the return air boot.

The accepted practice of locating warm-air supply registers in the baseboard on an inside wall of the room was satisfactory when the rooms were large. Trouble started when houses became small during and shortly after World War II. The rooms in these houses were small and usually had only one wall suitable for the placement of much furniture. That same wall usually turned out to be the one wall where the warm-air register was located and if the home maker wanted to place a large piece of furniture along that wall it was just too bad that warm-air outlet happened to be there. To meet this problem the registers were placed six feet from the floor and over the top of the furniture. It was realized that this would not give satisfactory heating unless the blower operated almost all the time when the weather was cold. That was when C.A.C. (Continuous Air Circulation) was introduced and it worked so well that it has become a standard adjustment for all warm-air systems.

The industry found it hard to break away from some of the old traditions. One was that the warm-air supply registers should always be on an inside wall, a holdover from the old gravity furnace days. About 1950 it was discovered that placing the registers in the floor or wall beneath the windows and locating the return-air inlet near the ceiling would greatly improve the heating. That was the start of perimeter heating.

The introduction of automatic heat with oil and gas brought about many revolutionary changes in the design of warm air furnaces. The forced warm air heating system with its blower, ducts and registers makes a natural distribution system for summer cooling equipment and the industry knows it and is doing something about it. Automatic temperature controls have contributed their part to the modern warm-air system, but that is part of another story.

Steam and then hot water heating came into being because people were not satisfied with the kind of heating they were able to get from stoves and the warm-air furnaces in use at the time. At one time, steam heating was used to some extent in residences but it never was a popular heating method. Very little, if any, steam heating is used in the average moderate-sized home today. Vapor heating is used today, but that operates in quite a different manner.

Hot water heating became popular as soon as it had been developed to a reasonable state of perfection. It was easier to operate than was a steam system and cost a lot less to install.

Not too much is known about the early days of steam heating. It probably got its start when the first steam generators were made to operate the first steam engine. This was about the end of the 17th century. In 1769 Watts made the steam engine a practical machine. So it was somewhere during the early part of the 18th century that steam heating was introduced. The first steam heating system that we have on record was installed in 1742. It had a crude cast-iron boiler to which was connected copper pipes with shuttered openings in the pipe to allow the steam to escape into the room. It heated the rooms to a satisfactory level but also filled them with steam and vapor. This system never caught on.

The first system of indirect heating with steam was installed a few years prior to 1800. Later, indirect systems using hot water instead of steam appeared, too. The first steam system had a round nine-inch diameter sheet metal pipe inside of which was a three-inch steam pipe. The larger pipe was equipped with air vents so the air within it heated by the steam line could escape into the room. This assembly did a good heating job, although it never became popular. Along about 1800 the first high pressure steam heating system appeared in England, using pressures as high as 130 pounds.

The first hot water heating systems that we know about came into being about 1835. These were largely in the larger semi-public or commerical buildings, but they laid the groundwork and established the design principles by which the strictly domestic installations were to use a few years later. Some work evidently had been done on hot water heating systems prior to this. The ones installed between 1830 and 1835 were said to be superior because they used considerably less water.

The early designers of these systems were much concerned about the weight of a column of water 30 feet high, pointing out that such a water column terminated in a wooden hogshed would cause the hogshed to "violently burst asunder." Consequently they used wrought iron pipes with ¼ inch thick walls made to withstand 3,000 pounds of pressure. The pipes, or tubes as they were called, were compactly coiled back over each other and installed in a brick furnace in the secondary passes where they were exposed to the hot gases on their way to the chimney outlet and not to the direct heat.

This system had all the elements essential to the open systems that came into general use some years later. The system had a fill pipe that extended to the top of the building, and this was where the system was filled with water. There was another pipe extending to the top of the building. This was terminated in a section of considerably larger pipe that acted as an "expansion tube" to take care of the increase in water vollume as it became warmer. The circulation system was so arranged that hot water was piped to the top and downward feeders supplied the radiators.

The radiation in those days was nothing to delight the heart of the home-maker, nor did they in any way appeal to the esthetics of the building architects. They were tremendous things—just an assembly of a large coil of pipes usually partially enclosed but not necessarily so.

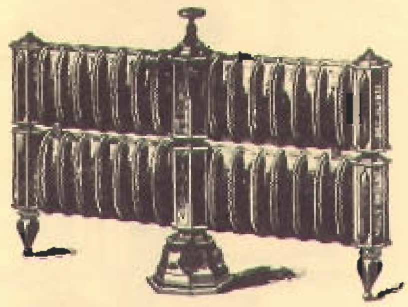
Great progress was made in the design and construction of boilers during the next 50 years and by 1900 they were not far different from what they are today. Greater attention was given each year to boiler economy and to the importance of both direct and indirect heating surface inside the boiler.

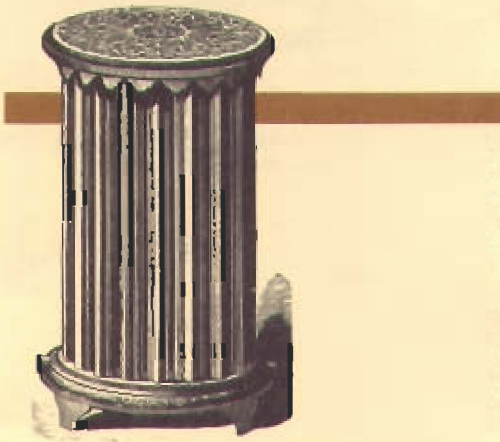
About 1860 a young man named Samuel Gold made several significant inventions that had a profound effect on boiler construction and radiators. Up to that time most boilers had a single water compartment with variations such as flues passing through it. In effect this meant that each size boiler had a definite heating capacity and that an entirely new boiler would have to be fabricated from scratch if a different capacity was desired. Further, boiler design had not reached the point that the danger of bad boiler explosions were eliminated from internal causes that no one seemed to understand. Gold hit upon the idea of fabricating boilers from individual cast-iron sections, and the greater the boiler capacity desired, the greater the number of sections that would be used. He also believed that individual section construction would minimize the danger of violent boiler explosions since one section could blow without throwing the entire boiler across the street.

This idea was sold to a large boiler manufacturer and is in common use today with all manufacturers producing cast-iron boilers.

Between 1900 and about 1915 the design of boilers was greatly improved and became more stabilized. Ones most commonly used for domestic heating were made of cast-iron sections in two general types. One of these used round sections piled on top of each other. The other used vertical sections placed back to back to form a square boiler.

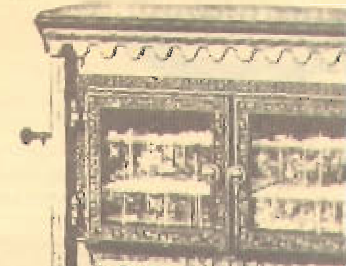
UNUSUAL steam radiator in the 1880s.



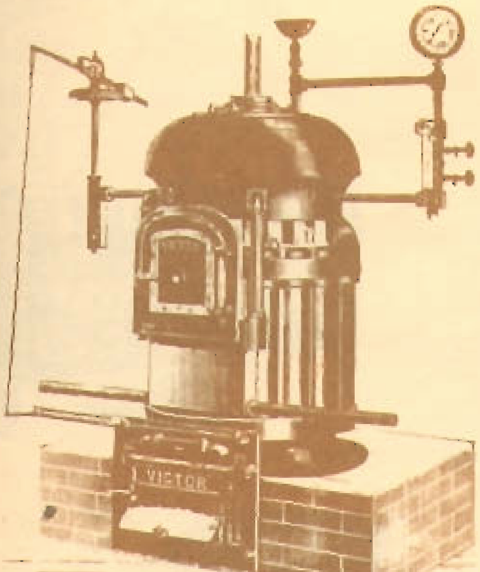


ROUND RADIATOR used for steam or hot water heating.

RADIATOR with food warming cupboards for use in dining rooms.



COAL FIRED hot water radiator with ornamental urn for expansion tank.



A DOMESTIC steam heating boiler made in the 1880s.

Meanwhile great improvements had been made in the design and fabrication of steel boilers, and were preferred by many heating contractors because they were lighter and occupied less floor space than their cast-iron brothers.

As automatic fuels replaced coal, boiler manufacturers were able to reduce the size and cost of their units. Manufacturers enclosed them in steel jackets and today all but the largest sizes of residential heating boilers are comparatively compact units that are attractive and can be brought into the house as an assembled unit.

Aside from the design of boilers, the industry was faced with problems concerning the distribution system. It was necessary to get the steam or hot water to the radiators scattered around the building and then to get the water, including the condensed steam, back to the boiler. A lot of work went into the solution of these problems and it was not until about 1910 that all of them seemed to be settled.

Hot water heating systems also were in trouble around the turn of the century. All of them were gravity circulation systems which meant that the motive power for circulating the water was the difference in weight between heated water and cold water. That was not very much to go on and was insufficient to overcome much resistance in the piping system.

The gurgling and occasional over-flow of the open expansion tank annoyed the homemaker. The radiators were usually monstrously large affairs but not uniformly effective. These and other things convinced the housewife that she did not like the heating system and something had to be done.

This took a change for the better about 1910 when the heat generator was invented and the Honeywell Heating Specialties in Wabash, Ind., came out with one of the first of them. It was a device placed in the circulating system. Equipped with a column of mercury, it would not permit the water to spill out into the expansion tank until the pressure of the system exceeded 10 pounds. This greatly increased the ability of the water to circulate through the system and made the use of smaller pipes possible. It was a revolutionary invention.

The heating men next turned their attention to the radiation and designed more compact radiators with smaller passages and equipped some models with fins to increase the amount of heating surface of them. This put the gravity circulation system back in trouble again because it did not have enough "oomph" to push the water through smaller bore radiators.

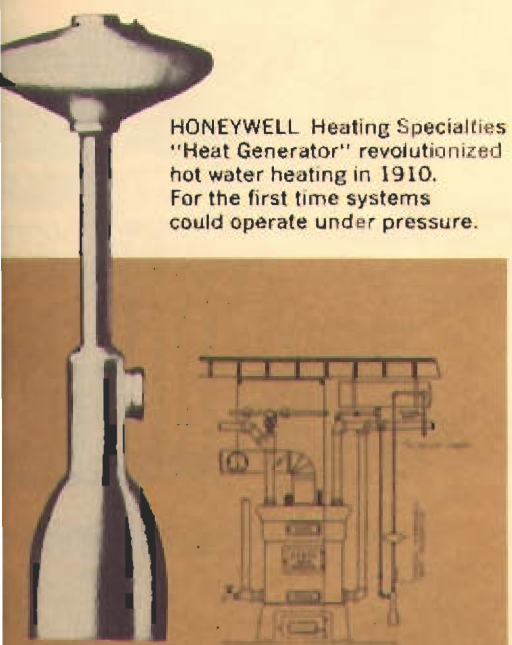
Circulator pumps appeared about 1930 and they pushed the water through the pipes with a positive force. The sluggishness of the system disappeared overnight. Encouraged by what the pump could do, heating men again turned their attention to the radiation and came up with a long, narrow, and low radiator that took the place of the conventional baseboard in the rooms and thus for the first time became completely inconspicuous. This ran into trouble, too, because in some rooms there was not enough wall area on which to place the required amount of hot water baseboard. A new version had fins and tubes enclosed in an attractive face plate and they had enough BTU capacity to satisfy anyone.

Early in the 1940's someone hit upon the idea of eliminating the radiators completely by warming the floors or ceilings and let these warm areas in turn warm the rooms. This was strictly radiant heating—something the Romans had done with the old Hypocaust. Some of the early jobs were not good.

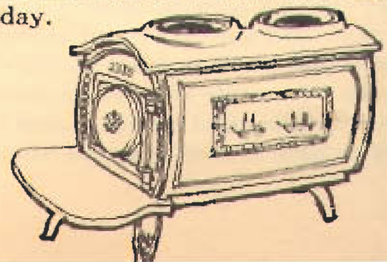
The general idea was to embed hot water pipes in the form of grids in the concrete of a slab floor or in the ceiling. The trouble was that the floors got too hot, giving occupants a severe case of the "hot-foot" and the ceilings were so warm that the rooms were oppressive. The pipe coils in the walls did not work very satisfactorily either. After a bit of research had been completed the proper temperatures of the floor and the ceilings, too, were discovered and radiant heating with hot water became very comfortable.

So now we know how to install a comfort giving heating system in the home using either warm air, steam or hot water, but we are not always giving good heating systems to the home-maker because too many in the industry think they must be competitively "cheap." It is impossible to be "cheap" without cutting corners that should not be cut. The result is that too many "cheap" heating systems have been installed that are cheap in performance as well as in price.

