NON-CONDUCTION.

The retention of heat after it is once generated would seem to be as important, from an economic point of view, as the lessening of the consumption of fuel, yet this practical aspect of the case seldom receives attention. Many devices are brought forward which are calculated to reduce the quantity of fuel in given instances and to effect a saving amounting to a large percentage, while the heat wasted by radiation and convection is allowed no consideration.

In the case of cooking stoves, for instance, we have for an object to heat small ovens to a fixed temperature, which must be maintained, and although this result is successfully attained, it is done at the expense of fuel, for, as a general thing, no part of our stoves is protected by any poor conductor, and the heat is not confined where it is needed. It would seem that at least two-thirds of the surface of a cooking stove might have double walls which could be filled with an incombustible material, and thus not only keep a more constant temperature in the ovens, but prevent a needless amount of radiation and consequent waste of fuel. The question of the loss of heat receives attention in the handling of steam, because it is compulsory to do something to prevent condensation, and not especially for the reason that fuel can be saved.

We are naturally very extravagant, and at the same time parsimonious, in this matter of heat-saving, for, on the one hand, we allow, day after day, the freest use of coal to obtain a desired effect, and, on the other hand, if recommended to make a temporary outlay which would permanently bring about the same result, we say it would not pay. The efficiency of fuel should not be determined by the amount of heat, which might be called surplus heat, that we may lose with impunity.

Then, again, we mistake the power of a medium to prevent the passage of heat. It is generally expected that an inch of insulating material must totally eclipse the radiation from a surface heated to 212 degrees. There is nothing capable of doing it, and physicists have not ventured to suggest how attenuated the fibers or how microscopic the air spaces would have to be to accomplish this result. Everything bearing upon successful insulation is quite the contrary of the prevalent expectation, that a little thickness is going to keep in a high degree of heat, or that an inch of material will prevent the extraction of warmth from water pipes so effectually that they cannot freeze. Furthermore, bodies radiate heat in greater proportion as the temperature increases (nearly as the square of the temperature), and, therefore, the thickness of the jacket should vary accordingly. There is also a great difference between air-confining materials as to the time in which they may be raised to a maximum temperature, and this is probably due to the nature and position of the fibers ; if there is much parallelism between the threads, the highest temperature is sooner reached than if there is no common direction to them.

There is a material now growing into general use which the principles of non-conduction would certainly have brought forth, if the theoretical part of a science could ever take a substantial form. The conversion of scoriaceous substances, chiefly blast-furnace slag, into fine threads called mineral wool, had directed considerable attention to the marked difference between bodies which readily transmit heat and those which retard its passage ; and it really seems as if the density of one and the porosity of the other would soon be recognized as essential characteristics, and then we will no longer be offered a production which will accomplish two opposite results.

The use of dense materials for the transmission and radiation of heat, or for the conduction of sound, makes it appear rational to think that extremely porous material must have the complementary effect. The adaptation of mineral wool to all purposes where the circulation of the air would either allow the passage of heat or the transmission of the vibrations necessary to sound, has gone beyond experiment, and real merit is conceded to the material. The method of the New York Steam Company is to place an 11 inch steam pipe in a hollow log 3 inches thick, but leaving a space all around, 2½ inches wide, which is filled with mineral wool.

This plan it illustrated in Fig. 1 of the engravings. Fig. 4 shows a somewhat different method of reaching the same result. Wooden collars made in sections are employed, protected next to the pipes by tin or sheet iron sufficiently high to carry over joints. The lagging or strips of wood which are nailed to the collars are shown in the central part of the cut. After these strips are in place, the pipe is covered with cotton cloth or burlaps, and painted white or in some color. Fig. 5 shows pipes incased in mineral wool, which is held in place by wooden boxes. The boxes for this purpose are made of ⅞-inch boards, and the method shown is one well adapted for use in the case of pipes exposed to the weather. Figs. 2 and 3 show two methods of protecting boilers against radiation, one being the plan employed at the Grand Opera House, New York, and the other the method adopted by the Pennsylvania Railroad Company.—*Metal Worker.*

AERIAL NAVIGATION.

There has long been a theory among balloonists than an easterly current of air prevails at a certain height from the West to the Atlantic coast in this country, and several attempts have been made to test it. Recently such an attempt was made by Prof. King with all possible precautions for success, but it ended in failure because it was discovered that after ascending some 3,000 feet the wind did not blow in an easterly direction, and the balloon became unmanageable. After drifting for a short distance, Prof. King's balloon descended in a field, and the attempt was abandoned. Regarding this theory of navigating the air by the help of eastern currents, Mr. Donaldson, one of the most experienced balloonists we have, says : "There is no science in air navigation. A balloon is nothing more than a feather in the air. There is nothing in the eastern air current. The air is full of currents running in every direction and different every day. The science of ballooning is nothing more than the skill necessary in knowing how to go up, how to regulate with ballast, how to descend, and how to make a safe landing. Twenty men's power cannot alter the course of the balloon in a strong current. I alone, however, when above the clouds in a calm, have raised my balloon by fanning the air, but I could not change its course. I don't think that human invention can devise any apparatus that will steer a balloon in the air. There is not a sufficient body of resistance in the air at any height over two hundred feet."

Inventors are still, however, engaged in endeavors to solve the problem as to how to navigate the air, and now, if some one will find out how to confine gas so that it will not escape from the balloon, it will be a discovery worth considerable to aeronauts, because then they can stay up until they want to come down. They can stay up to be blown wherever the wind takes them. That is the one discovery or invention necessary. Then the other invention must be made an apparatus to steer a balloon while in the air, so that it can be operated like sailing a ship at sea. There are the two things necessary for positive aerial navigation ; First, to box up and preserve the lifting power of gas for an indefinite time—until done with it for the trip ; second to invent a steering apparatus. Until these things are done successfully, ballooning will be all an experiment haphazard, and forever groping helpless in the air, without a single purpose in full control.

A method of propelling an elongated balloon by a screw worked by an electric motor, has recently been patented in France. An experimental balloon has been made and fitted up, the motive power for which will be derived from a small dynamo-electric machine, the frame and all metal parts being made hollow to ensure lightness. The force generated by this machine will be stored in very light electric accumulators made of ebonite or parchment lined with sheet lead. It is claimed that the electric motor is superior to a steam engine for the purposes on these points. 1. It has a constant weight, while that of a steam apparatus is alway changeable. 2. It is free from the danger of fire in the presence of a combustible gas. 3. It is most simple and easily managed.

M. Jules Godard, a well-known aeronaut, exhibits at the Electrical Exposition in Paris an electrical warner in which, when the balloon is descending, an electrical vibrator is set in operation, when it is ascending a bell rings. This effect is obtained very simply by a valve, which is in equilibrium when the balloon keeps it level and is moved by a slight current of air.

Among the practical uses for balloons in their present form may be noted that of obtaining astronomical observations. M. W. de Fonvielle, of Paris, recently ascended at midnight, in a balloon, for the purpose of noting the appearance of comet B, 1881, as seen by him from the car. It was proposed to examine the curvature of the comet's tail above the dense and moist lower atmosphere, and to test the efficiency of M. Trouve's electric lamp. At an altitude of 1,000 metres the curvature was almost insensible, instead of acquiring fantastic proportions. The tail was a little longer than seen from the earth, but was cut off straight, as if a line were drawn over it horizontally with