shell, A, through which tubes traverse, the whole being inclosed in an outer shell, B. The fountain communicates with the valve chest of the cylinder, C, in the same way as the steam induction pipe of a steam engine connects the boiler and the cylinder. In the outer shell, B, is placed some of the water or weak solution of ammonia that was left in the boiler of the still, of a suitable temperature to generate the required pressure at starting. This heat exists, then, in the liquefied ammonia as expansive force, and passes out with the gas to the cylinder, where, a portion having been converted into work, the remainder passes, with the exhaust gas, back to the weak solution in the shell, B, where, the latter becoming instantly condensed, the heat is again rendered sensible and passes through the walls of the tubes, to generate expansive force, and so on, the total loss of heat for a given amount of work being the equivalent of the work performed, *plus* that which may have radiated from the shell during the performance of the work; while the loss of the material itself is only that due to whatever leakage has taken place.

This succession of conversions is one of the most beautiful examples of the correlation of forces to be found in any mechanical motor. The theory, upon which the engine is constructed, is sound, while the difficulty of controlling so subtle a gas under high pressure has also been met in an ingenious manner by the use of oil packed stuffing boxes.

One of these is shown at D, Fig. 2. An annular chamber surrounding the piston rod is kept supplied with oil from the chamber, E, through a suitable pipe; this forms a practically impassable barrier to the escape of free ammonia. The oil becomes more or less saponified by the action of the ammonia; but this does not interfere with the usefulness of the packing, or the proper lubrication of the moving parts.

In the Transactions of the American Institute, 1865–6, page 436, the new ammonia engine of M. Tellier, of France, is described. This distinguished chemist invented a means of storing and using mechanical power, by compressing ordinary ammoniacal gas to the liquid state, and applying it for propelling omnibuses and other vehicles, in places where steam power was not admissible. The small vessel containing liquid ammonia (and gaseous ammonia above it) may be compared to an ordinary steam boiler. When the valve is opened, a portion of the gas, having a tension, at 60° Fah., of about 200 pounds per square inch, presses against a piston within a cylinder filled with common air. This movement of the piston transmits power through a crank, and, at the same time, condenses the air before it in the cylinder. At the completion of this stroke, a little water is injected into the cylinder, behind the piston, when the ammonia is instantly absorbed by the water and a vacuum is produced. The pressure behind the piston being thus removed, the compressed air on the other side of it is brought into play; thus the piston comes to its original position and the crank has completed one revolution. After the ammoniacal water has been drawn off, the piston is ready to receive another charge of ammonia. It will be perceived that this apparatus would work more steadily if two cylinders were used. M. Tellier proposes to use three. This arrangement, or any other in which a gas passes from the liquid state at a nearly uniform pressure, has many advantages over that employing atmospheric air as a secondary motor."

This was the ammonia engine alluded to in our editorial of September 23d, in which we stated that a successful trial of it upon an omnibus in Paris had been reported. Dr. Lamm informs us that the trial, though sought, was never made. Even if it were, our readers will see that the engine of M. Tellier is radically different in principle from that of Dr. Lamm, and no more resembles the latter than the steam engine of Savary resembles the modern steam engine.

Dr. Lamm's invention was patented July 19, 1870. Full information regarding it may be obtained from the Ammonia Propelling Company, New Orleans, La.

Ray's Improvement in Wheels for Vehicles.

The object of this invention is to strengthen the fellies or rims of wagon and carriage wheels at the joints, or where the felly segments abut together. The invention consists in the use of a fish plate, curved longitudinally to fit the inside diameter of the felly, and also transversely to fit the inner surface of the felly, of a length sufficient to receive and support the ends of the first spoke or more, on either side of the felly joint.

The plate is made of metal and let into the wood, so that its outer surface is even with and corresponds with the inner surface of the felly, or it may be used without cutting the fellies. The plate extends far enough in either direction from the joint to receive a spoke on each side, holes being formed through it for the tenon of the spoke. Screw bolts pass entirely through the tire and rim, and hold the plate firmly to the felly.

It is well known that the weakest part of the felly of a wheel is at the joint; and various devices have been adopted to strengthen the felly at these points. The fish plate, used as described, confines the ends of the segments, and forms a strong arch, supported by the spokes at the joint, for withstanding the heavy blows dealt upon every portion of the rim of the wheel. It is a cheap, simple, and seemingly effective arrangement. This improvement has just been patented by William F. Ray, of Fort Wayne, Ind.

IRELAND'S VAULTS FOR THE SAFE KEEPING OF VALUABLES.