At any rate, it is a long way from the fire in the cave with a hole in the roof to the regulated heating apparatus of today.



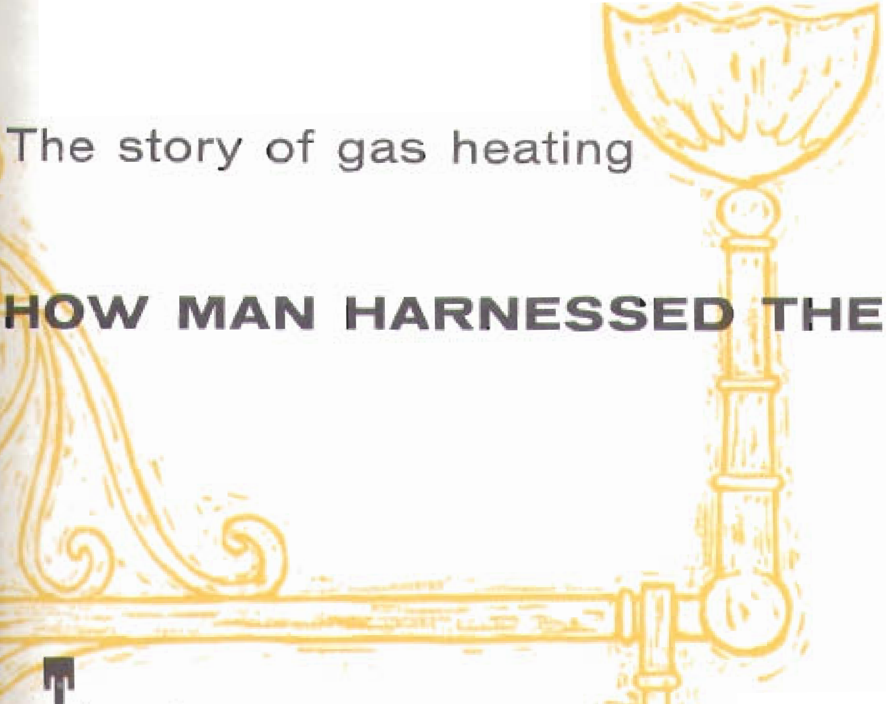
HONEYWELL Heating Specialties "Heat Generator" revolutionized hot water heating in 1910. For the first time systems could operate under pressure.



THIS THREE-LEGGED box stove was made in New England about 1840.

The story of gas heating

HOW MAN HARNESSED THE GHOST



The use of natural gas for space heating and illumination is almost as old as civilization. Early man discovered gas escaping from cracks in the rocks and from the surface of streams. It was an age when people were superstitious, and they became terrified when the gas caught fire. These people related this fire to a supernatural force and worshipped it. It did not take them long to discover, however, that gas flames could be useful as well as mysterious.

Centuries before the beginning of our present calendar, the Chinese discovered natural gas wells and piped the gas through hollowed bamboo to their temples for light and heat and other uses we now would classify as industrial. Similar wells were discovered later in Persia, Japan and other parts of Europe and Asia and put to similar uses. There is little question but that gas was the first public utility.

For many centuries there was little progress made in the utilization of gas. There was very little to be gained in exploiting it or finding new uses for it as long as only natural gas was available. It could be used only where a natural gas well was handy, and while there were many of them in various parts of the world, most were accidental finds of limited capacity.

Only in the last two or three centuries has civilization discovered how to locate gas wells and how to drill for them. Until then utilization of gas was practically at a standstill until we learned how to manufacture it in sufficient quantities to be useful instead of depending on a natural outpouring of gas from the rocks and streams.

Even after manufactured gas became available in quantity, no great progress was made in its use for heating purposes. It was used principally for lighting and cooking, and to a limited degree for heating of a single room with a small capacity heater. Very little was used for central heating even after these systems had come into rather general use in homes. Coal continued to be the universal fuel for residential heating until the oil industry pioneered automatic central heating with oil in 1916.

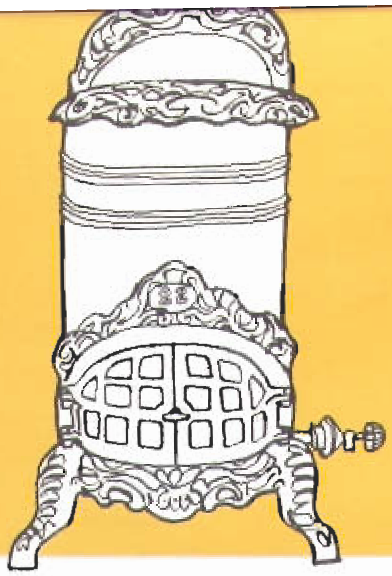
Undoubtedly some of this slow progress in automatic central heating with gas was a result of the high cost of manufactured gas in areas where natural gas was not available. The major obstacle, however, was the apathy of the gas companies. These firms thought that the lighting and cooking gas load was sufficient and they were satisfied. It was only when electricity began to make serious inroads on the amount of gas used for both cooking and lighting, that they started to search for new markets. This began in a feeble way about 1924, but it gained momentum rapidly.

Natural gas was called by various names in the early days. When a gas "spring that did boyle and heave like water in a pot" was discovered in England in 1667, it was said to "be like a strong breath," and there is no knowing what it might have been called in the years preceding this little event. Gas got its present name as a result of experiments made in 1609 by a chemist in Brussels who became aware of invisible, strange "wild spirits" released when he was experimenting with coal. He called this invisible phenomenon a ghost or spirit, the old Dutch word for which is "geist" or gas.

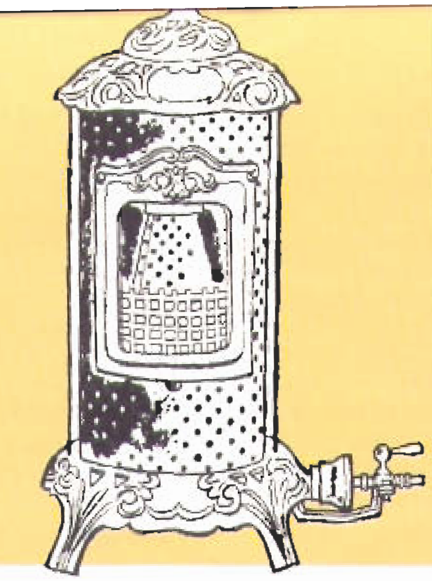
An early discovery of natural gas in America was in 1776 on a tract of land in West Virginia that George Washington had set aside for a public park. This was a "burning spring" in a crevice in the rock, an outpouring of gas that had become ignited and was a great curiosity. Another gas well was discovered in New York state in 1837, and the gas from this well was piped into a few nearby houses and used. There were many instances of natural wells discharging gas into the atmosphere without anyone making use of it. One such well is known to have caught fire and burned for 15 years.

One of the first major attempts to use gas escaping from a well was in 1863 in New York state near Rochester. In this instance a well for oil was to be sunk 480 feet, but shortly before that depth was reached, the driller struck gas. The well was completed with some difficulty. No oil was found and the well was abandoned. Later the well ignited and the flames could be seen for miles. An enterprising entertainer erected a pavilion at the site of the "Old Burning Well" and many a gay dining and dancing party was held there.

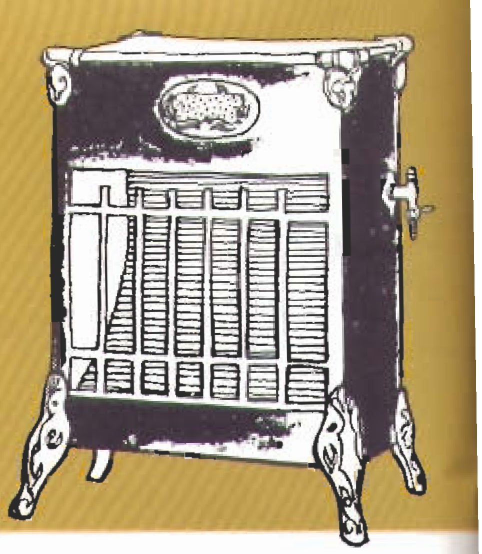
In 1870 the well was purchased by a company organized to pipe the gas 25 miles into Rochester, and to connect the pipeline and supply gas to the city gas lines. The pipeline was made of Canadian White Pine logs carefully turned to a diameter of 12 inches and then bored to an 8-inch inside diameter. The wooden sections were tarred inside and out and fitted with a bell joint. The hollowed logs had to be laid in a straight line because they had no curved pipe and the logs would not bend. The line also had to be level, and the ditch varied from 3 to 10 feet in depth to accommodate the inflexible pipe. Gradually the line



INCANDESCENT yellow flame room heater with mica-glazed doors.



INCANDESCENT blue flame radiator with ceramic cone.



YELLOW FLAME reflector radiator with open flame tips.

approached Rochester, but one night someone closed the valve on the end of the pipeline too tight, and the line blew up from the internal pressure of the gas. This was a bit disconcerting because the entire line was found to have innumerable leaks. Finally in 1872 the line reached Rochester and some gas was supplied to the city mains. The customers promptly refused to use the gas because it was not luminous enough.

In spite of these set-backs, the natural gas industry continued to grow. Gas was discovered in new places, and the technique of building transmission lines improved. A high-pressure gas line made of cast iron pipe two inches in diameter was put in service in Pennsylvania in 1872. It was 5½ miles long and considered quite an engineering accomplishment of the day. Gas wells were drilled in states from New York and Pennsylvania to Texas and Louisiana and then California, and the gas piped into the cities. Pittsburgh in 1884 had 330 miles of gas mains in the city streets and the people used 250 million cubic feet of natural gas daily. The rate was 30 cents per thousand cubic feet.

One of the nation's best known economists made the statement in 1890 that the stocks and securities of natural gas companies never would amount to much. He considered them a poor risk, but it was not long before those who had heeded his advice realized how wrong he was. By 1912 there were 1,102 gas companies in the United States that supplied manufactured gas to their customers. There were 547 others that supplied natural gas, and their number increased rapidly as new gas transmission lines were constructed. In 1948 a line was built from south Texas to New York—1,840 miles. These long pipelines were made practical with compressor stations. They literally pump the gas through the pipelines. Many long lines have been constructed since, and natural gas is now available throughout a vast area of the country.

About 1890 natural gas was sold at a flat rate. Gas meters had been developed and were in use but it was believed that they were affected in some manner by natural gas that caused them to meter the gas inaccurately. The flat rate usually ranged from $1.50 per month for a cooking stove to $3.00 for a heating stove. This was an unsatisfactory arrangement to the home owner and utility company alike. Eventually ordinances were enacted that required meters on all installations. In 1888 gas meters had been installed on all service connections in Pittsburgh, and other cities quickly followed.

It was manufactured gas that gave the gas industry its real start. Natural gas was fine when it was available, but the gas wells usually were remote from the major population centers and the movement of gas through pipelines had not become the fine art that it is today. Manufactured gas came into being slowly. It was first noted in 1609 when the Brussels chemist discovered the "wild spirit" geist in the course of some experiments he was making. It was almost 200 years later in 1792 that William Murdock, who was to become known as the "father of the gas industry" rediscovered it by the distillation of coal and set up a small plant with an iron retort that produced enough gas to light his home in England.

The first company in the world to sell gas it had manufactured from coal was established in London in 1807. Then in 1816 the Gas Light Company of Baltimore was established to manufacture and sell gas primarily for street lighting. Progress was rapid from that time on and gas companies were established in cities across the country. In 1860 there were more than 340 of them manufacturing and distributing gas distilled from coal. The going rates ranged from $3 to $10.05 per thousand cubic feet—quite different from the cost of burning gas today.

The early equipment used to distill gas from coal was crude and cumbersome, and the process required much back-breaking labor and drudgery to make a relatively small quantity. This changed as the years brought new and improved equipment.

As the gas industry continued to expand, the accessories necessary for utilization of gas were improved and new ones brought on the market. There had been, for example, a number of gas pressure regulators brought out, but in 1880 a simple type of regulator was invented that was particularly adaptable for regulating gas pressures for lighting. The Welsbach mantle made of rare earths was patented in 1884 as an incandescent mantle for gas lights. There was even talk 20 years earlier concerning the use of electricity to light gas light burners by means of a platinum wire. While the emphasis was on gas lighting, the Bunsen burner was invented about 1855 designed to give a gas flame that would produce heat instead of light. While this did not have much of an impact upon the industry at the time, it did pave the way for burners designed specifically for space heating some years later.

