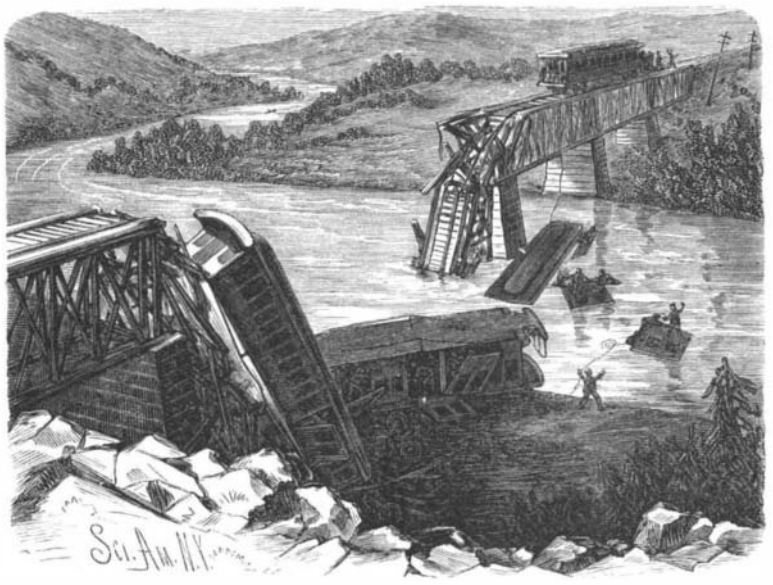
AN IMPROVED PASSENGER RAILWAY CAR.

A passenger car made with detachable and buoyant side panels, readily removable in case of accident, for the release of the passengers, is represented in the accompanying illustration, and has been patented by Mr. Henry Niehoff, of No. 74 West Fifty-third Street, New York City. These panels, which extend below the windows of the car, have in their lower portions air-tight vessels, or the lower part of the panels may be filled with cork or other light material, the panels having recesses in their abutting edges for the introduction of a double-headed dowel, of which the heads extend to the inner and outer faces of the panel. Below these recesses is a transverse slot, in which is fitted the connecting web of an H-shaped clip, the web entering registering recesses in the abutting edges of the adjacent panels, and the clips being bent down to bear against the outer and inner faces of the panels. One of the end panels is permanently connected to the car, and as many other panels are employed as may be necessary to fill up and inclose that side of the car, their vertical edges connected as described, and each panel being supported at its lower edge by a pin which fits into a socket secured to the sill of the car. In the upper edge of the panels is a slot entered by a tongued shaft mounted in the framing of the car above the space occupied by the panels, this shaft having outer handles and inner handles or lever arms. This shaft and lever handles are so arranged that in case of accident, as by the overturning of the car, the tongues will be carried upward, and a slight push upon the panels will cause them to fall outward from the car frame, thus clearing the whole side of the car; or this turning of the tongues may be effected by parties on the outside or inside of the car by grasping the inner or outer handles. By this construction also, should the roof or floor of the car be badly broken, the panels will fall out, and should the cars fall into the water the air-tight or cork-packed compartments of the panels will make them useful as life preservers.



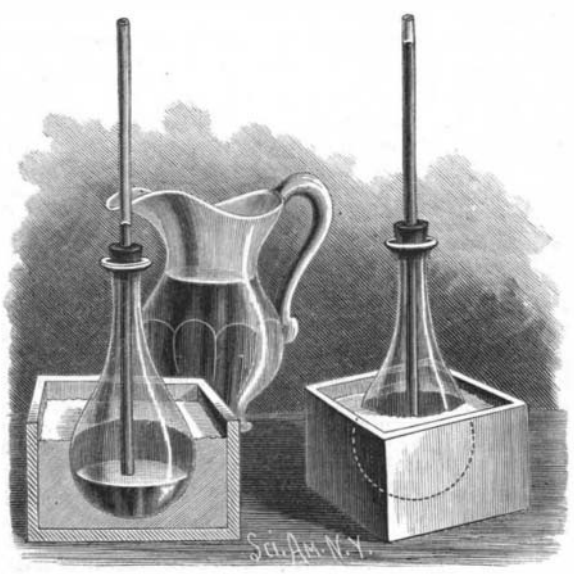
NIEHOFF'S PASSENGER RAILWAY CAR.