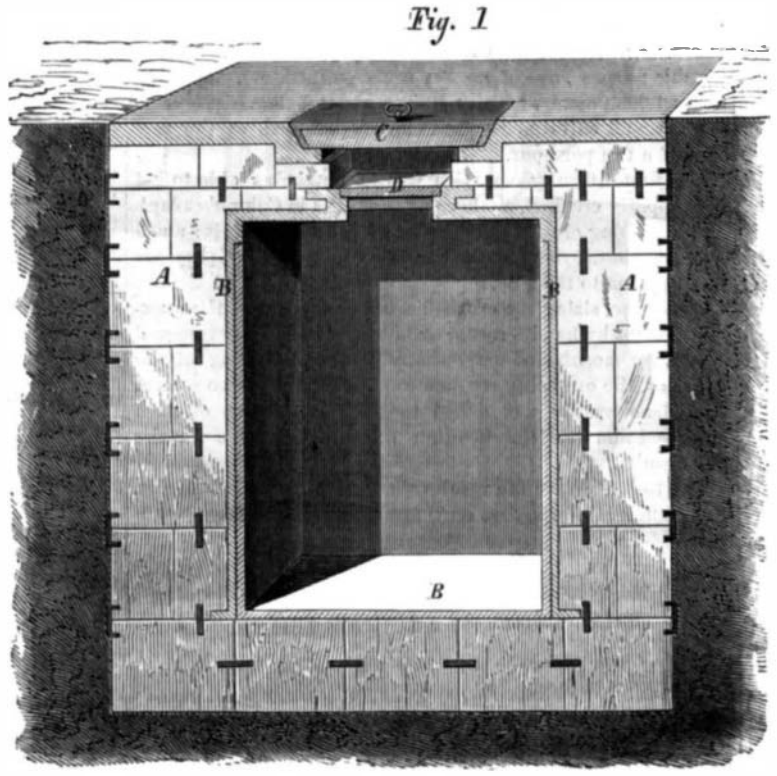
The accompanying engravings illustrate an improved burglar and fireproof vault, for the safe keeping of valuables. Two kinds are shown in our engraving, involving, however, the same principles of construction.

Fig. 1 shows the vault designed for banks, insurance offices, counting rooms, etc., and Fig. 2, a design for use in dwellings, for the safe keeping of plate, jewels, money, documents, etc.

The vault, in both cases, is constructed principally of masonry, and placed below ground, so that, in case of fire, all the heat to which it can be exposed will be by downward radiation, through the thick wall of masonry and through the entrance, which is constructed to defend the interior of the vault against heat, as shown in Fig. 1, in which A represents the stone masonry; and B an iron frame, composed of a top plate and four corner parts or rods, which descend from the top, and are bent outward at right angles, the hooks thus formed engaging with the stone work as shown.

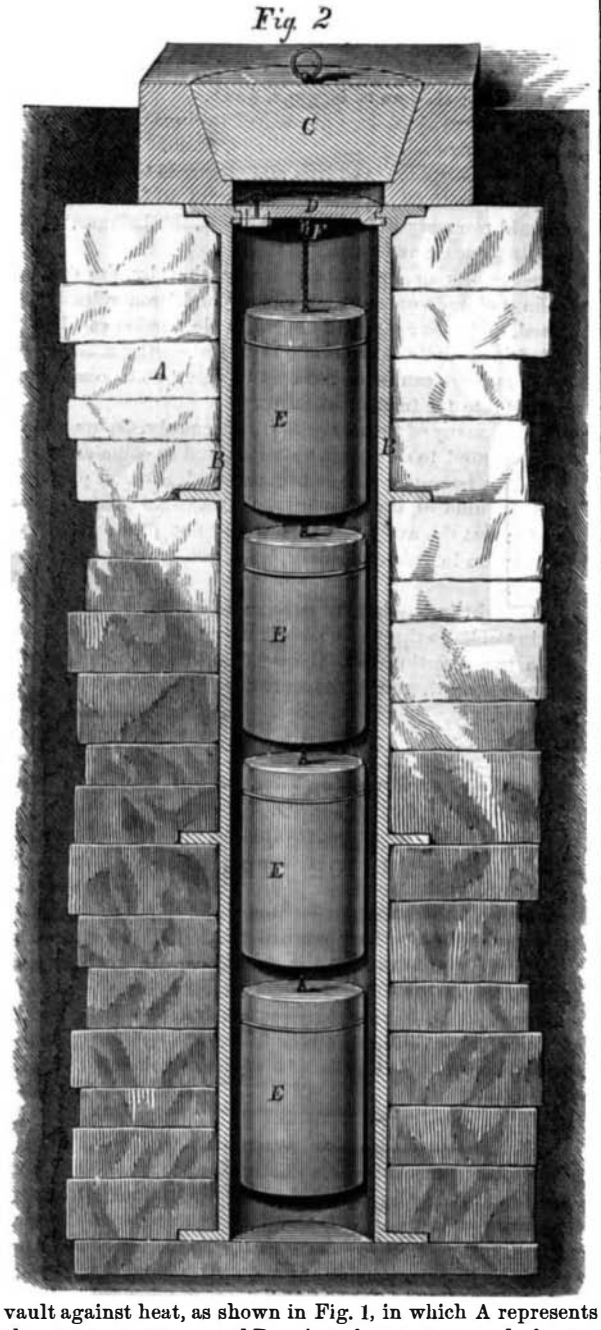
The masonry is bound together by iron straps, as shown, thus making a very solid structure.