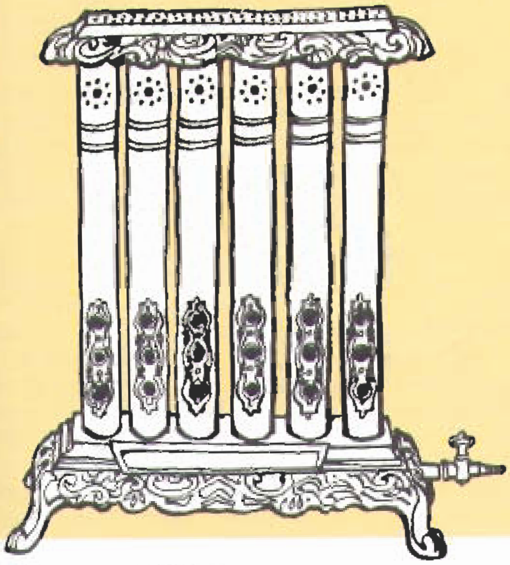
One oddity in the historical background of heating with gas was the statement made in all seriousness about 1880 that "natural gas can be breathed without ill effects while manufactured gas actually is dangerous to inhale." Be that as it may, the city of Troy, N. Y., passed the first ordinance requiring that an odorant be added to all gas so that its presence in the room air could be detected quickly and positively.

The use of gas for space heating developed slowly in the industry in the early days but progressed swiftly once the gas companies realized the potential. The first attempts at space heaters involved the use of what we now would term room or space heaters. About the middle of the 19th century someone in England devised a gas heating stove with refractory materials made of terra cotta which got hot enough to approach incandescence by the burning gas. It resembled a coal fire after it had been operating for a short time and the refractories got hot. A modification of that same stove a few years later added asbestos fibers to the refractory material, and these became incandescent almost as soon as the gas was ignited. This stove was the predecessor of the asbestos-backed stove that became popular some years later. This was a stove with an open front and a backing of asbestos against which the gas flame burned. The loose fibers of the asbestos became incandescent from the flame.

In Boston about 1859 a manufacturer introduced a line of small space heaters. These were called "portable heaters," were not vented and were connected by a hose to a nearby gas cock. This might well be termed the start of the "gas stove heating" era.

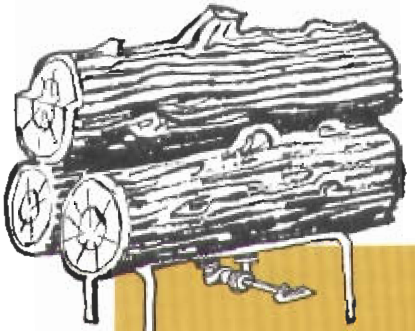
By 1914 there were five general classifications of space heaters on the market, the classifications being based on the way the heater released heat into the surrounding space.

One was the *Incandescent Radiator* which was essentially an open-faced heater with mica glazed doors with the gas flame heating a refractory that became incandescent. Another was the *Reflector Radiator* in which the radiation from the flame was reflected into the room from a polished metal surface behind it. Then there was the *Gas*



YELLOW FLAME multi-cylinder gas radiator with colored jewels.

THREE-STICK driftwood fireplace gas log. One log serves as humidifier.



COMBINATION COAL-GAS fired gravity warm air furnace. Two separate furnaces—gas at the right.

Radiator which was enclosed with sheet iron and heated the room air from the hot surfaces of the enclosing sheet. The use of the word "radiator" in describing and classifying these heaters is confusing unless they are understood. In this instance, "radiator" was used to describe the manner in which the heat of the flame was transmitted into the room air. It had no connection with the same term used in connection with steam or hot water radiation. There were two of these, one in which the flame-heated water within the radiator and the radiator in turn acted as a conventional hot-water radiator, but self fired. The other heated the water into steam within the radiator and in turn it acted like a conventional steam radiator.

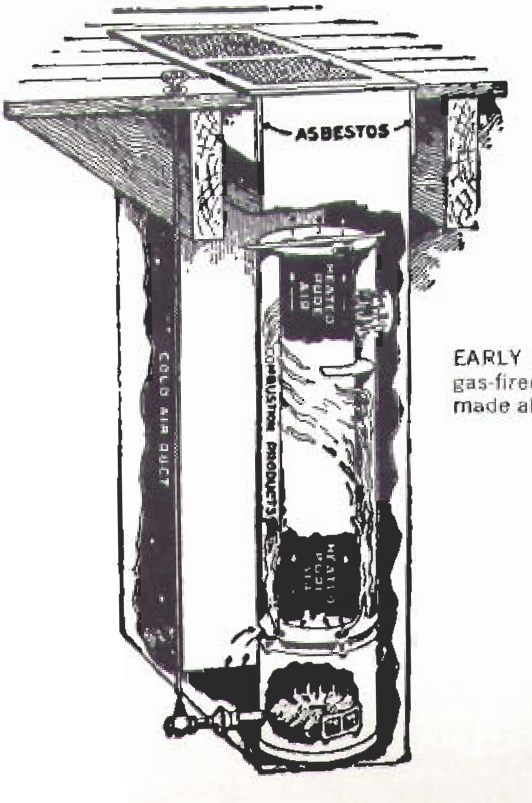
In the meantime, utility companies had become more interested in heating load because there was a continuing drop in the gas used for lighting. In the early part of the 20th century the gas companies at St. Louis and other cities made extensive investigations on home heating with gas, and the results were favorable enough to increase the interest in gas-heating load. The climax came when the gas company in Chicago started a house-heating drive in 1933. By mid-summer it had more than 10,000 such installations, all using conversion burners and mixed gas of 800 Btu.

All of the early installations were conversion burners placed in existing furnaces or boilers. Houses that did not have central heating equipment but which were heated with a fireplace in each room were offered "fireplace heaters" that filled the fireplace opening. In addition, there were fireplace gas logs made of a ceramic material around which gas flames would play.

Manufacturers of coal furnaces, and that's about all there was in those days, got into the act and began the design of gas-fired furnaces. Several manufacturers of cast iron sectional furnaces inserted an extra section in or above the firepot section. This was in effect a gas burner ring of cast iron with drilled ports arranged so the gas flame burned downward. The theory was that this system left little possibility that ashes from the coal fire would get into the ports and clog them. Because of the relatively high gas rates, it was expected that coal would be burned in the furnace during very cold weather and the gas used in the spring and fall.

In the midwest, there were several removable conversion burners offered. These were an assembly of burner parts inserted through the fire door of either a furnace or boiler and set on the grates or supported above them. The protruding pipe connection was joined by a hose to the gas supply. These burners were all hand controlled and had no pilot. They, along with the gas ring in the cast iron coal burning furnace, usually were lighted when the home owner tossed a wad of burning paper into the firepot and then turned on the gas while he stood well to one side of the firedoor just in case ignition might be delayed and the firedoor was blown out the basement window into the backyard.

Some furnaces and boilers designed for burning solid fuel did not operate economically with a gas conversion burner. This was because the flue passes and heating surfaces were not designed for gas burning, and the stack temperatures were much too high. This resulted in a rash of so called fuel savers. One was a secondary heat exchanger through which the hot gases from the furnace passed on their way to the chimney and the heat extracted from them by the fuel saver was used



EARLY MODEL of gas-fired floor furnace made about 1910.

to heat or partially heat a room or the cellar. They did too good a job in reducing stack temperatures. The result was that condensate collected within the passes of the auxiliary heat exchanger and rusted it out.

As the use of gas for heating houses increased, manufacturers of boilers and warm air furnaces began to design heating equipment especially for gas burning. This was not too much of a problem for the boiler manufacturers, but it did introduce a few problems for the furnace boys. They had been making coal-fired furnaces of heavy boiler plate or cast iron that had sufficient mechanical strength to withstand coal firing. This gave them a lot of mass and considerable thermal lag, both of which were not necessary. In some respects the same applied to furnaces when oil was burned. Thus came the beginning of the lightweight combustion chamber.

There is little doubt that lightweight combustion chamber furnaces got their start with west coast manufacturers, particularly in California. Coal had never been burned in home heating equipment there since gas was the almost universal fuel. There was no need for a combustion chamber that could withstand the mechanical abuse of heaving coal and a furnace poker. Climatic conditions were such that a heating unit with quick pickup was highly desirable because most residential heating systems were shut off at night and restarted in the morning before breakfast. Thus right from the start, these manufacturers built combustion chambers of light-gauge steel. This practice eventually spread to manufacturers east of the Rocky mountains. Some carried this to an extreme. In one instance combustion chambers for a 100,000 Btu furnace were tested that were light enough to be picked up and carried out of the room practically under one arm.

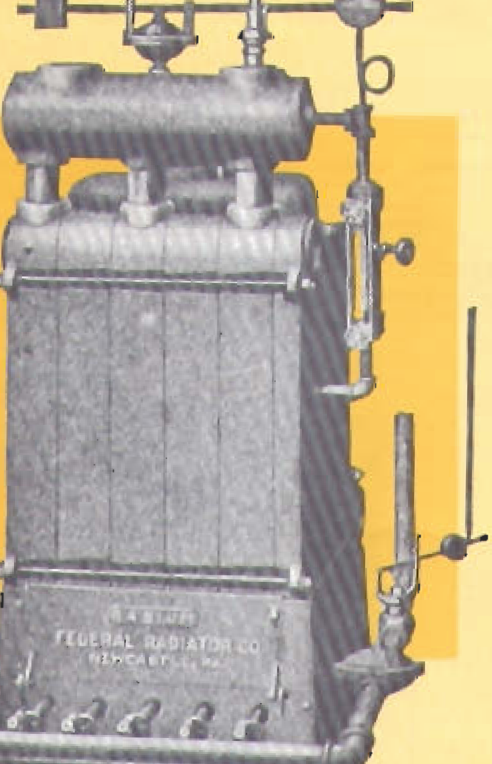
The west coast manufacturers also made some additional contributions to the art of home heating with gas. They designed and marketed the floor furnace that is hung from the floor and suspended in the crawlspace under the house. They also originated the wall furnace that is buried between the studs. One manufacturer claims that he made the first downflow furnace although he did not know at the time that he was making one that eventually would become a standard type unit.

There have been many improvements in the design and operation of gas-fired residential heating equipment. However, the high level of safe, smooth and economical operation that has been built into the modern gas-fired automatic heating system would not have been possible without the help from automatic temperature controls. This is particularly significant in the realm of safety because gas, like its major competitor oil, has potentialities for misbehavior that must be watched and carefully supervised. In this area Honeywell has led the way.

There were virtually no gas-fired central domestic heating systems when Honeywell opened the doors of its factory of 1885. Coal was the predominant fuel and the only controls made by Honeywell were thermostats and damper flapper sets to open and close the draft dampers on a coal-fired furnace or boiler. The first order Honeywell received for controls for a gas-fired central heating system, which was about 1915, was for damper flapper sets. The gas burners of that day controlled the flow of gas to the burner through a lever-type gas valve. To the end of the valve was attached a weight to insure closing, and the arm was attached to the damper flapper arm by chains and pulleys. When the thermostat called for heat, the damper flapper pulled on the chain and that in turn opened the valve and started the burner. When the thermostat said "stop," the arm turned again, put slack in the chain, and the weight pulled the valve shut.

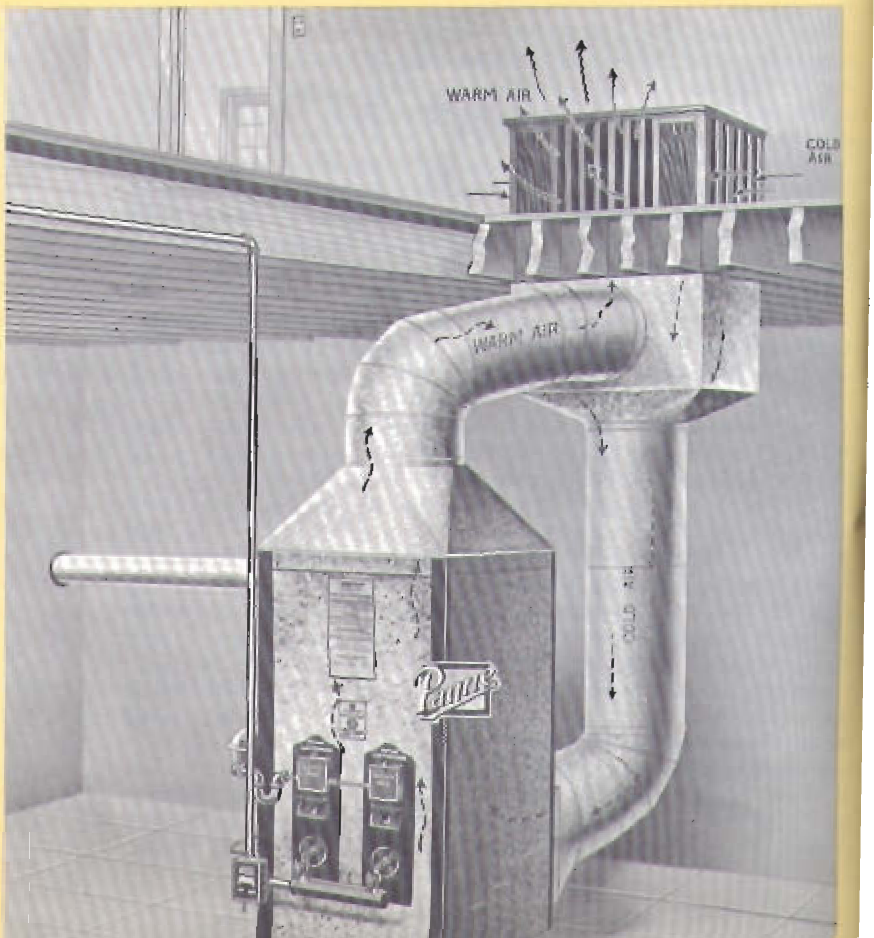
No one bothered about the pilot light, and there was little need to be concerned about it. A constantly burning pilot was used that was large enough to heat the house in mild weather without assistance from the main burner. It would have taken a breeze of gale intensity to blow it out. This size pilot flame did not cost much if the fuel was low-priced natural gas, but it raised mischief with the fuel bill in manufactured gas territory. Eventually the size of the pilot was reduced to a small flame. This pilot needed supervision because it could go out, and there was danger if the gas valve were open without a pilot to ignite the gas.