EXPERIMENTS ILLUSTRATING PHYSICAL AND CHEMICAL CHANGE.

T. O'CONOR SLOANE, PH.D.

At the present time, when physics and chemistry approach so closely to each other, and may even be said to overlap, it is very hard to furnish definitions that will really distinguish one from the other. When the vexed ground of solution and molecular combination is reached, it is often impossible to characterize reactions as chemical rather than physical, or the reverse. Perhaps the best distinction is to consider chemistry the science of atoms, and physics the science of molecules. Then mechanics is left as a heading for the science of mass.

The general indications of a chemical reaction include the production of thermic changes. If it is a case of combination, an increase of temperature is produced, as a general rule. Heat is always developed, but it may be marked by incidental changes productive of cold. On the other hand, in a physical change, minor thermal activity, as a rule, prevails.



PHYSICAL AND CHEMICAL CHANGE.

Advantage is taken of the opposite thermal effects due to chemical combination and to liquefaction in the experiment illustrated, to produce an example of a chemical contrasted with a physical change. In the first, heat is produced by chemical combination; in the second, cold is produced, or, more strictly speaking, heat is absorbed by the act of liquefaction—a purely physical phenomenon.

Two flasks, of about one pint capacity, are fitted with singly perforated corks. Through each cork a glass tube of about one-fourth inch internal bore is passed, which reaches nearly to the bottom of the flask. A little water, enough to seal the end of the tube, is placed in each, and the corks are pressed home. This forces water up into the tubes. All should be so arranged that when the corks are in place the water will reach to the center of each tube. The flasks thus arranged form delicate thermoscopes or indicators of a change of temperature. To render their indications visible, a little coloring matter should be added to the water. A little sulphocyanide of iron, formed by adding potassium sulphocyanide and ferric chloride (chloride of iron) to the water, is an excellent material. It colors the water red, and, unlike most of the aniline colors, does not stain the glass. For most experiments where water is used, this will be found an excellent substance for rendering the water visible.

Two boxes, which should be as near watertight as possible, and which should be large enough to hold the flasks, are next needed. In each of these a flask is placed. One is packed around with quicklime, preferably in somewhat small pieces. The other is embedded in crystals of nitrate of ammonia. Water is poured into the two boxes, so as to fill them within an inch of the top, while giving the fluid time to percolate through the mass of solid material.

The quicklime has a strong affinity for water, and in combining with it undoubtedly suffers an atomic change. The water and calcic oxide unite, and in a few minutes become very hot. The air within the flask is expanded by the heat, and the column of water rapidly rises in the tube. If left long enough, it will overflow it. This illustrates a chemical reaction with evolution of heat.

In the other box the nitrate of ammonia rapidly dissolves or liquefies. This change requires the expenditure of energy, represented by the absorption of heat. As none is supplied from an artificial source, the dissolving salt absorbs it from the water, and cold is produced. The column of water in the thermoscope tube sinks rapidly, and soon is out of sight. This illustrates a physical reaction, the change of state from solid to liquid without any atomic change.

The water should be added to both boxes from one pitcher. Thus conducted, a very curious and paradoxical effect is produced. Water from the same vessel produces both heat and cold.

As regards the solution of the nitrate of ammonia, possibly an obscure chemical combination, heat may be produced by it. If so, it is overcome by the greater degree of cold which is produced by the change of physical state of the nitrate of ammonia from solid to liquid.

Other substances may be used. Thus anhydrous carbonate of soda may be used instead of the lime, and many salts used in freezing mixtures could be cited as substitutes for the nitrate of ammonia. Ammonic sulphocyanide is an extremely powerful refrigerant. But from its general innocuousness, the nitrate is to be strongly recommended.

Making Sash Weights out of Tin Cans.

The latest use for tin cans, and the chips from the tin shops, is the conversion of the material into sash weights. The *Commercial Bulletin* says: There is no secret about the process. The only thing is to have a proper sized furnace and to get up a sufficient heat. The business has developed of late, but the manufacturers say the margin of profit is small. It costs more to melt the scraps than common iron. Chips ready for the furnace cost seven dollars a ton. The sash weights produced are of a superior quality. The business is, like the case of old rubber, an illustration of the use of waste material. The tin can companies and other manufacturers of tin goods formerly dumped hundreds of tons into space, but now these scraps are utilized, and the irrepressible small boy works the ash fields to his profit in companionship with the blithesome goat.

