MODEL IRON WORKS.

[from Engineering.]

The Round Oak Iron Works are, *par excellence*, the best designed of any in South Staffordshire; they are handsome in their style, and substantial in their construction, while not only have they a fine outward appearance, but they are built in a manner best suited to the laying out of the internal machinary. The works are the property of the Earl of Dudley, a descendant of the famous Dud Dudley, who was the first to successfully smelt iron with pit coal. The site of the present works is also not far removed from the spot where Dud Dudley carried out his operations. The Round Oak Iron Works are situated at Brierley Hill, about two miles from Dudley, close to the Great Western Railway, while at their rear is a canal, so that excellent facilities exist for the transport of material to and from the works. Nearly the whole of the land and minerals lying within a circle of five miles round Dudley are the property of the Earl, and it was with the object of utilising on the spot the very rich materials employed in the construction of iron, with which the district abounds, that the present works were constructed. The celebrated "thick coal," ten yards thick, is worked from his lordship's pits, as is also the rich argillaceous iron stone, from which alone the iron is made at these works. The mine is smelted in the blast furnaces, of which there are two extensive plants, and the limestone, used as a flux, is obtained from the pits and caverns on the estate. The iron produced here is, for certain purposes, unsurpassed, and it commands a higher price in the market than any other made in the district. The whole of the materials used in the building and machinery are raised and manufactured, and the buildings, engines, machinery, &c., were erected by his lordship's own workmen. There are four blast furnaces at the New Level, each supplied with hot air stoves, the blast being furnished by a large condensing beam engine. The blast main has a partition running through its centre, so that it can be used for two separate engines at the same time; it is approached by a circular staircase, and a platform runs the whole length, so that men may have ready access to the valves. The tops of the furnaces are level with the main railroad, which brings the coal and coke from the earl's collieries, and delivers them at the furnace mouths. The limestone and ore are drawn from the canal side up an incline to the top of the furnaces by a beam engine, which also draws the cinders from the falls to the top, whence it is taken away, and tipped down the cinder bank. The Round Oak Works are built in a very substantial manner, of red bricks faced with white, and the eaves of the slated roofs are terminated by cast iron spouting of a very handsome pattern. The slated roofs, which cover the entire works, are supported upon ornamental cast iron columns and brackets. The centre portion of the building is occupied by two forges, and on each side of these are the mills; in close proximity to the mills are two extensive warehouses for stocking the finished iron, and these warehouses form the extremities of the front of the works. The boiler houses, three in number, are at the back, while in the centre of the front of the works is a neat little building, used as the timekeeper's office. At the back of this office are two forges, having about fourteen puddling furnaces in each. The machinery in No. 1 forge is worked by a large rope band from a pulley on the flywheel shaft of a horizontal high pressure steam engine, having a 30 in. cylinder and a 3 ft. stroke, placed between the two forges. This machinery consists of a 6½ ton helve, while in No. 2 forge is a 6½ ton helve, worked by gearing from an intermediate shaft. There are two forge trains, one standing in each forge, worked from either end of the intermediate shaft above referred to. In each of these trains there are three pairs of rolls with all their necessary appliances. Steam is supplied to the forge engine by five cylindrical boilers, 30 ft. long by 5 ft. diameter, and one boiler placed upon cast iron columns and girders over a heating furnace, and connected by a flue to the latter. Besides the machinery already named, there is in one forge a very powerful smith's steam saw, which will cut up to 7 in. or 8 in. rounds and squares, and in the other a massive pair of lever shears used for cropping the edges of the plates. To the 16 in. mill there are three heating furnaces, and to the plate mill the same number, with the addition of a large annealing furnace. A 4-ton Kirkstall Forge Company's patent steam hammer stands at one end of the forges.