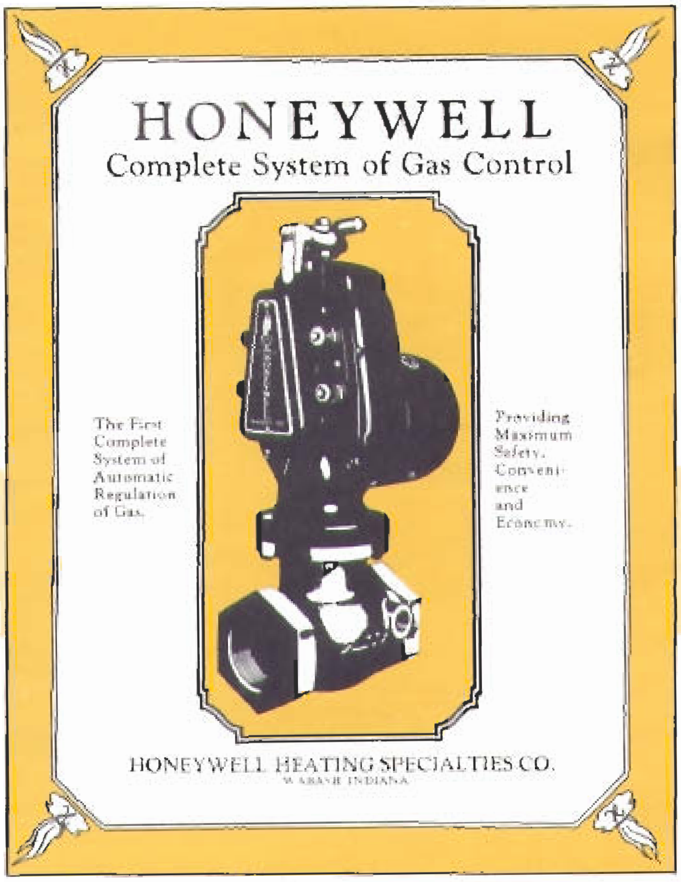
This control system was far from satisfactory. The damper flapper motor was electrically operated and required electrical energy on both the opening and closing operations. It worked fine as long as there was current. Unfortunately, in event of current failure, the valve would remain in the same position it happened to be in when the failure occurred. Everything was fine and dandy if the valve had been closed when the failure occurred, but if it happened to be open, the furnace



A TYPICAL GAS-FIRED boiler of the 1910s. May be used for either steam or hot water. Lever-type gas valve shown at right of boiler.

TYPICAL ONE PIPE gas fired gravity furnace of the early 1910s. The single pedestal-type register combines warm-air and return-air functions.





HONEYWELL gas controls catalogue of 1927. B-1 motorized gas valve shown on cover.

would overheat and the results could be unfortunate. At best the damper flapper was poorly suited to the job of controlling a gas-fired heating system. Immediate steps were taken to design equipment especially for the job. In the mid 1920's motorized valves such as the B-1, the B-22 and the F-2210 made their appearance. These were designed to move to the closed position automatically upon current failure. Some of these early valves are still in service and those that are have a small pilot with automatic pilot protection.

The early valves, which were large, cumbersome and expensive, soon were replaced by a continuing parade of smaller, better valves that operated more quietly with many improved features. Included in these were the solenoid valves (the early ones certainly were not very quiet but they did do yeoman duty for years) and various types of diaphragm valves.

It was also about this same time that the heating industry became aware of the need for a smaller pilot flame that would not overheat the house and raise the fuel bill. The automatic pilot protection was the next advance in gas-heating controls. Most of the early models were operated mechanically by the pilot flame impinging upon a bit of metal, such as bimetal, that would expand when it was heated by the flame and then contract if the pilot flame went out. The most common one in the very early models used a bit of bimetal for the flame to heat, and practically all of them opened the electrical circuit to the main gas valve, which in turn, would prevent it from opening.

These automatic pilot protectors worked very well, but there was still a bit more to be desired. Being a purely mechanical device they were subject to certain kinds of mechanical failures. It was all right if the failure was one that prevented the main gas valve from opening, but that was not always the case. There were instances where the bimetal became fatigued from overheating or the mechanical mechanism connecting the bimetal to the electrical switch would become jammed or bind and the pilot protector fail to give the necessary safety protection. This was changed when the thermocouple pilot was introduced.

The thermocouple pilot operates upon an entirely different principle. One or several thermocouples are properly placed so the pilot flame can impinge upon them. This generates a minute amount of electrical energy in the thermocouple wires, and while the amount of current is small and the voltage measured in millivolts, it is sufficient to maintain an electrical switch in the closed position as long as there is flame on the thermocouples. Subsequent developments utilized this same principle to generate a current great enough, but still measured in millivolts, to operate the gas valve. It was possible then to thermostatically control the operation of a central heating system electrically without the need for an outside source of electrical energy.

The temperature-control equipment on a residential heating system generally is electrically operated, but there was a system in use about 30 years ago that used the gas itself to operate the valve and required no electricity. It was used mostly with hot-water heating systems. Instead of electrical wires between the thermostat, limit control and gas valve, small-diameter copper tubing was used. This in turn was connected to the gas supply so the tubing was under gas pressure when no heat was required by the thermostat. When heat was wanted the thermostat released the gas pressure from the top of the diaphragm-type main gas valve via the copper tubing and the gas valve opened. It gave no better performance than any of the other more conventional systems—it might have been even a little less responsive than the others—but it required no electrical energy for its operation.

Aside from the manually-operated hand valves or cocks required on the gas-fired heating system of today, the controls that it must have on the boiler or furnace are a pressure regulator, automatic pilot protection and the main gas valve. These are in addition to the thermostat in the room and the high-limit control to prevent the heater from becoming too hot. The gas heating industry has come into an age of smaller and more compact heating units and ones that can be sold at a lower price. The result of this trend has been to combine as many of these single-control functions into one control that will provide all these. Much of this has been accomplished by Honeywell engineers.

Residential automatic heating with gas has added much to the American way of life. The gas industry has made a major contribution to civilization even though there were many bypaths with rough going. Honeywell has contributed much to bring progress. As the industry advances during the coming years and new controls or different control sequences become necessary, Honeywell will be there with the products when they are needed.

A service truck of 1926 vintage.

A SALUTE TO THE OLD TIMERS

Trade Winds salutes the many men who sold, installed and serviced the early gas and oil burners in homes across the United States and Canada—especially during the "roaring 20's."

The voices of some old-timers have been stilled, but many others are still with us, young in heart. The contributions these men made to better automatic heating have resulted in the kind of indoor comfort enjoyed by hundreds of thousands of families today.

The manufacturers of the early burners designed them in their shops and laboratories, but it was the old-timer who perfected them. It was he who installed them in the homes of his trusting customers, and it was he who had to live with them. He discovered what was good or bad about the burners, and when he told the manufacturer, the manufacturer listened and went back to his drafting board or laboratory. Automatic fuel burners could not have survived without that field experience.

It was the old-timer who sold the "newfangled" burners to the home owner and popularized them. In those days there were no boiler-burner or furnace-burner units. There were only conversion burners to be sold and installed on existing heating systems. To locate houses with prospective customers meant the old timers had to push doorbells down one side of the street and up the other. They made thousands of home-owner calls, day and night. The prospects were hard to convince, and as many as 8 or 10 calls on a single prospect was not unusual. But these diligent men kept on pushing doorbells and sold the product.

After the sale, it was he who had to keep the burners operating and the home owner happy. Often this was more difficult than making the original sale. The early dealers slept with the telephone at their bedside, and like an obstetrician, if they were not routed out at 2 or 3 o'clock on a cold wintry morning it was most unusual. They were swamped with service calls on every wintry day and these calls were all taken care of by a service man who appeared in a Model T, a sleigh, streetcar, or if necessary he came struggling through snowdrifts on foot. These men took pride in the jobs they sold and in their ability to keep them operating. They took all of these early struggles in stride, confident that these were but the birth pains of a great new industry.

They labored in a morass of technical confusion. No two burners were exactly alike, and there was a diversity of opinion about how they should be controlled. New burners appeared and then some disappeared. As late as 1932 there were almost 200 oil burner manufacturers, and many of them had at least a half dozen models. If servicing a burner got too tough for the service man he called upon the control company sales or service man to help him out. Between the two of them they usually got the burner safely operating again.

They had many troubles, and some of them were expensive ones for them, too. But they persevered. The industry today is what it is largely because of them. Few of these men have any regrets. As one of them put it, "Don't let it ever be said that I am disgruntled or unhappy. I have given my life to it and it has been good to me." A little historical background of some of the Old Timers still actively in business follows.

WILLIAM SELBY

Scarboro Oil Burner Parts Ltd.
Toronto, Ontario, Canada

William (Bill) Selby, a real veteran in the heating business, says that if his blood were analyzed, there would be no question about finding fuel oil and carbon in abundance. While he now is the operator of a wholesale heating establishment in Toronto, he learned the business the hard way.

He got into the heating business in 1919 with one of the largest Canadian oil burner manufacturers. Since then he has worked with many men who eventually rose to executive positions in various companies. One was Honeywell's Tom McDonald, first head of the Canadian company, whom he recalls as a man ready to pitch in at any time. Not only has Selby been involved in domestic oil burner installations, but he also has been associated with installations in many of the largest buildings in Toronto and the Province of Quebec.

Bill Selby had no illusions about the heating business right from the start. "Those early days were rough," he recalls. There were no regular hours in the business. He had to be on call 24 hours every day. The only available transportation was the streetcar. Selby carried the burner, fittings and tools for the job. Often he had to stick the pipes out of the rear window of the trolley. If the trolleys were not running, he walked and lugged the equipment.

One shouldn't for a moment get the idea that William Selby has been unhappy in his chosen field. His pride in the industry to which he has made a notable contribution burns with a white-hot flame. Since those days when he first went to work in the heating business and when his family purchased one of the first crude oil furnaces in Toronto—and were scared stiff by it—there have been many changes. The equipment is better engineered, the automatic controls have contributed much and transportation is much easier. In fact changes have been so vast that Selby says the business bears little resemblance to the early days.

Bill Selby is one not to regret the passing of the old days. He thinks the present is incomparably better. Fuel oil in his blood or not, however, one gets the impression that he wouldn't have missed the excitement for anything.

The Schneuker Hardware Store about 1905.

Alfred Schneuker and 60-year-old shear still used.

ALFRED SCHNEUKER

Schneuker Hardware
Milverton, Ontario, Canada

Alfred Schneuker doesn't look like an old-timer. He's in his middle 50s but he's been around in the heating business. Let there be no mistake about that. His father got into the trade about the turn of the century, and Alfred, from the days he was just a little gaffer, used to spend most of his spare time helping his pop. In the same way he gained wisdom and experience, his own son Murray eventually will take over the business with a background of practical experience.

Pleasant-faced, kindly Alfred Schneuker reflects the countryside which surrounds the village of 1,500 in which he has lived all his life. Milverton is a trading center for a rich farming area of rolling hills settled mainly by Mennonites whose farming ability and customs are widely known. His workshop still uses the same sheet metal tools handed down to him by his father—some of them 50 to 70 years old.

