NONPAREIL CORKBOARD INSULATION FOR COLD STORAGE WAREHOUSES, ICE PLANTS, BREWERIES, PACKING PLANTS, FUR STORAGE VAULTS, DAIRIES, CREAMERIES, ICE CREAM PLANTS, REFRIGERATORS, FREEZING TANKS AND GENERALLY WHEREVER

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Trieste

NONPAREIL CORKBOARD INSULATION

For COLD STORAGE WAREHOUSES ICE PLANTS BREWERIES PACKING PLANTS FUR STORAGE VAULTS DAIRIES CREAMERIES ICE CREAM PLANTS REFRIGERATORS FREEZING TANKS AND GENERALLY WHEREVER REFRIGERATION IS EMPLOYED OR A HEAT INSULATING MATERIAL OF GREAT EFFICIENCY FOR TEMPERATURES UNDER 212° FAHRENHEIT IS REQUIRED

1915 Edition

NONPAREIL
REG. U. S. PAT. OFF.

ARMSTRONG CORK & INSULATION CO.
PITTSBURGH, PA., U. S. A.

BRANCHES OR DIRECT REPRESENTATIVES IN THE PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

The cork oak—native of the Spanish Peninsula and Northern Africa, from the outer bark of which Nonpareil Corkboard is made

Nonpareil Corkboard Insulation

FOR a good many centuries men have known better than to store wine in leaky vessels. Today no one allows steam that ought to be driving machinery to escape from broken pipes. Nor is electric power permitted to go to waste by failure to insulate properly the supports on which the wires are carried. Yet many men pump refrigeration into rooms day after day, making little or no intelligent effort to prevent the heat from constantly leaking back.

The Vital Importance of Insulation

The reason for this neglect may be sought in several quarters. Heat is a very commonplace thing. We experience its effects every hour that passes. There does not seem to be anything particularly wonderful about it. But if we stop to consider, we find ourselves face to face with the fact that of all known forms of energy, it is one of the most powerful and all-pervading. We can shut out the light; certain substances are impervious even to X-rays; but as for heat, nothing will completely stop its passage.

Its Importance is Frequently Overlooked

No one needs to be told the part the refrigerating machine plays in keeping a room cooled to proper temperature. One can see the wheels go round and watch the strokes of the compressor. But as for the insulating material, what good does it do? So the average man is apt to reason. Get anything that will fill up space fairly well, stuff the walls, floors and ceilings, and let it go at that. Insulation does not show; it will all be covered up anyway. Why bother much about it, or spend time and money in designing and installing it?

Good Insulation is True Economy

Right at this point, by following this natural but erroneous reasoning, many plant owners make their first big mistake, the results of which follow hard on their trail for many a year, revealing themselves in the form of increased operating expense, rapid depreciation of machinery and insulation repairs. The fact is that the insulation of any cold storage room is just as important as the refrigerating machinery. Three-fourths of the work of the machine in the average plant is done to remove the heat that leaks in through the walls, floors and ceilings; but one-fourth goes to cool the goods in storage. If you use ice, seventy-five out of every one hundred pounds put into your coolers is melted by the heat that works its way in from all sides. This loss cannot be prevented entirely, because no material is heat-proof. It is possible, though, to cut it down to a point, neither above which nor below which you can profitably afford to go. If any plant is to operate on a truly economical basis, it must be protected against the heat to the point where the cost of any additional insulation would not be offset by the extra saving in operating expense.

Insulation a Permanent Investment

As a well-known refrigerating engineer has tersely said: "Insulation should be considered in the light of a permanent investment, just as buildings and equipment, the returns of which should be based on the savings effected by the lower operating cost. It is a great deal cheaper to prevent heat from entering a building than to remove it by means of refrigeration."

The word *insulation* is derived from a Latin word meaning *island*. The significance, therefore, of the definition of *insulate*, as given in the dictionary, will be readily grasped: "To place in a detached situation, having no communication with surrounding objects." In insulating a cold storage room, what the engineer tries to do, is to make it an island in the ocean of heat.