Howatson's patent heating furnace has lately been tried here with great success. The speciality of Mr. Howatson's plans consists in his modes of supplying hot instead of cold air to the grates of the puddling and heating furnaces, and he asserts that in one year coal and iron to the value of £187 may be saved in a puddling furnace, and over £450 in a 12 in. mill heating furnace, by the adoption of his system. We are not, however, in possession of sufficiently extensive data to to enable us to form an opinion of the accuracy of these estimated savings under a variety of circumstances. The invention is applied to a heating furnace in the following manner: All the ordinary air passages, such as the opening under the grate at the end of the furnace, and the fuel charging place, are covered over; the former with sheet iron, having a sliding door, actuated by a balance weight at the top, which can be lifted to clean the bars; and the latter with a hanging cast-iron door. By this means all air is kept out from the grate end of the furnace, and all air necessary for combustion is supplied from the stack end. At the bottom of the stack there is a square opening, and, above, several perforations in the brickwork; through these the air enters, and passes into flues surrounding the base of the stack, where it becomes heated by contact with the flues. It is then conducted down, round the neck of the furnace, into a series of parallel passages, from whence it enters the opening under the fire bars, and is used at a high temperature for the combustion of the fuel. In order that the gases generated by the fuel shall be thoroughly consumed, and that there be no smoke, a flue is made in the walls of the fire grate, opening by means of perforations both above and below the bars. The perforations under the bars are covered with a sort of valve, which can be regulated so as to supply any quantity of air as required over the top of the fire, and can stop it altogether when there is no smoke. A handle attached to this valve is placed in front of the furnace near where the man stands. The application of the patent to a puddling furnace is slightly different, as the cold air is first supplied under the bed of the furnace, which it cools and preserves, and then passes round the base of the stack, along the back of the furnace, and is then delivered in the heated state under the grate. The smoke consuming apparatus can be applied as in the heating furnace. By an extra arrangement in the puddling furnace, the pig iron is melted in a separate chamber by the waste heat from the furnace. This chamber is built between the puddling chamber and the furnace neck. The charge of pig iron is put into it, and whilst the puddler is manipulating his charge, drawing the balls, and taking them to be shingled, the pig iron is ready to run down into the puddling chamber. With a heating furnace constructed on this plan at the Round Oak Works, the following results have been obtained: In one week of ten turns, when a 12 in. mill furnace had got into regular working order, a saving of 5 tuns 18 cwt. 0 qr. 17 lb. of coal, 1 tun 2 cwt. 1 qr. 3 lb. of iron, and a loss of 2 tuns 8 cwt. 2 qr. 3 lb. of cinder, the decrease in the latter being accounted for by the saving in the iron. It is also stated that the furnace has worked better, the iron being sooner and more uniformly heated, that the labor of the furnace men is diminished, as less fire required, and that there is every appearance that the brick lining will last much longer than is usual with the ordinary apparatus. A puddling furnace has recently been tested at Mr. Thomas Vaughan's Bishop Auckland Iron Works, and there was a saving during the first week it was in operation of 4 cwt. 0 qr. 9 lb. of coal, and 2 qr. of iron per tun of puddled bar made.

The Round Oak new forges, which are situated at a short distance from the other works, have been built about six years, and were erected with the object of making a sufficient supply of puddled bars to keep in advance of the works. The puddling furnaces, 28 in number, are arranged in a semicircle, the engines, forge trains, helves, &c., being placed as nearly as possible about the centre of the semicircle, by which plan all the furnaces are at almost an equal distance from the helves. The forge engines are vertical and placed side by side, having cylinders 27 in. in diameter, with a stroke of 2 ft. 4 in. Steam is supplied from six cylindrical boilers, 35 ft. long by 5 ft. diameter, which are at some distance behind the engines, and clear of the works. To each engine there is a forge train helve, and a pair of shears. The cam rings are driven by pinions on the flywheel shafts, which work into wheels on an intermediate shaft, and are geared to the cam ring shaft. Each helve weighs 6½ tons. The forge trains and two pairs of cutting down shears are driven from the ends of the intermediate shafts, worked by gearing and cranks.

Experiments with Dualin.

Some recent experiments with this new explosive, made on a section of the New York and Boston Railroad, near Tarrytown, N. Y., seem to prove that, while it is somewhat less powerful, it is far safer than nitro-glycerin.

The experiments were conducted by Mr. A. C. Rand, of the Laflin and Rand Powder Co., N. Y., in the presence of many gentlemen interested in the employment of blasting agents.