In early days the store sold furnaces that would burn wood. Things were not easy in those days. The problem of transportation in those horse and buggy days was a great handicap to both selling and installing. Schneuker well remembers the day when a newfangled contraption called an auto scared the horse of the wagon he was driving. A cast iron furnace fell into the ditch and smashed into a thousand pieces. He recalls that business was hard to get in those days and that a furnace salesman told him in 1932 that he had had a very successful year—he had sold six furnaces in 12 months.

Oil became the big thing in his community about 15 years ago. Today Schneuker sells far more oil furnaces than he ever did the wood-burning furnaces. One of his customers, for example, who owned 30 acres of hardwood bush, took out his wood furnace some years ago because he wanted more even heat. The coming of oil furnaces changed the heating end of his business tremendously. Heating has become the most important part of his business and now represents roughly 50 per cent of his total business volume, including hardware sales.

His favorite sport is deer hunting, although he occasionally asks himself why he should freeze and punish himself just to get a couple of deer. The depth of his feeling for the excitement of the deer hunt soon makes itself obvious. But it is no more exciting to him, you soon will discover, than the heating business has been over the years.

FRED RIEFLER

Laco Service Center
Valley Stream, New York

Fred Riefler is a real old-timer in the oil heating business. He is the oldest member of the Oil Heat Old-Timers Club, which he joined in 1915, making him a 44-year member. Just turned 73 years young and semi-retired, he still keeps his fingers on the pulse of his business. His two sons, Ernest and Harold, are in charge of the company's day-to-day affairs, but Fred is in the office at least two days a week.

Riefler started in the oil burner business in 1915 and sold only burners and parts until 1935. His first place of business was his home in Lynbrook, Long Island. Those were the early days of oil burners, and automatic controls for them had not been developed. Most burners used a thermostat that operated a damper flapper for a coal-fired furnace to open the oil valve or otherwise set the burner into operation. Long Island was then—as now—a highly competitive market. That his business has grown to its present size speaks well for the Riefler firm's highly aggressive merchandising policies.

In 1935 Fred went into the oil business along with selling oil burners, because he felt the oil business is a continuing one while the burner business is largely a one-shot sale. When he started the oil business he moved to his present address and changed the name of the company. A Model A truck was his first service car, but now he operates a fleet of modern delivery tank trucks. The oil business, along with the burner business, has been expanding constantly. In 1950 his firm sold more than a million gallons of fuel oil.

He is another early pioneer of automatic oil-burning equipment who has contributed much to modern heating. He had all the troubles that other early heating men had, and one by one, through ingenuity and diligence, he managed to overcome them. He has a right to be proud of his contribution to the industry of better heating.

JOHN W. MILES

J. W. Miles Co., Inc.
Wilmerting, Pa.

John W. Miles has an enviable span of 50 years in the heating business. He moved from West Virginia to Wilmerting, Pa., in 1909 to work for his brother, C. A. Miles, who had been in the sheet metal and roofing business there for 10 years.

While roofing and sheet metal was not an unusual combination in those days, the firm left the roofing business 20 years ago and concentrated on warm-air heating and sheet metal work. They also established themselves as plumbing contractors, and John calls this a happy and prosperous combination.

During the half century he has been in the Wilmerting valley, Miles has had a shop in only four different locations. Each shop has been larger than the previous one, and none has been more than three or four blocks from the other. Miles has five trucks in operation, and Miles has placed in charge of each truck, a man who is capable of planning and installing a job completely.

He recalls the difficulties of selling central-heating equipment in the early days. Most of Miles' jobs came to him through his doorbell pushing and through recommendations from satisfied customers.

He maintains a 24-hour answering service for trouble calls and has three men do the service work. Each man allowed to service a job must have been with the company for five years and must thoroughly understand gas-burning equipment. Miles says he personally does some service but feels he is getting a bit too old to go out many times at night. If people are in trouble or have a sickness in the house, Miles services them promptly himself. The 24-hour answering service is the finest thing a heating company could have, he says.

Most of its early work was on gravity warm-air furnaces, but the firm put a heavy emphasis on forced circulation warm air when his brother, Jimmy Miles (J. C. Miles), invented the Miles furnace fan and started to manufacture it. Now almost all his jobs are forced air instead of gravity, and a high percentage of them are gas-fired. John Miles gives thanks to heating distributors who have helped him over the years and says because of that he prefers to buy through them instead of directly from the manufacturer.

Miles indeed is a heating man of the early tradition to whom service and loyalty to customers still comes first.

J. P. BALDWIN

J. P. Baldwin Co.
Chicago, Ill.

In age and years spent in the industry, J. P. Baldwin certainly qualifies as an old-timer. He was born in 1884 and 15 years later began a lifetime of service in steam and hot-water heating.

His first job was as shop boy with G. F. Schampel, an early steam heating contractor in Chicago. He went to Armour Institute night school for engineering training, but he admits he learned more about steam-fitting in the Saturday afternoon shop clinics. Steam-fitters then worked a 44-hour week and came to the shop Saturday afternoons for their weekly pay—$44 in cash. The rest of the afternoon was spent in an informal round-table discussion of heating problems and solutions. Baldwin recalls this was accompanied by refreshments and usually a poker game.

He remembers the one-pipe steam systems that were just getting a good start in the late 1890's and were particularly favored for "flat buildings," later known by the more fancy name of "apartments." They were crude in comparison with the steam-heating systems of today. Automatic air vents were not in general use until after 1900, and the radiators were vented manually by shell or thumb-handled vent valves. Some flat dwellers left them open all night to be sure to have heat in the morning, and many a rug or ceiling was ruined by a geyser of water from them in the morning when the steam came on.

From about 1910 to 1925, vapor-vacuum systems were the latest thing for the better flats and apartments. These gave way to straight vacuum systems with vacuum pumps by 1930. Baldwin recalls that hot-water systems dominated the residential field during the first three decades of the 20th century. The only honest criticism he ever heard of a good hot-water system in those days was the huge radiators made necessary by low operating temperatures of the water. As early as 1910 their size could have been reduced by the higher water temperatures made possible with a new device called the "Honeywell Heat Generator." The trade was skeptical, and even the most daring did not take full advantage of "high temperature" hot water in those days.

Baldwin is enthusiastic over the comfort possibilities of hot water heating and after the years of service he has given the industry he has a right to be. He was president of the Chicago Master Steamfitters association in 1929 and a member of the board of directors of the Plumbing & Heating Industry bureau in the late 20's and again in the late 30's.

EDWARD R. BENSON

Oil Heating Sales Company
Milwaukee, Wisconsin

Ed Benson looks back over the years he has spent in the heating business without regrets. "Financially I would have been a lot better off," he says, "if I had been in something else. The trouble with pioneering as I did is that you sink a lot of money in it and have the problem of trying to get it back or starting all over. We always decided to stay in it and fight it through."

It has brought him a lot of personal satisfaction.

Benson started installing oil burners in furnaces and boilers in Milwaukee in 1922. He and a partner got the franchise for a popular burner made in residential sizes and another larger one for commercial jobs. The early days were hectic. Benson had engineers and sales managers and 13 service and installation trucks. "We lost money steadily and had to start all over again," he says wryly.

The present firm was incorporated in 1924 with his wife as president. Since then, the firm has prospered because Benson made sure that every job was properly installed. In later years the firm expanded its activity to enter the oil business.

Ed remembers clearly some of the troubles with early burners. He once sold a burner that had a pot-type combustion chamber inside the box. The pot was made of a steel alloy, but it had a bad habit of cracking and allowing oil to leak into the bottom boiler where it would burn. All he could do was to stand by with a fire extinguisher to keep the fire within the boiler, but it was always a question whether he or the fire department would get there first.

He survived the era of "oil burner puffs." Benson recalls an instance when a burner "puffed" seven times in one month and the house had to be redecorated completely after each one. Fortunately it was not one of his burners.

Ed is justly proud of the service he has given Milwaukee home owners during the past 38 years. He points out that his is one of the few combination oil burner-oil sales companies with a service department whose experience goes back to 1922.

OTTO SCHEDLER

Otto Schedler and Sons Heating Co.
Milwaukee, Wisconsin

Otto Schedler got into the automatic heating industry through the back door. He now operates an oil burner sales and service company in Milwaukee and has no interest other than oil burners, although occasionally he will install a power-type gas burner.

In 1918 he had an office job in Milwaukee and an evening job installing and servicing damper regulator sets used on coal-fired heating equipment. He started work at 5 o'clock in the afternoon and worked until about 10, during which he would install two or three regulator sets or service five or six of them. That job was with the local distributor for the Honeywell Heating Specialties Company of Wabash, Ind. A couple of years later he transferred to a national distributor of heating specialties and kept on with his damper regulator work and also installed heat-regulating equipment in some large hotels and office buildings in Milwaukee. He recalls the lever-type steam valve that was used with the lever arm connected by chains to the arm of the damper motor.

Oil burners were becoming popular, and it was inevitable that Schedler eventually would get into the oil-burner business. He went in partnership selling and servicing an early burner, but things did not go very well for the company. He recalls that his partner placed an order for 100 burners against Otto's advice in 1929 and the burners were obsolete before they were delivered. The depression came and by 1932 the company was ready for the sheriff. Otto got out. Shortly thereafter he started his own business and has been at it since.

He is strictly an oil burner sales and service man and is not interested in installing complete heating systems, although he will make slight changes in them for better performance such as changing traps and valves. He will not go after the project type of job because, as he says, "I am not in the auction business."

Schedler vividly remembers the tribulations of the early days with houses filled with oil soot and smoke, the basement floor covered with oil because a trip bucket failed to work, and burner "puffs" because there was not enough combustion air getting into the furnace room. He recalls that when he received a service call it often was a case of who would get there first—his truck or the fire department.

Otto at 74, is hale and hearty and happy. He says he has had a lot of fun in the 42 years he has been in the heating business.

E. L. PAYNE

E. L. Payne Heating Company
Beverly Hills, California

In 1914 El Roy Payne and his father opened a small shop in the Los Angeles area to do sheet metal work and install warm-air furnaces. Since that time he has seen many changes in the heating of houses in the mild climate of southern California.

In the early days some homes were heated with wood, a few used coal and only an occasional one used gas. Now most of the homes use gas, and warm-air heating is almost universal, although not necessarily with central warm air furnaces. Many are heated with floor furnaces and wall furnaces and other varieties of gas-fired room heaters, some of which originated in southern California.

Heating practices in southern California always have been slightly different from those east of the mountains. Central furnaces would not always meet the local requirements. In such cases, a number of smaller furnaces, each heating a single room or two, would be used. El Roy recalls installing one such job some years ago in a large home with 29 such furnaces. In another home there were 26 of them, and there was a control system so each could be operated individually and the operation co-ordinated from a central place. He also remembers when he first became aware that many homeowners wanted to turn off the heat at night and open the windows but still have thermostatic control of the heater. That was when he insisted that Honeywell supply him with thermostats with a night cut-off switch.

Always alert to find better ways of heating a house, Payne's organization in 1937 tried placing the warm air registers beneath the windows. Although no one realized it at the time, this was a preview of perimeter warm air heating that the industry adopted 15 years later. Faced with the problem of having the furnace on the first floor and the ducts in the crawl space beneath, Payne experimented with a furnace with blower on top blowing down through the furnace—a forerunner of the Down-Flow furnace that came into standard production and use some years later. These are a few of the innovations Payne tried.

El Roy is proud of his large service department and he keeps a complete office record of every job. These records make it possible for the service man to know just what he may find on the job before he leaves the shop. Payne also has samples of every control ever installed by his company. He has these mounted on a large display board so the service man or home owner can identify the controls on a job with recommendations for proper replacement of controls no longer available.

Payne is still active in the business, but his son Gordon has taken over many chores. He is proud that some of his employes have been with him for more than 35 years and he hopes that under the direction of Gordon the E. L. Payne Heating Co. will carry on another 45 years.

