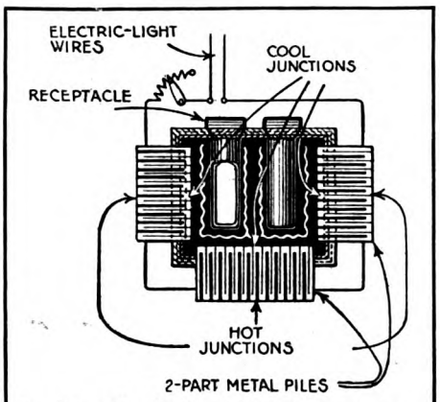
up heat to its surroundings—this is the heat that must be removed by the cooling water. Later, in its path along the conducting pipes it is allowed to expand, passing from a point of high pressure to one of lower pressure. It is at this point that the fluid takes up heat from its surroundings—that is, cools whatever is to be refrigerated.

Electricity behaves like a fluid, although as a matter of fact it is really very minute particles, the electrons that modern science has discovered. It may be pumped around a conducting wire by a battery or dynamo, just as fluids are pumped through pipes. A battery or dynamo is merely an electrical pump on one side of which the electrical pressure is lower than on the other side.

The First Electric Pump

The first electric pump was made by Volta in 1800. He put together two different kinds of metal, connecting them with a bit of cloth damp with acid, and so made the first electric battery. Twenty-one years later another kind of electric pump was discovered. A man of the name of Seebeck fastened two dissimilar metals into a ring and heated one of the junctions. He found that a current of electricity was caused to flow around the conducting path formed by the two metals. The junction of two dissimilar metals acts as an electric pump when it absorbs heat from its surroundings. It remained for Peltier in 1834 to discover the reverse of this phenomenon. If a current of electricity is passed through the junction of two unlike metals in the form of a cross, the junction will be heated or cooled, depending upon the direction of the electric current when it is turned on.

Connect a strip of nickel to one of iron so as to form a ring. Heat one junction, and a current will flow around the circuit. At the heated junction it will flow from nickel to iron. This junction acts like an electric pump. At the cooler junction the current flows in the opposite way.



In the walls of this refrigerator are hundreds of alternate strips of bismuth and antimony. When the current flows, the outside junctions of these strips reject heat which the inside ones have absorbed

Now put a battery into the circuit. At one junction the battery current will flow from nickel to iron, that is, in the same direction as it would if we heated this junction. This junction must absorb heat, for if it rises in temperature it will act like a pump, keeping the current going in the same direction as we started it. We should then have perpetual motion.

At the other junction, where the battery current is in the opposite direction, heat is given off; that is, the junction rises in temperature. It then acts like a pump opposing the battery current. In any electrical circuit, as the student of direct-current motors knows, passing current through an electrical pump makes the pump act to oppose the flow of current, not to assist it.

There is a neat experiment that may be performed to show this phenomenon of the absorption of heat at one junction and its rejection at another. Make a circuit of bismuth and antimony. Place a little ice around one junction and a little ice-cold water around the other. Pass a current through the circuit in the proper direction, and the ice will melt while the water freezes.

The effect, however, is very small. These thermo-electric pumps develop only a fraction of a volt for each degree of temperature to which they are heated. It is exactly as if we tried to run an ammonia machine with a poor compressor, and with so small an enlargement of the pipe where expansion occurred that the gas cools but slightly.

Is Electric Refrigeration Practicable?

It may well be, therefore, that we shall never see electric refrigeration. If we do, there will be formed a long circuit composed of alternate strips of bismuth and antimony for which the Peltier effect is greatest. This will be carefully insulated and folded up as shown in the picture, so that when a current is sent through it, all the junctions on one side are cooled, while all those on the other side are heated. The side that gets cooled will be put into the refrigerating chamber, and the other side left in the open air. Flanges to increase the radiating surface will be needed on the outside, and perhaps a running stream of cooling water as well.

This Tank Now Under New Management

TANKS are usually associated with rides more sinister than joy rides. But here is a tank that has been equipped to provide space for passengers who desire to travel over smooth and rough places in one of these capable though clumsy vehicles. A platform has been arranged for the top of the tank, thus increasing its space for passengers