In order to demonstrate the non-explosive nature of the compound without the aid of a fulminator, a keg packed with the material was elevated by a derrick to a hight of about sixty feet, and then allowed to fall on a rocky surface. The concussion produced no more effect than would have followed had the keg been filled with common earth. As an evidence of its extraordinary utility in submarine work, a broken package was thrown carelessly into a pond of water, and sunk with the aid of a large stone, having first been connected by means of a wire with a powerful electric battery. On being fired it exploded with tremendous force, almost completely lifting the entire body of water into the air, and tearing away the earth for a distance of several feet at the bottom where the package, containing not more than half a pound of the "dualin," had been deposited. A similar quantity, when placed on the surface of an immense bolder, having been first covered with a little earth, was exploded with the fulminating cap by electricity, blowing the rock to atoms. A moderate charge of powder tamped into a hole six inches deep had previously blown out without affecting the solidity of the stone. Other satisfactory experiments were performed.

The effectiveness of the dualin as compared with powder was proved by placing an ounce of the latter in a mortar loaded with a ball weighing over fifty pounds. On the charge being fired, the ball rose lazily in the air to a hight of perhaps not more than twenty-five feet. An ounce of dualin was then carefully weighed and placed in the mortar underneath the ball. The battery having been applied, the iron missile was sent flying toward the clouds, reaching an altitude of at least four hundred feet.

The dualin, which, as our readers are aware, is a preparation of finely comminuted wood and nitro-glycerin (see page 170, Vol. XXII., of the SCIENTIFIC AMERICAN), in appearance resembles pulverized vegetable matter, and is a remarkably light substance. On coming in contact with fire, whether the quantity of dualin be large or small, it burns rapidly, with a fierce flame, evincing no explosive features whatever. A box filled with the compound was thrown into a bonfire, and, on being ignited, passed off in a volume of flame, leaving the receptacle almost intact.

Protection against Fire.

One of the most important elements of our civilization is the power to preserve treasures against destruction by the elements. It is only during the present generation that this power has obtained a recognition in the arts proportionate to its importance. Fireproof buildings, safes, and vaults, for the preservation, not only of momentous public records, but of all considerable accumulations of money, of precious goods, and of documents, are now devised with all the ingenuity of our ablest inventors, and constructed with all the practical skill of our most expert artisans. The result is not only that the libraries and public records of this age will be saved to history, but that the accumulation of wealth from year to year will go on more securely and rapidly. Destructive as was the Chicago fire last week, it would have been doubly so but for the protection afforded to jewels, books of account, money, records, deeds, and the like, stored in safes and vaults.

On the other hand, it is evident that the work which ingenuity and enterprise have to do in protecting property against fire is as yet not half done. The devices which enable our best safes to hold their contents unharmed, for many hours amid a furnace heat, are not applicable to large buildings, and nothing else has been found to take their place. At Chicago whole blocks which had been built at great cost to be "fire proof" gave way to the flames almost as soon as mere wooden sheds. Stone walls "chipped" and fell, iron beams broke or softened and bent, iron shutters were melted off or else blown off, and all the woodwork, or the inflammable goods, within the best of these structures seemed to burst into fire before the heat which the wind directed upon them like the flame of a blast furnace.

The indestructible building which will protect inflammable contents against destruction when a great mass of fire is poured upon it from outside is not yet invented, and is perhaps impossible. But the building which, with its contents, is perfectly safe from fire except when the city around it becomes a furnace, is well known; and if one street were built in this way it would be a complete barrier to the fire; half a city on either side of it might burn, and the ruin might be stopped at this street even against a gale of wind. Had Lake street, or Madison or Monroe, from the river to the lake, been made of buildings like that of the Chicago *Tribune*, the fire of Monday would have ended there, and the northern half of the city would have been saved.

This is a subject which demands attention, not only from landlords and builders, but from all cities. The same kind of security which the bank has in its vaults or the merchant in his safes is to be sought by cities in making, if not each house, at least each section of the city, proof against the spread of fire from any other section. Where land abounds, wide avenues and frequent parks are, for many reasons, the best possible protection. But where land is too scarce and dear for these, as it now is in all New York south of Fifty-ninth street, fire proof streets seem to be the only remedy. A little care in building for ten years to come, and a small addition to its expense, would make it nearly impossible for a fire to cross Broadway; and the same principle might gradually be applied to twenty or more cross streets below Fourteenth, so that no large part of New York could under any circumstances, be burned by one fire. In rebuilding Chicago, it is evident that something like this ought to be done at once.