COMFORT FROM A TANK OF OIL

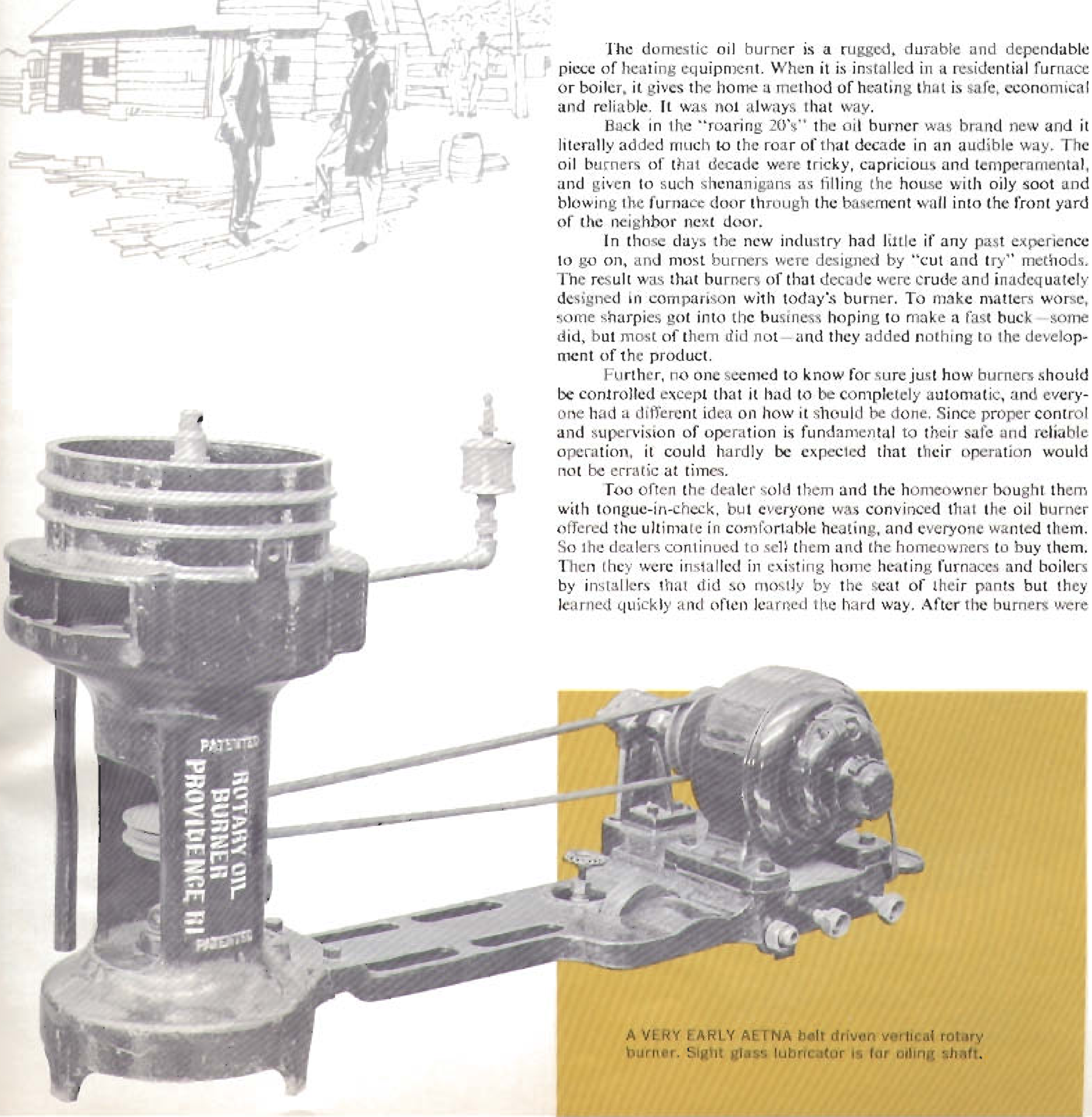
The domestic oil burner is a rugged, durable and dependable piece of heating equipment. When it is installed in a residential furnace or boiler, it gives the home a method of heating that is safe, economical and reliable. It was not always that way.

Back in the "roaring 20's" the oil burner was brand new and it literally added much to the roar of that decade in an audible way. The oil burners of that decade were tricky, capricious and temperamental, and given to such shenanigans as filling the house with oily soot and blowing the furnace door through the basement wall into the front yard of the neighbor next door.

In those days the new industry had little if any past experience to go on, and most burners were designed by "cut and try" methods. The result was that burners of that decade were crude and inadequately designed in comparison with today's burner. To make matters worse, some sharpies got into the business hoping to make a fast buck—some did, but most of them did not—and they added nothing to the development of the product.

Further, no one seemed to know for sure just how burners should be controlled except that it had to be completely automatic, and everyone had a different idea on how it should be done. Since proper control and supervision of operation is fundamental to their safe and reliable operation, it could hardly be expected that their operation would not be erratic at times.

Too often the dealer sold them and the homeowner bought them with tongue-in-check, but everyone was convinced that the oil burner offered the ultimate in comfortable heating, and everyone wanted them. So the dealers continued to sell them and the homeowners to buy them. Then they were installed in existing home heating furnaces and boilers by installers that did so mostly by the seat of their pants but they learned quickly and often learned the hard way. After the burners were



A VERY EARLY AETNA belt driven vertical rotary burner. Sight glass lubricator is for oiling shaft.

installed they were kept in operation by fanatical service men determined to learn all they could about the idiosyncrasies of the particular burner they were working with. They soon discovered that the burners had to be pampered, petted, and encouraged in order to keep them running properly and that theirs was a job for stout-hearted individuals. It was said back in those days that an oil burner service man could be recognized easily because he had a permanent crick in his back and carried his head to one side—a habit developed from dodging furnace doors.

Domestic heating with oil burners started about 1917, but that was not the date of the first oil burner. Oil had been found in many places in the world, and there is some evidence that indicates that petroleum fuels were used 6,000 years ago. Just how it was so used is not clear. It is known that it was used to caulk boats and for waterproofing and for paving and countless other uses, but its use for burning got a major impetus when a shortage of whale oil developed in 1860. A method of distilling petroleum for kerosene was applied, and kerosene took the place of whale oil from then on.

The first oil burners in Europe seemed to have been invented in Russia. One was invented during the 1860's in which oil flowed at a controlled rate over a series of grates and burned. It was successfully used for some time. About the same time, another burner was developed that used a blast of hot air to vaporize or atomize the oil. A few years later, one was introduced that had a tube through which a jet of high pressure steam was passed to atomize the oil. A few years later came a small oil-burning stove for heating a room, and it likely is the prototype of the oil-fired space heater of today.

From this it is apparent that the start of domestic oil heating was about 1880.

The first oil well in America was drilled in 1859 by Edwin L. Drake who fortunately was a bull-headed man with faith and determination in his job. Oil had been found in many parts of Pennsylvania before that but nothing had been done about it. Quite often it was found in a well that had been drilled for brine for salt making. When the well was found to be contaminated with oil it usually was abandoned because the drillers wanted salt water and not oil. Every once in a while, such a brine well would strike natural gas. This the salt maker could use, but not oil. Natural outpourings of oil were found on both sides of the Alleghenies, and some of this oil was scooped up and sold for medicine. No one was interested in or recognized the value of the oil that was right at their doorstep.

Finally this indifference gave way to interest. One of the largest natural oil springs was at Titusville, Pa. This one interested a group of financial men after a report had been written by a professor of chemistry, Dr. Benjamin Stilliman of Yale university. His report stated in part, "your company have in their possession a raw material from which, by simple and not expensive process, they may manufacture very valuable products." They decided to drill for oil.

The original company organized to develop this property fell apart, but eventually another company took over and engaged Edwin Drake to start drilling. He did, although he knew nothing about drilling for anything, and kept at it for about two years with nothing much to show for his labors. The town people thought he was slightly off his rocker and called the well drilling process "Drake's Folly," but he kept on. Then on a Saturday evening, August 27, 1859, the drillers stopped work for the week-end at a depth of 70 feet. The next morning one of the drill crew took another look at the well and discovered it was filled almost to the top with oil. The battle was won, and with that little well a new industry was born.

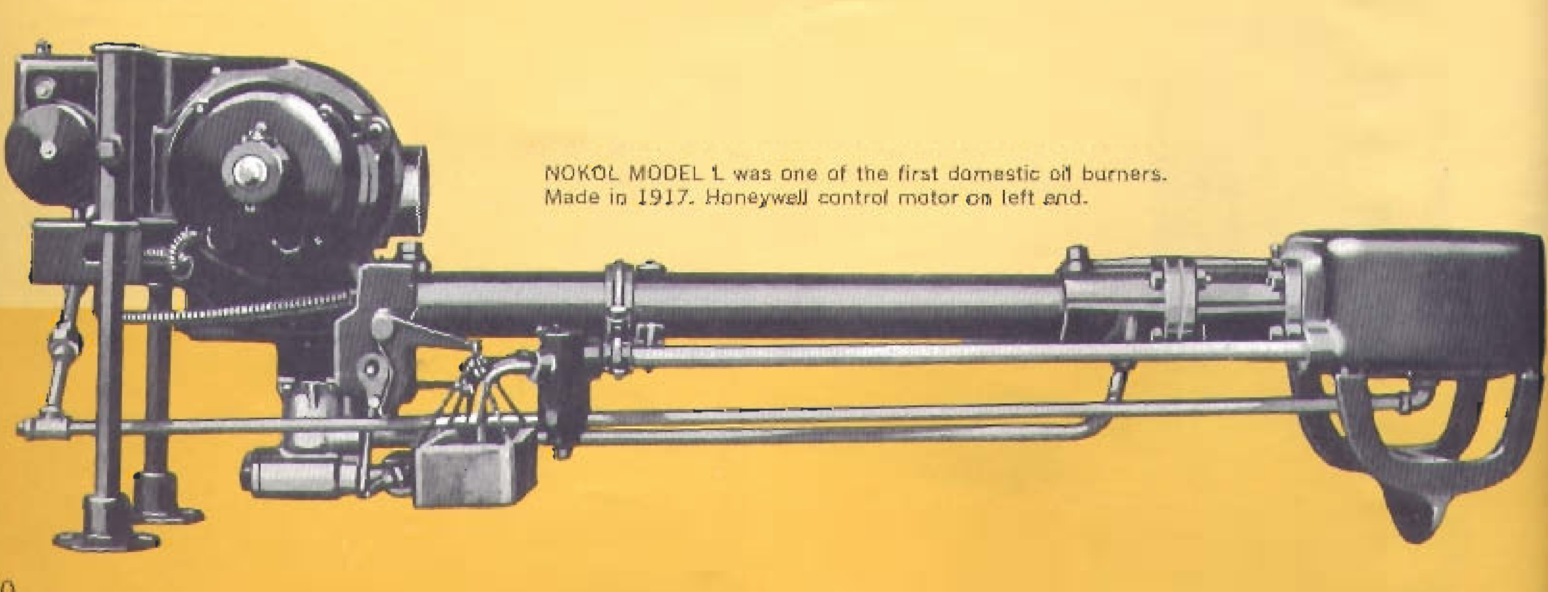
During the next 50 years, there was much improvement in oil burners for industrial use. Steam was used to atomize the oil in most of them and they were used extensively, including some that were used on steamships and railroad locomotives. A few used high pressure air, but these made little headway and soon dropped by the wayside. Most of the pioneering on this type of burner was done by two or three companies on the west coast. Two of these companies are still in business. While the work they did in oil-burning pioneering was not directed specifically to the domestic burner, it did pave the way for the smaller burner that was to follow.

Public interest was aroused in the use of oil for heating when it was announced that the 54 boilers used to heat the buildings of the Chicago World's Fair in 1983 were oil-fired. When the second World's Fair opened in Chicago in 1933 there were more than 100,000 oil burner installations in the Chicago metropolitan district served by 40 or 50 firms distributing fuel oil and almost 300 firms engaged in the retail sale of burners. Another significant thing came out of the oil burner installations at the 1893 fair. An electrical inspector sent to the fair by the insurance companies to look after their interests in relation to fire and accident losses remained in Chicago and eventually classified electrical devices and heating equipment, among other appliances, with respect to safety. The job he did so impressed the insurance companies that they organized the Underwriters' Laboratories in 1901 to test and list for safety approval all devices with a safety, fire, or electrical hazard. Included in this list were oil burners.