The Transmission of Heat

Radiation

Heat, though, has several ways of getting about. It can pass through space on the ether waves without appreciably heating the air. Stand in front of a stove, and the truth of this assertion is self-evident. Or perhaps the sensation of warmth that one feels in bright sunlight on a cool day is a better illustration of the *radiation* of heat, as this method of transference is called.

Conduction

When the problem of insulating a cold storage room is under consideration, however, the other two ways that heat moves are of more importance. By *conduction* is meant the transference of heat from one molecule or particle of matter to another by impact. For instance, put one end of a poker in the fire, and soon the other end will get hot, although far removed from the source of heat. This is exactly the process that goes on in the walls of a cold storage room. The outside is heated by the sun's rays or the warm air. The molecules on the surface are first set in motion. Gradually the movement spreads and goes deeper and deeper into the wall. When the molecular excitement gets into the insulation, it travels forward less rapidly. The progress of the heat is impeded, just as piling along the water front breaks the force of the incoming waves. Still, some of the heat eventually passes through, the amount depending upon the efficiency of the insulation.

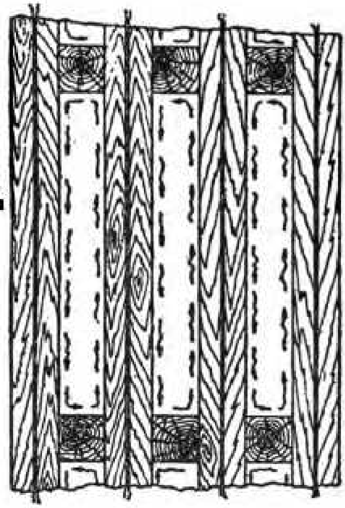
Slowly but surely the temperature of the room rises, unless refrigeration is continuously applied to offset the heat leakage.

Convection

The heat conductivity of dense substances—metals, whose molecules are heavy and close together—is very high; the conductivity of lighter materials, such as wood, is less; while that of gases is extremely low. Hence, air, the most available gas, is the most efficient insulator that can be had, if a vacuum, which is impracticable on a large scale, be excepted. But the problem is to confine the air so that it cannot circulate; for the transmission of heat is also effected by a third method called *convection*, or in other words, the carrying of heat from one point or object to another by means of some outside agent, such as air or water, or any moving gas or fluid. The principle of convection is well illustrated in an ordinary house furnace. The rooms of the house are, in such cases, warmed by means of a current of heated air. In the hot water heating system, water is the medium utilized to carry the heat from the boiler to the room to be heated. No mechanical means has to be employed in either case, to make the air or water circulate. Ducts or pipes are provided, and the hot air or water rises as it is warmed and drops as it becomes cool, thus automatically setting up circulation.

Passage of Heat Through Insulation

On a miniature scale, a similar process takes place in every form of insulation. To make this point clear, there is shown on the next page a cross-section of boards-and-air-space insulation, consisting of air-spaces from one to two inches thick and twelve inches high, formed by alternating layers of boards and furring strips. The side of the insulation next to the outer air is, of course, warmer than the side next to the cold room. The air against the outer wall of each air-space in the insulation becomes heated and rises, its place being taken by the cold air from the other side. As this becomes warm, it forces its way upward; the other part, having gradually cooled, drops to the bottom; and thus a constant circulation is set up inside the air-space itself. This movement tends to equalize the temperature on both sides of the air-space and will continue as long as there is any difference in temperature. From this it is obvious that the fewer the air-spaces, the more rapidly will heat pass from one side of insulation to the other. Therefore, the best insulation is that which embodies the greatest number of the smallest possible air-spaces, for the smaller the air-spaces the less extensive will be the effect of the circulation of the air confined therein. The problem is, then, so far as the nonconduction of heat is concerned, to find some material which contains a large amount of entrapped air absolutely confined in minute particles.


Inside Cold

Outside Warm

Convection in boards-and-air-space insulation

Smallest Possible Air-Spaces