FIRE SAFES.

There will be lessons to be learned from the Chicago fire concerning the value of safes and vaults, and the true principles of constructing them. The public at large has taken too little interest in this subject; but now that a hundred thousand people have suddenly lost everything except what these contrivances saved to them, the question how and why so much was saved, and how much more might have been saved, becomes interesting to all men. We are as yet without details as to the fate of the several kinds of safes employed there; as to the construction of those which did best, and of those which disappointed the hopes of their owners; but these are matters which must attract attention soon, and on which the public are entitled to be well informed. It is known that the Custom House vault failed entirely to protect its contents. We do not know who built this vault for the Government, nor what officer accepted it. But the fact is a grave one, as showing the incompetency or dishonesty of some man in a high place of trust, and it ought to be investigated at once.

The occurrence of this fire, with the impossibility, in most cases, of saving even the most valuable papers, unless they were already deposited in a fireproof place, is likely to lead the people of other cities to prepare against such an emergency by a more extended use of safes. It becomes the makers of these to study the results of the Chicago fire with care, and to remedy the defects which it may have revealed in any of their work. In particular, they must learn not to sell as "fireproof" any safe whatever which is too small really to protect its contents against a great heat; for it is certainly the small sized safes which have chiefly failed, and it is of the first importance for them to remember that it is the enormous price of their goods which has hitherto prevented the more common use of them; and that, in order to serve the community to the utmost, and thereby to enrich themselves most effectually, their immediate end in view must be to sell the safes at the very lowest price consistent with good workmanship and security—that is to say, at a much lower price than at present.—*New York Evening Post.*

THE London *Athenæum* hears that Mr. Darwin is engaged on a work in which the facial expression of animals will be one of the chief topics discussed.

Improved Thrashing Machine.

The accompanying engraving will give our readers an idea of an improved thrashing machine, in which the thrashing drum is provided, on its outer surface, with separated ribs or thrashers, *a*, extending from end to end of the drum, and so constructed that each rib will present, to the material being thrashed, an obtuse angular front surface, and a receding curved or convex back surface.

The drum is made light near its center, and heavy at its perimeter, to increase its momentum and steady its motion.

Above the drum is placed a concave cap, C, which is also provided with ribs extending, as on the drum, from end to end, and constructed with flat rectilinear thrashing sides and convex backs, as shown. These are so arranged, relatively to the ribs on the drum, as it is claimed, to operate to the best advantage in thrashing grain without injury to the straw.

The ribs of this concave are made separately, and bolted to braces upon a sheet metal backing, and, to combine strength with lightness, they are grooved or made concave on the backs, which meet the sheet metal backing.

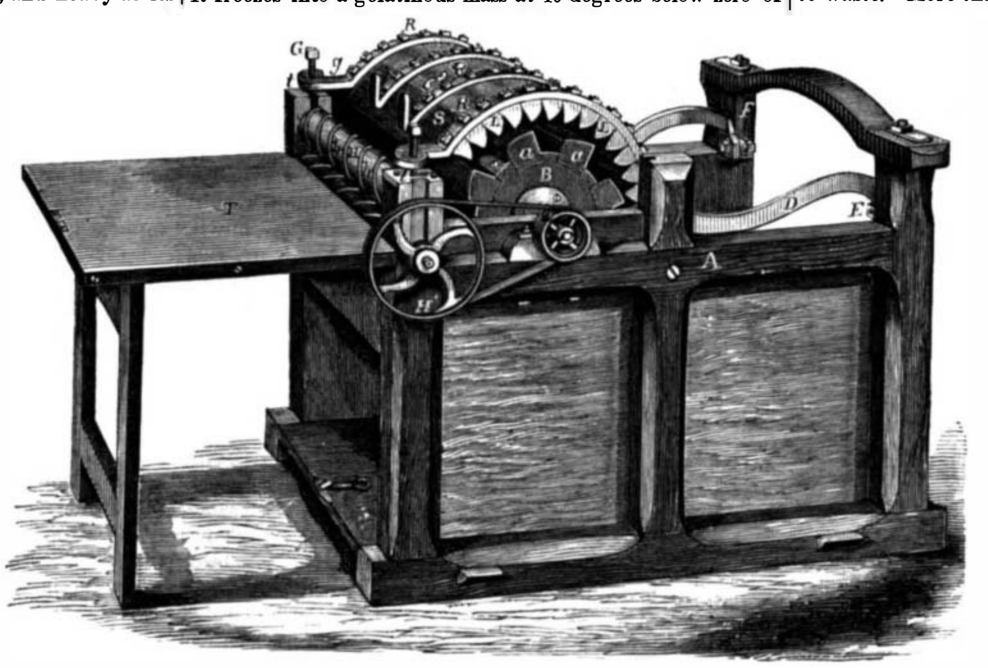
The feed rollers are made with spiral bands extending over their peripheries, as shown.