Fig. 1



IRELAND'S VAULTS FOR STORING VALUABLES.

Fig. 2



The square vault, Fig. 1, has a cement lining.

The entrance is closed by an external lid, C, and an internal one, D, the air space between the two forming a non-conducting medium, through which heat can only with great difficulty, traverse.

The inner lid is of metal, and is provided with the proper locks and bolts. The external door or lid is made of an iron frame, filled with hydraulic cement.

In Fig. 2, A represents the stone masonry; B is an iron tube, having flanges formed thereon, at proper intervals, which interlock with the masonry, as shown. Within the tube or cylinder, B, are suspended, by a wire rope, chain, or other suitable support, the cylinders or cases, E, for the reception of articles. The chain or rope is suspended from a staple by a hook of fusible metal, F, which, should the heat endanger the articles in the upper case, melts and allows the cases to fall as far as the length of the tube will admit, thus removing the top case from the heated lid, D, and insuring the safety of its contents.

The style of construction, adopted by Mr. Ireland, gives great solidity to the masonry, affording obstruction to the operations of burglars, while it employs comparatively little iron work; and thus can be used with less expense than other vaults. Being completely surrounded with earth, and the iron work not being continuous, heat cannot be conducted to the interior.

We are told that a small safety vault for a dwelling, constructed on this plan, has been subjected to intense heat for four hours and a half, without the first trace of injury to its contents.

The invention was patented May 30, 1871. For further information address Geo. H. Ireland, Somerville, Mass.

Sensible.

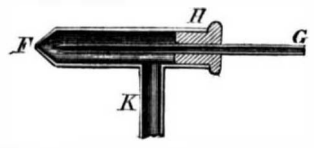
The American Educational Monthly says that the High School of Springfield, Ohio, graduated the young ladies of its last class in calico dresses, as pleasing to the eye of taste as to the hand of economy. This was brought about by the thoughtful suggestion of the superintendent and the hearty acquiescence of the girls themselves, on the only ground on which high schools can be long perpetuated, namely, that being supported by taxation they must be open to all classes in society, and confer their advantages upon the poorest of their pupils, without prescription by fashion or creed, expenses or anything else.

[For the Scientific American.]

STEAM VERSUS DISEASE.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY UNIVERSITY MEDICAL COLLEGE, NEW YORK.

While experimenting with the apparatus of which I gave a description in the last number of the SCIENTIFIC AMERICAN, I have often been surprised by the agreeable coolness, experienced whenever the hand happened to pass through the mixed column of air and steam that issued from the nozzle of the vacuum tube. The reader will remember that when steam, under a high pressure, is thrown from the nozzle of the tube, G, through the larger nozzle, F, a vacuum is formed in the tube of which this nozzle is the termination, and through the lateral tube, K, this vacuum may be applied for various purposes.



If, now, the connection is removed, and air permitted to pass freely through K, a mixture of air and condensed steam is thrown with considerable violence from the opening at F, and this current, brought into contact with the surface of the body, produces an agreeable sensation of coolness, which would, I think, not only be a grateful application in the treatment of all superficial inflammations (as erysipelas), but would, by its soothing action on the nerves, aid in modifying or removing the diseased condition.

In addition to the pleasant sensation imparted by the issuing column of steam and air, I find that it also possesses chemical properties, for it shows the presence of traces of ozone, which has doubtless been produced by the electricity developed by the passage of the current of steam through the nozzles of the apparatus. That ozone may be so formed has been satisfactorily shown in the experiments made, many years ago, with steam electric machines, where the characteristic ozone, or electric odor, as it was called, was produced in a marked degree. This trace of ozone renders it probable that such a steam air current might also be applied with good results to every kind of foul or gangrenous ulceration; and, if proper modifications were made to secure as great a supply of electricity as in the steam electric machine referred to, I see no reason why we may not look forward to the use of ozone, so developed, in the purification of the wards of hospitals, and the disinfection of the holds and decks of fever stricken ships.

THE CHICAGO FIRE.—How it could be that neither buildings, men, nor anything could encounter or withstand the torrent of fire, without utter destruction, is explained by the fact that the fire was accompanied by the fiercest tornado of wind ever known to blow here, and it acted like a perfect blow pipe, driving the brilliant blaze hundreds of feet with so perfect a combustion that it consumed the smoke, and its heat was so great that fireproof buildings sunk before it almost as readily as wood.