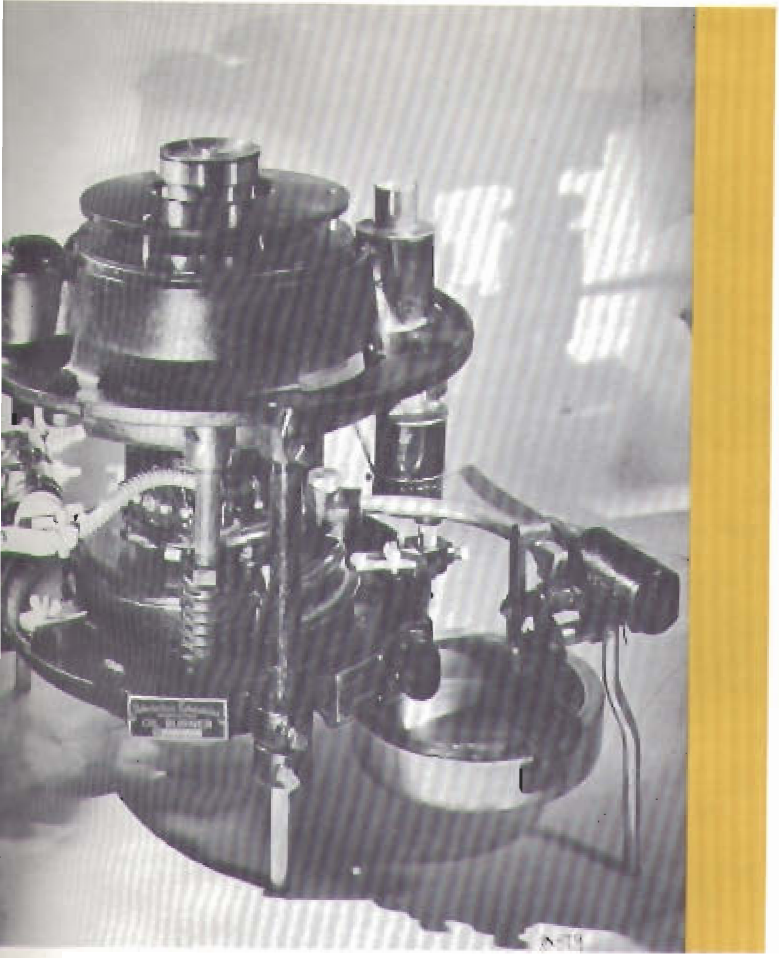
The first approval listing of an oil burner was in 1912, but this listing was withdrawn three years later because the manufacturer stopped making it. The first mechanical draft burner that represented the domestic oil burner as it was subsequently developed was listed and approved by the laboratories in 1919. In 1936 when the number of oil burner manufacturers probably reached its peak, there were more than 200 listed burners. Not all burners were submitted to the Laboratories for approval, and there is no certain way of knowing just how many burner manufacturers there actually were. Some wild guesses going the rounds of the industry during the 1930's gave the number of them as something over 1,000. At any rate, for a while they came and then disappeared at a rapid rate. There where more than 180 burner manufacturers listed and tabulated in 1932. Some of these had as many as six different models, all for domestic heating systems. Only a few of those that were on that list are still doing business.

The First World War was in a large measure responsible for the start of the domestic oil burner business. It was in 1917 that Honeywell received its first large order for controls that were clearly identified for use on an oil burner. About all that Honeywell or any other control manufacturer had to offer was a damper flapper set consisting of a thermostat, limit control and damper motor. Just how this damper flapper set was adapted to control oil burners will be discussed later.

Coal was the universal fuel, and it was in short supply because of the war. The War Priorities Board in Washington had placed priorities



NOKOL MODEL L was one of the first domestic oil burners. Made in 1917. Honeywell control motor on left end.



THIS ABC ROTARY burner had a 10,000 rpm direct driven vertical shaft atomizing cup. Trip bucket safety switch at lower right.

on the use of most metals and in order to save fuel had established "coalless Mondays." That day, no one was to use coal for heating. There were no restrictions on the use of oil for heating, but this was hardly necessary because there were no domestic oil burners and there was an ample supply of oil. However, there were several domestic burners under development at the time.

One of these was a burner designed especially to fire the boiler of the Doble Steam automobile. It was just about ready for use when the war interfered with the production of the car. Without an automobile, there would be no burners sold. Rather than let the burner wither on the vine, the manufacturer adapted it for use in domestic furnaces and boilers. He promptly applied to the War Priorities Board for materials with which to manufacture it. The appeal was based on the fact that there was an ample supply of oil, and that every such oil burner made and installed would reduce the demand on the scarce coal supply. The board evidently was impressed with the story because they alloted materials for production of the burner. That was how the NoKol burner was put on the market.

There will not be space in this story to describe all the early burners or even to name the many that appeared on the market during the following years. Hundreds were born, lived a while and then died and were heard of no more. Some did not live long enough even to get on the market—the first installation was enough to show the futility of installing a second one. However, every one of these made some contribution to the art and "know-how" of burning oil in a domestic heating system. If they did nothing else they indicated some of the methods that should not be used and to things that would better be left undone.

The NoKol was typical of the pot-type burner that was in its heyday in the early 20s. Included in this group were such as the McIlvaine, Kleen-Heet, Northern, and an early model of the Electrol. The oil was burned in a pot placed in the center of the firepot of the furnace or boiler and required a minimum amount of alteration of the heater. The oil flowed into the center of the pot and was ignited by a gas or oil pilot and combustion air was supplied by a blower. Most were well engineered and substantially built. One early Electrol model made in 1918 even boasted of electric ignition supplied by an ignition coil and a spark plug with two-inch spark points.

On the negative side they required a very light oil that would burn clean, such as kerosene, and were likely to be quite noisy. A more serious problem was the combustion pot. Even though they were made of high grade alloy steel in most instances, the pot could not withstand the heat indefinitely and often cracked. When that happened, some of the oil would leak into the ashpit area under the burner and eventually start burning. This situation was quite disconcerting to every one involved, especially the homeowner.

Another class of burner that was extremely important in the early days was the atomizing vertical rotary type that appeared in general use about 1920. An earlier model was made in 1912. There were many of these introduced during the following years. While the basic principle of operation was the same with all of them, engineering imagination ran riot in the details of their design. It seemed that every one making this burner wanted his model to be as different from the others as possible, and they succeeded. This burner, which must not be confused with the "wall flame vertical rotary" type, used an atomizing plate, nozzle or cup spinning at high speed within the combustion chamber above a specially-built hearth.

These were driven by a vertical shaft at speeds ranging from 1,150 to 10,000 rpm. The fuel oil was supplied to the atomizer either by gravity or by an oil pump. One model had a vertical shaft with a tapered hole inside the entire length of it. The lower end of the shaft was immersed in an oil container in which the oil was maintained at a constant level by a float valve. When the shaft was operated at high speed, the oil flowed up the center of the shaft to an atomizing cup. The motor driving the shaft was usually placed under the burner, but here again the manufacturers showed considerable ingenuity to make their burner different. Some used a motor with a vertical shaft, others used a conventional motor with a horizontal shaft gear connected to the burner shaft, and at least one of them had a belt-driven vertical shaft with the motor outside the furnace. Some burners had forced-draft blowers while others depended entirely upon natural draft. Most of them had gas ignition at first and later electric spark ignition was tried with indifferent success.

Some of the very early burners in this class, such as the Hardinge, ABC, Super Oil Heater, Northern, and Aetna did yeoman service for years and helped substantially to secure public acceptance for oil heating. These burners also had the advantage of being able to burn the heavier oils which usually were less expensive than lighter oils, such as kerosene, that the pot burner required for clean and trouble-free operation.

The wall flame rotary burner appeared about the middle of the 1920s. The oil in this burner is burned around the edges of a specially-designed hearth, against the walls of the combustion chamber, while the fire in the atomizing rotary burner is shaped like a sunflower or a bushy flame immediately around the burner head. The oil in the wall flame type is thrown to the edges of the hearth where the air-oil mixture impinges upon a series of metallic fingers. There it is thoroughly atomized and mixed with combustion air. The result is that the burner burns with a blue flame with little radiant heat.

The first burner of this type was the Silent Automatic, but it was followed soon by others such a Timken, Fluid Heat and Torrid Heat. These burners gave an excellent account of themselves. They were quiet and dependable and operated at a relatively high efficiency if properly installed and adjusted. The early models used a gas pilot for ignition, but after considerable work an electric ignition system was used instead. After a few years Silent Automatic and Timken consolidated and became the Timken Silent Automatic burner.

The low-pressure, gun-type oil burner, which was important to the oil-heating industry during the very early days, might well be called another "war baby" like the NoKol. C. U. Williams of Bloomington, Ill., owned a theater building and a garage that was heated with oil all through the war with a rather crude burner developed by his son, Walter, just before he was called for military service. The burner performed so well that when Walter returned from his military duty, father and son decided to manufacture oil burners. The result was the Williams Oil-O-Matic burner which, as a low-pressure, gun-type burner, is a classic today. This burner eventually moved the company into national fame. Other low-pressure burners of this type soon followed, including the Hart, Nu-Way, Sundstrand and Caloroil.

The high-pressure, gun-type burner is probably the most widely-used burner today. The prototype for it undoubtedly goes back to the early 20s when Electrol introduced one that was a good performer and did a highly-creditable job. This was their well-known Model "T." In this burner the oil was drawn from the storage tank by a gear-type pump and forced through a small orifice in a nozzle with tangential, slightly-curved grooves. Air was delivered around the nozzle from a blower in a spiral motion and the air-oil mixture entered the combustion chamber in a fine whirling mist and burned as a bushy, hollow cone.

This burner was the first to be equipped with an oil cut-off valve actuated by the air pressure of the blower arranged so the oil flow was delayed a few seconds on the starting cycle to allow the air flow to be firmly established before the oil entered the combustion chamber, and cut off the oil flow a few seconds on the stopping operation before the air flow stopped.

Other such burners appeared about 1927. Though they did not exactly follow the designs of the early Electrol, they were fundamentally the same. Since then the high-pressure burner has been predominant in the field. Many of the early burners of this general type had belt-driven pumps, but these were gradually replaced by direct-connected pumps that could maintain the approximately 100 pounds oil pressure used in these burners.

The high-pressure gun-type burner has earned its preference because of its reliable, steady performance. It has the advantage of using some heavier oils at lower cost and greater Btu value. The oil and air handling parts are remote enough from the flame so there are no heat problems that could result in deterioration or formation of carbon or coking of those parts handling oil.

At best this story can point only to a few highlights in the development of the product of an industry that has contributed so much to the health and well-being of the nation. Only a small part can be told in this story. Names of many companies and burners such as Chalmers, Bird, Hubbard, Petro, Gilbert and Barker, S. T. Johnson, Bettendorf, Hart, Delco, Enterprise, Ray, Wayne, and a host of others should be mentioned and their contributions to the industry pointed out because every one of them helped the industry advance to the position it now occupies in our economy.

In addition to burners that gained prominence before they vanished into obscurity, there probably were hundreds that flourished awhile in a local area and then disappeared. Philadelphia is an excellent local example. At one time it was a hot house in the sprouting and growth of new burners, but paradoxically all of them disappeared or the manufacturers moved away.

There was not a single oil burner installation in that city in 1920 and there were exactly eight gas-fired heating jobs in the city and its environs. NoKol opened a direct factory branch in 1922 and during the next year or two sold exactly 11 burners.

However, the anthracite coal strike which lasted practically through the winter of 1923 put them and almost every other oil burner company in business because of the ill will that the strike had engendered toward the coal industry. In a short while, most of the other major oil burner companies had offices and showrooms there that were factory owned and staffed by managers who had been factory trained. They hired large crews to canvass the city to sell burners, and they sold them. In time all of these branches were sold either to one of the salesmen or to some local enterprise, and the factory branches disappeared.

Probably because of the success that factory branches had enjoyed, many local companies started to make their own oil burners. One was the Tabor made by the Tabor manufacturing company. Although the company had ample finances and a good engineering talent, the Tabor burner died before it got well started. Another was a burner patented by a "Captain Wilner" who was an excellent rifle shot and a "Captain" by courtesy of his friends. He had some rather revolutionary and unique ideas that he hoped to build into his burner, but he had no money. To get started, he went in partnership with a local boiler and foundry company and eventually wound up with neither partnership nor burner.

One of the best known local burners was the Sword Burner invented by Jim Sword and financed by a man named Kimber, forming the firm of Sword and Kimber to manufacture the burner. This was a somewhat unusual burner that projected a fine stream of oil against a target in a pot. Later, with the help of Jim Breese, a feature was incorporated into it whereby some products of combustion were recirculated into the combustion zone to lower the stack losses and quiet the combustion noise. The burner had a complicated casting in the firepot that could not take it and disintegrated. That was the end of the Sword burner.

Then there was the Oildom burner. It lasted long enough so 100 were sold and installed and then the firm disappeared. This brought a sigh of relief to some Honeywell service men who had helped install almost every one of them. Another outfit that probably had heard about the Brouse burner in Canada which was powered with a Pelton water wheel, decided to make its own water-powered oil burner. It was a unique device, and instead of connecting it to an electrical outlet one simply ran a hose between it and the nearest faucet in the basement. The higher the water pressure, the faster the burner ran. Since the water pressure was not steady, almost anything could and did happen. The city of Philadelphia finally put a stop to it because it was using too much water. These are only a few of the many burners that were hatched and died in that city.

No story of oil burners would be complete without a word about the burners that predate most of those that we have been talking about. Widely used was a type of vaporizing burner that used a woven wick to bring the fuel oil from the fuel container beneath it to heat of the flame and expose it to vaporization and burning. This was probably the first application of oil to domestic heating.