The two central bands, or braces, which support the ribs of the concave, have their front ends turned upward, to aid in supporting a detachable chimney or funnel, through which dust and other light particles escape from beneath the front edge of the concave cap.

The material is fed in very uniformly by the feed rollers, which enable a person little skilled to do the feeding in a proper manner.

It is claimed for this machine: That it requires not more than half the power to do the same work that is used by spike thrashers. That it separates the grain, grass seed or flaxseed, thoroughly, without injury to the grain or breaking of the straw. That by the adjustability, up or down, of the concave cap, it may thrash all kinds of grain, clover, millet, and other seeds, beans, peas, etc., in a per fect and rapid manner. So perfectly is it said to spare the straw, that it requires a keen eye to detect the difference between a sheaf of thrashed and unthrashed straw.

This machine, which has been christened the Lone Star Thrasher, was patented September 13, 1870. Circulars containing further information may be obtained of E. E. Roberts & Co., brokers in patent rights, 15 Wall street New York.



THE LONE STAR THRASHER.

Ammonia as a Motive Power for Street Cars.

The use of ammonia as a motive power involves some very nice scientific and mechanical principles. That the general reader may comprehend the peculiar difficulties met with in the attempts to render this substance available for the propulsion of machinery, we will enumerate its leading characteristics.

Ammonia is composed of three parts—by weight—of hydrogen and fourteen parts of nitrogen. These substances do not directly combine to form ammonia; that is, there has yet been discovered no way by which they can be made to combine when placed directly together, but when the hydrogen is presented to nitrogen at the moment of its liberation from water, the oxygen of the latter being abstracted by the oxidation of some other substance, the combination takes place, and ammonia is formed.

