TIME

SCIENCE

The Physicist's Fire

Few things in life are more attrac tive than an open hearth fire—or less efficient. It is messy, requires continual attention, and sends perhaps as much as 90% of its heat up the chimney with the smoke. Most homeowners learn to live with such flaws. Lawrence Cranberg, an Austin, Tex., physicist went back to basic physics to correct them.

He has designed a fireplace grate that forces a fire not only to burn better but to send more of its heat out into the room.

Cranberg turned his attention toward hearth fires last winter; in an attempt to conserve oil, he supplemented his home heating with his two fireplaces. Frustrated by the inefficiency of a standard three-log fire, he studied what really happened when he poked at the logs to make the fire burn better. His conclusion: "I was opening up a furnace, prying the logs apart a bit or rotating them to expose the hot, charred surface in order to get more heat into the room." He was creating, in effect, something similar to what physicists call a "black body," a furnace-like cavity with walls that absorb and then emit practically all the heat and other radiation that reaches them; only a fraction of the radiation escapes through a small hole in one of the walls.

Easy to Light. Applying this concept, Cranberg built the "Texas Fireframe," a spindly metal contraption that looks like a standard fireplace grate with two taller uprights at the front corners fitted with adjustable metal arms that extend into the fireplace. To use it, he places a large log toward the rear of the grate, two smaller ones toward the front, and a fourth log, slightly smaller than the first, on the adjustable arms *(see diagram)*. He then lowers the arms until the top log just touches the surface of the large one at the rear. This creates a cavity that opens into the room—a sort of wooden furnace that contains the fire and prevents much of its heat from immediately escaping up the chimney.

One product of this arrangement is a hot, even, slow-burning fire; about 30% of the heat generated inside the slot eventually streams out into the room. There is another bonus: it is easy to light. A conventional fire requires a pile of kindling, a few balls of crumpled newspaper and, frequently, several matches before it will catch. Often it burns for half an hour or more before it starts dropping coals and throwing off substantial heat. Because his arrangement traps heat so well, Cranberg can light even damp wood with only a few sheets of newspaper, placed directly in the cavity, and have a hot fire in 15 minutes.