Careless Handling of Nitro-glycerine.

If there is anything more surprising than the explosive force of nitro-glycerine, says the *American Architect*, it is certainly the carelessness with which that substance is handled. It is well known that nitro-glycerine freezes at a temperature considerably above the freezing point of water, and scores of accidents have resulted from the reckless methods employed for thawing it. Years ago, when pure nitro-glycerine was used for blasting, a workman in Germany found one morning his can of explosive material frozen. Being in a hurry to begin work, he returned to the house, heated a poker red hot, and started off to thaw the nitro-glycerine with this instrument. It is hardly necessary to say that he succeeded to perfection, the nitro-glycerine changing its condition with an energy which pulverized not only the operator, but all other surrounding objects.

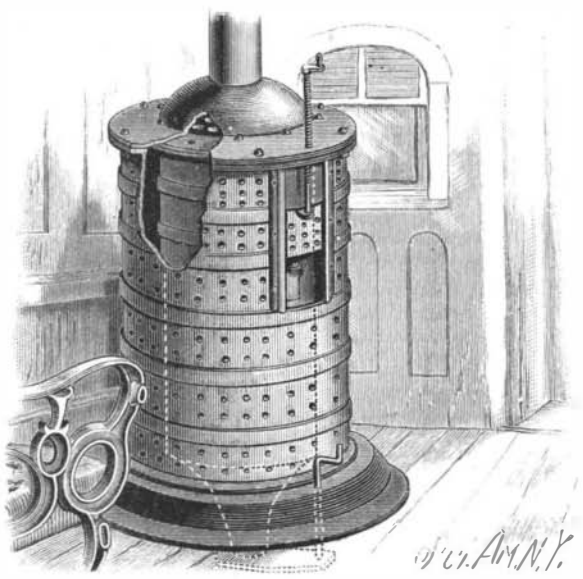
A few days ago, according to *Fire and Water*, five miners in Michigan brought a bent gas pipe to a blacksmith's shop, where it was heated and straightened. Without waiting for it to cool, they then filled it with dynamite, which immediately exploded, killing them all. Almost at the same moment a man in New Jersey brought some blasting cartridges to thaw them out by a fire. He accomplished this result by holding them on the flame for a suitable period, and is supposed to have dropped one during the process, for his remains were found in a fragmentary condition sixty feet away. At Richmond, Ind., on the same day, six tons of dynamite, which had been stored on a farm, exploded, blowing a horse and wagon to pieces, excavating a pit fifteen feet deep and twenty-five feet in diameter, injuring a woman a quarter of a mile away, and breaking every window in a neighboring village.

An Unlooked-for Explosion.

A little knowledge of chemistry has often, from ignorance or when possessed by a person of an experimental turn of mind, led to disastrous results. *Hospital* tells of a nurse in a London hospital who was cleaning a bottle which had contained glycerine. To facilitate matters she poured in some nitric acid, thereby unintentionally forming the explosive compound nitro-glycerine. The bottle burst in her hands, and one piece flew up and struck her face with such violence that her cheek was badly cut and one eye seriously injured.

AN IMPROVED CAR-HEATER.

A car-heater designed to be capable of sustaining great weight, and not allow the escape of fuel should the car be overturned, is illustrated herewith, and has been patented by Mr. James Wardle, of Hope, British Columbia, Canada. It is constructed of two concentric cylindrical casings of malleable steel or iron, both cylinders being strengthened by outer attached metal hoops or bands, and between them a space for the circulation of air. The centrally-apertured base to which both cylinders are attached is secured to the car floor, the inner cylinder having a conical bottom projecting downward through the floor, as shown in dotted lines,



WARDLE'S CAR-HEATER.

a horizontal plate beneath acting as a damper, and also as a means whereby ashes may be dumped through the conical bottom. The outer cylinder is provided with a series of apertures between the encircling bands, and the inner cylinder is capped by an apertured plate, to prevent fuel entering the smoke-pipe should the car be overturned. The latched fuel door of the inner cylinder corresponds with an opening of the outer casing, covered by a door adapted to slide in ways, and operated by a screw rod which travels in a threaded aperture in the flange of the top.