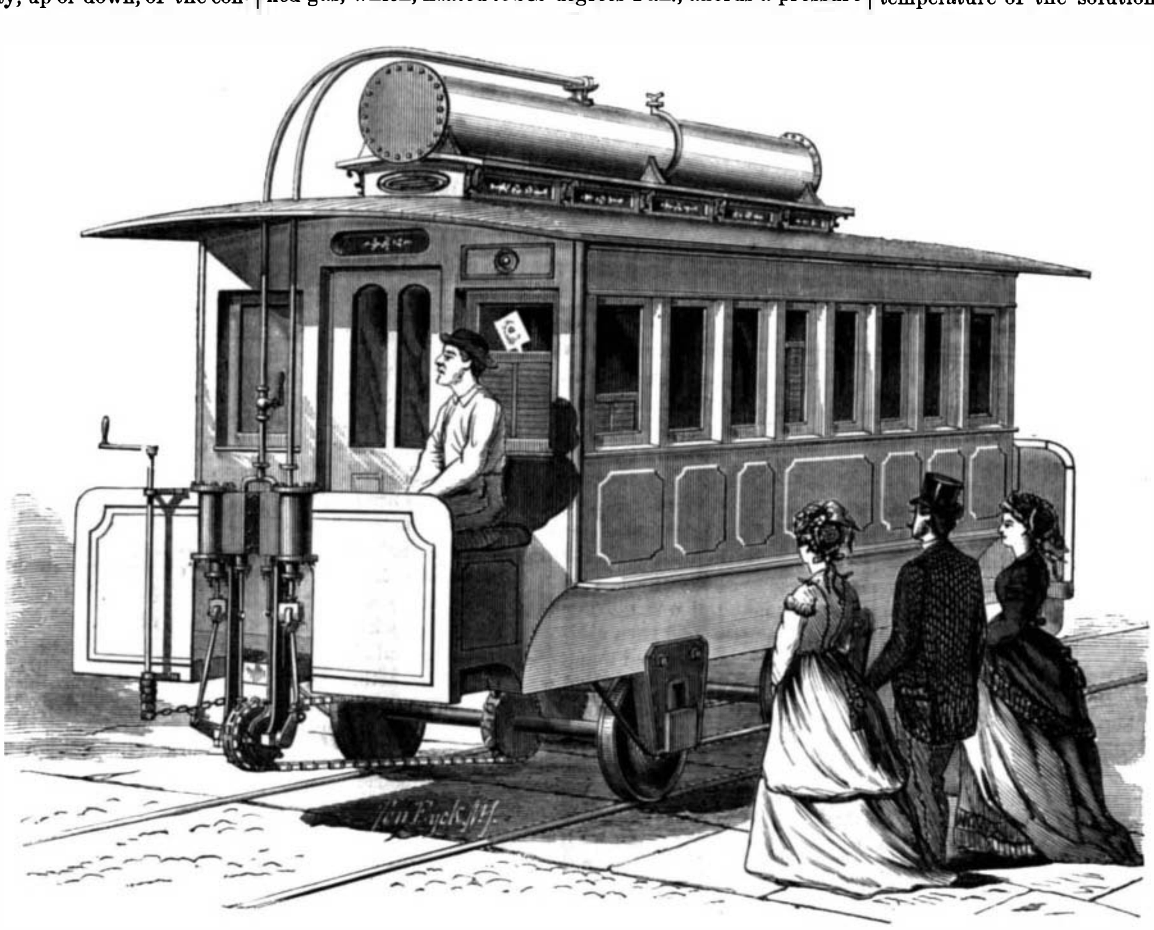
This reaction takes place in the decomposition of various vegetable and animal substances, and in the progress of many industrial operations, of which latter the most notable, in this respect, is the manufacture of illuminating gas. In distillation of coal at the gas works, large quantities of ammonia are produced, combined with sulphur and carbonic acid; and, the resulting carbonate and sulphide of ammonium being treated with sulphuric or hydrochloric acid, sulphate or muriate of ammonium is formed, the commercial name of the latter being muriate of ammonia, or sal ammoniac.

From the two latter salts, ammonia may be freed by heating either of them in contact with a paste made of water and quicklime, sal ammoniac being the salt principally used for the purpose. The ammonia passes off as a gas, is collected in water, for which it has such a strong affinity, that, when the temperature of the water is maintained at 59 degs. Fah., it will absorb 727 times, and at 32 degs., 1,050 times its volume of the gas.

The solution of ammonia in water, containing about 670 volumes of the gas, forms the *aqua ammonia* of commerce, and it is this substance that inventors have sought to utilize in ammonia engines, it possessing peculiar advantages for the purpose, as well as presenting many difficulties, to such an application, which we will point out.

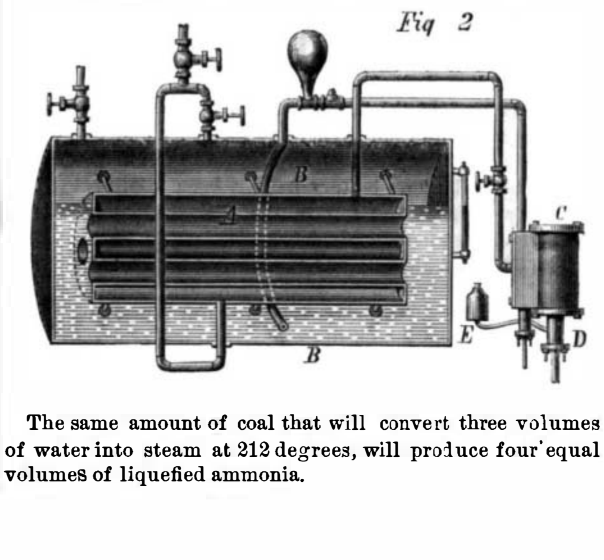
This solution is colorless, and strongly alkaline, is acrid to the taste, and so caustic that it blisters the skin if applied to it. It freezes into a gelatinous mass at 40 degrees below zero of the Fahrenheit scale, and liberates ammoniacal gas rapidly when exposed to the air, the escape being greatly accelerated by heat, so much so that ebullition is produced at 122 degrees Fah. A solution of the strength of 20 degrees Beaume boils at 140 degrees.