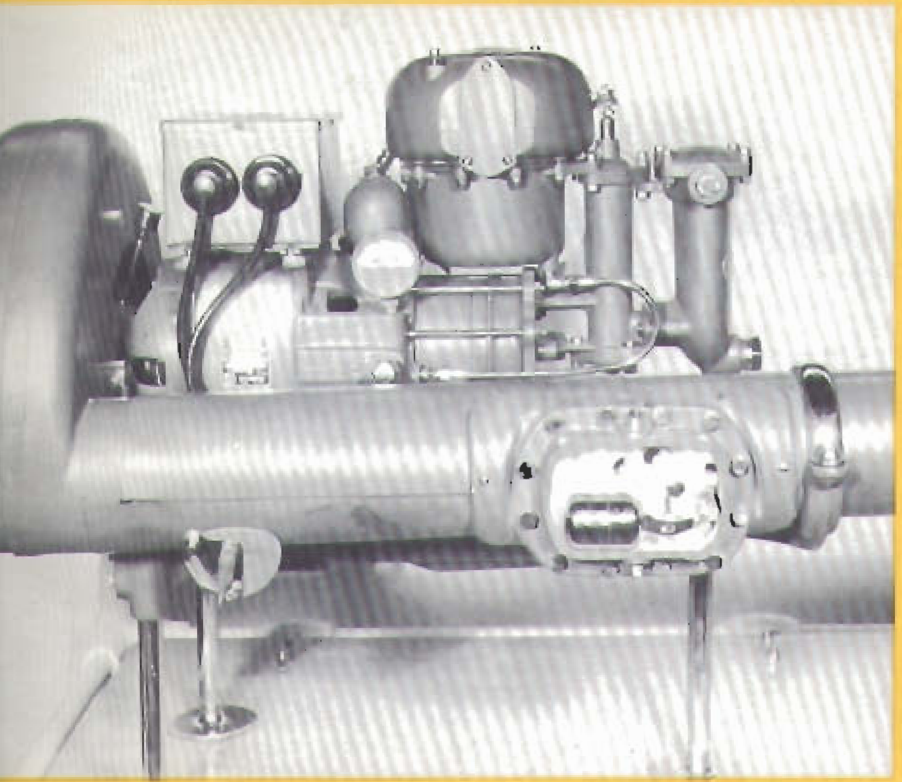
The wick-type stove has been replaced by a wickless type that uses perforated metal shells or sleeves to vaporize the oil. These were based on designs made by Jim Breese and Duo-therm. Thousands were used for kitchen ranges before World War II and since then an equally fantastic number have been used for stoves and room heaters. These were developed by such firms as Silent Glow, Quaker Manufacturing Co., Automatic Burner Corporation, Duo-therm, and Perfection Stove Co., now a division of Hupp Corporation.

Along with these there was, and still is, a type of burner for a central heating system that is known as the vaporizing pot burner. This burner has some resemblance to the first pot burners, such as NoKol back in the very early days. This burner has a pot in which the oil is burned. The oil enters the pot by gravity flow and is ignited either by a gas or oil pilot flame. The interior is lined with a perforated sleeve through which combustion air enters the firing area from a forced-air fan. As soon as the pot gets hot the flame rises above it and most of the fire is outside and above the pot. They, along with the stove and room heaters, burn a light distillate oil or kerosene.

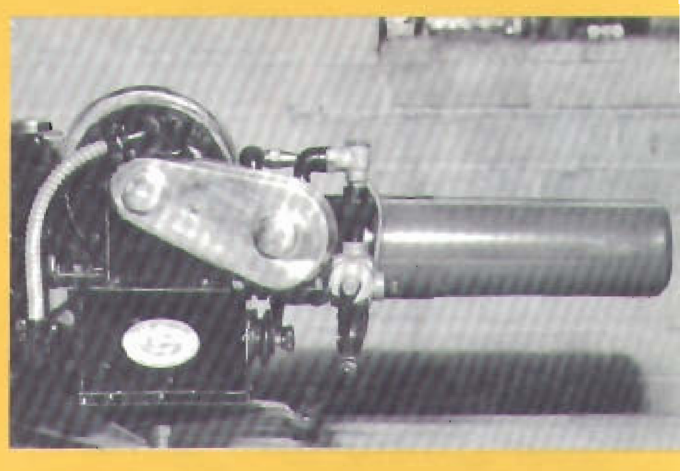
These burners had some problems that did not endear them to the heart of the home owner. The major one was that they could be awfully dirty and require considerable maintenance. When installed in a warm air furnace some jobs would burn as clean as a hounds tooth with little or no carbon remaining in the pot. However, a job next door in an identical house would be a smoker and the pot require weekly cleaning of the blackest soot you ever saw. Several firms making these burners have come and gone, including Oliver, Dist-O-Matic and Marr. They did stage a comeback, however, when improved models were made available by Duo-therm, Norge, Superfex and Evans.

It takes more than the mechanical refinements of an oil burner to make it operate with smoothness and safety. Oil can be a tempestuous and obstreperous fuel and gives vent to its anger in ways that are disconcerting to the homeowner. Consequently an oil burner must be constantly supervised while it is in operation and properly started when heat is wanted. That is the function of controls. Had not control manufacturers worked hand in hand with the oil burner manufacturers from the very day they started to design an oil burner, there would be no oil heating today.

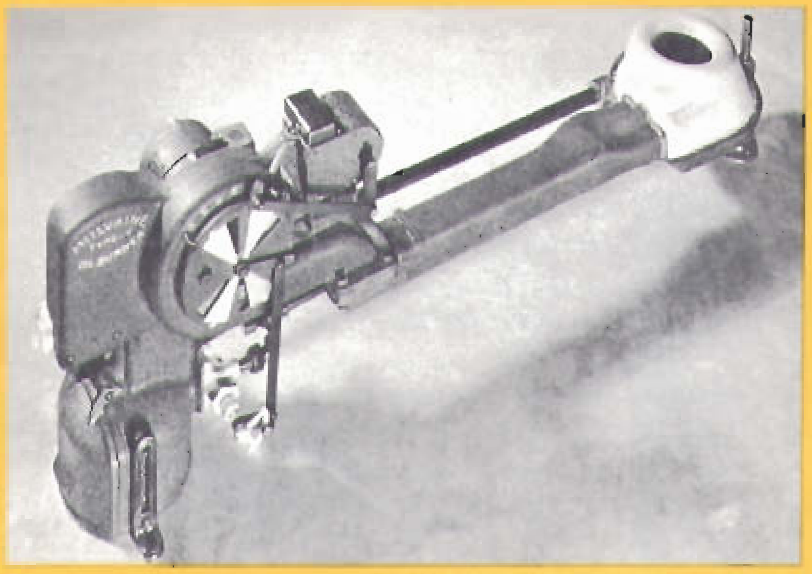
Honeywell has led the way in the control of oil burners of every shape, size and variation. The first order that Honeywell received for oil burner controls was in 1917, and all they had to offer was a damper flapper set that could be connected to the burner mechanism to start and stop it in response to the demands of a thermostat. That was all that



AN EARLY low pressure gun-type burner with electric ignition. Williams Oil-O-Matic, Model J.



AN EARLY model belt driven Nu-Way with burner mounted control relay and stack-switch in smoke pipe.



THIS CLASSIC old pot-type McIlvaine had 6 fire sizes by control from a step action thermostat and damper motor.

Honeywell had and that was all the burner manufacturer thought he needed.

The burners of that day were equipped with a drain pipe from the bottom of the combustion chamber that led to a trip bucket that in turn would stop the operation of the burner if the bucket filled with unburned oil. The only trouble was that it didn't. Sometimes the bucket failed to work because of an obstruction beneath it or for some other reason. Then the entire contents of the oil tank would drain on the basement floor. So Honeywell engineers got to work to do something about it.

The first oil burner relay made by Honeywell was in 1923, but this was only a slight improvement over the old damper flapper. It would open up the electrical contacts automatically if the current failed. It had sufficient electrical capacity to take care of all burners without an intermediate electrical switch which the damper flapper did not do or have. It was quite obvious to Honeywell engineers that a more reliable method was needed to determine whether the burner actually was burning.

Honeywell found the answer when it brought out two controls during the 1920s that did away with the trip bucket. One was the Pyrostat that would respond to the radiant heat of the flame and stop operation of the burner if flame was not present. The other control was the Protectostat mounted on the smoke pipe to the chimney and it measured and responded to the temperature of the gases within the pipe. If the stack temperatures did not increase after the burner was supposed to start, this control immediately would stop the burner operation.

This was only the start. The famous series 10 circuit was introduced in 1923, and it was the first low-voltage control circuit for a burner that would put everything back on dead center if the power supply failed while the burner was in operation. During the next 10 years, Honeywell made and tested over 70 Protectorelays before one was found that would properly sequence the starting and running operations of the burner and meet all the needs of burner manufacturers. It was through the continuing efforts of Honeywell that oil burner controls became standardized to the degree that it was not necessary to make a different control for every burner.

Honeywell will continue to work with the burner manufacturers and will have controls to meet new demands that the industry may bring forth in new and improved oil burning equipment. Honeywell is also constantly trying to improve existing controls to keep the capricious nature of the oil flame subdued.

THE YEARS AHEAD

We at Honeywell are busy in virtually every phase of science and engineering. Our field of activity ranges from participation in almost every major American space program to being a part of a scientific team that is planning to drill through the crust of the earth.

Despite Honeywell's interest in such space-age activity, Honeywell continues to be deeply involved and vitally interested in the field of home comfort.

As you know, this company was founded in 1885 to produce America's first home temperature control system. Diversified as Honeywell has grown, today it still is the world's largest supplier of temperature control equipment.

We intend to maintain our position, and we are continuing extensive research in temperature control problems. This research is likely to bring new types of environmental conditioning equipment, and new controls will be required for that equipment. These products will further the cause of human comfort, for undoubtedly they will provide an air supply in which not only temperature, but humidity, dust, odors and other factors will be automatically controlled.

In the decade just ended, there was heartening progress in home heating and cooling. The engineering improvements in such everyday mechanisms as the thermostat and controls are well known to you. But we are not sitting back and congratulating ourselves.

Our engineers also are working on an experimental temperature control device that would send radio signals to the heating system to call for more or less heat. This kind of thermostat would need no wiring. It would make possible the remote control of temperature from any area of the house. Some day, the housewife may be able to take a thermostat with her from kitchen to bedroom and to adjust the temperature automatically to a desired level.

DR. FINN J. LARSEN
Honeywell
Vice President, Research

We at Honeywell also are engaged in studies for simultaneous control of air temperature and humidity level in a home. Our research people are seeking a control device which will either add or reduce moisture in a home at the same time it is being heated or cooled. Proper control of humidity would eliminate much building deterioration as well as assist in eliminating the discomforts of common colds and other respiratory infections.

The desire and demand for summer comfort has developed at an incredible pace in the last decade. In many areas, commercial buildings without air conditioning are quite out of date. The tremendous sales of room units for homes indicates how widespread this desire for cooling has grown.

I believe that by the end of the 1960s, central air conditioning in homes will be standard. Practically all new homes will be built with central air conditioning systems. With engineering refinements, costs will go down, and more families will be able to afford a central cooling system.

To go along with controlled comfort, Honeywell is engaged in work to provide cleaner air for the home. This research is well advanced and Honeywell expects to introduce soon a low-cost electronic air cleaner designed especially for home use. It will quickly remove nearly all dirt, lint, dust and pollen from the air. The relief this mechanism will provide for allergy victims alone is almost immeasurable.

Some day, along with dust and pollen, Honeywell may be able to control odors. Scientists are studying molecular structure with the hope that they may learn how to modify odor molecules in such a way that they can convert or eliminate unpleasant odors.

This type of research also might result in our being able to control the many ingredients in our atmosphere. Scientists know that certain ingredients in the air we breathe affect our well being. We are exhilarated by crisp, mountain air or lulled by a warm, languid seashore air.

It is interesting to speculate that in the future we may be able to push a button and create whatever atmosphere we desire in our homes. This kind of control combined with the other comfort controls would permit us to work better and to live better.

What will the 1960s bring? What will the next 75 years bring? Some of the accomplishments we are sure of. On others we can only speculate. But Honeywell research and ...ering insure that these years will bring the means for a better life with an extension ... environment.

Carter-Donlevy Co.
1419 Spring Garden
Philadelphia, Pa. 30
Attn: C. W. Carter

W

Minneapolis-Honeywell Regulator Co.
Minneapolis 8, Minnesota
Return Postage Guaranteed

BULK RATE
U. S. POSTAGE
PAID
MINNEAPOLIS, MINN.
PERMIT NO. 40