Its capacity for heat is only one fifth that of water, and three pounds of coal will produce four gallons of the liquefied gas, which, heated to 232 degrees Fah., affords a pressure of six and one half atmospheres. To obtain the same pressure from steam requires a temperature of 320 degrees, the relative volumes of the ammoniacal gas and the steam, at this pressure, being 983 for the former and 295 for the latter.



AMMONIA ENGINE FOR STREET CARS.

Fig 2



The same amount of coal that will convert three volumes of water into steam at 212 degrees, will produce four equal volumes of liquefied ammonia.

To those familiar with these facts, it has long been evident that this gas possesses great theoretical advantages over steam as a motive power, but in its use the following difficulties have been met with:

The material is much more expensive than water, and, consequently, it is not permissible to allow it to escape, as waste, after it has performed work; as steam exhausts into the open air, or is condensed by contact with water, and then allowed to waste. More than this, small leaks that, in the use of steam, are of little or no importance, in ammonia engines are sources of great loss, as every atom that escapes is not merely a waste of heat, as in the steam engine, but a waste of a costly material. Besides, when steam escapes, it is harmless and bland, while ammonia is acrid, and acts corrosively on all brass or copper attachments or ornaments. This last property forbids the practical use of any metal but iron and steel in the construction of ammonia engines.

The adoption of this material as a motor, therefore, involves its indefinitely repeated use with such a minimum of waste as will not counterbalance the great economy of fuel, necessary for its production, over that required for steam.

As high pressures are necessary, it has been difficult to prevent leakage, and, in most devices of the kind under consideration, the waste has been so great as to render them useless for practical purposes.

Another difficulty has been the liquefaction of ammoniacal gas in large quantities; but, in the application of ammonia to ice making machines, this part of the problem has been practically solved, a pressure as high as sixteen atmospheres having been maintained in some of them, while, for a motive power, it will not be necessary to exceed ten pounds.

The principle upon which the theoretical utility of ammonia, as a motor, is based, may be thus stated: As the gas is absorbed by water its latent heat becomes sensible, and the temperature of the solution consequently rises. This heat may again be used for the expansion of liquid ammonia into a gas, under great pressure—the pressure thus generated being converted into work behind the piston of an engine. The heat thus transformed into work cannot be recovered and utilized as heat, and, consequently, to maintain the efficiency of the combination, additional increments of heat must be supplied, from external sources, to be again converted into work, and so on.

This is accomplished in a very effective manner by Dr. Emile Lamm, of New Orleans, who has also attacked the practical difficulties of the problem with great success.

We give, herewith, engravings illustrating the application of his ammonia engine to a street car, which, it is asserted, was successfully propelled by it for a distance of seven miles, with an expenditure of only one and sixteen one hundredths cubic feet of ammonia, notwithstanding the somewhat unmechanical and clumsy mode of transmitting the power from the engine to the wheels, rendered necessary by the fact that the engine and the car were not made for each other, and were simply brought together for the purpose of demonstrating the practicability of the method.

Dr. Lamm states that, on the trip mentioned, the gage registered at the start 120 pounds, and was the same at the end of the trip, at no time indicating a variation of more than ten pounds to the square inch; and this has since been confirmed by over 300 trips.

The detailed drawing, Fig. 2, is simply a duplicate of the engine and generator, and is lettered for reference.

Let the reader now bear in mind that, when heat is employed for liquefying ammonia, the latter possesses, through its intense affinity for water, the property of reproducing, at a distance from the furnace and still employed in its condensation, a force equivalent to the heat used in such condensation, the latent heat of the gas appearing anew, as sensible heat, in the water of re-absorption, and being again transferred to the liquefied gas.

In the mode of effecting this circle of interchanges the essence of Dr. Lamm's invention lies. To obtain the full dynamical effect of the expansion of vapors or gases, it is necessary to add as sensible heat the same amount which may be extracted from them as latent heat.

Now, the liquefied ammonia, which parted with its latent heat during condensation by pressure, is placed in the inner 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.

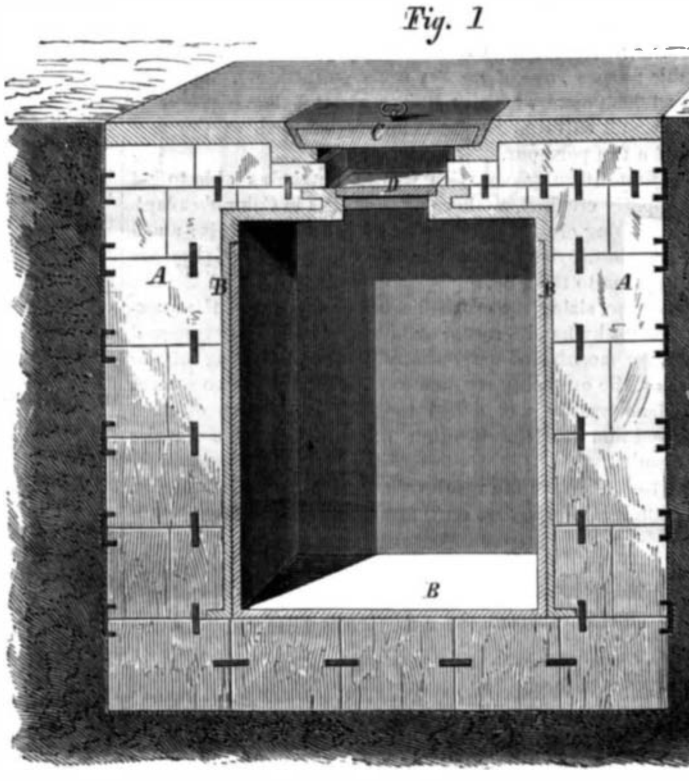
The accompanying engravings illustrate an improved burglar and fireproof vault, for the safe keeping of valuables. Two kinds are shown in our engraving, involving, however, the same principles of construction.

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.

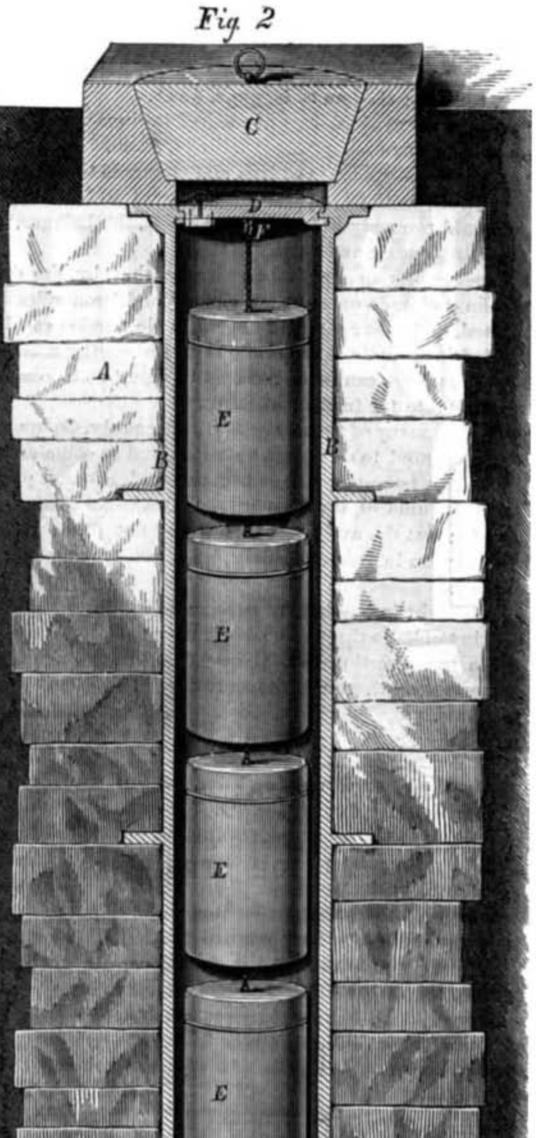
The masonry is bound together by iron straps, as shown, thus making a very solid structure.

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.

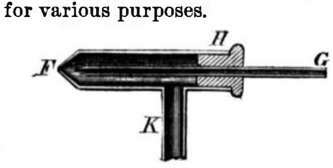
The American Educational Monthly says that the High School of Springfield, Ohio, graduated the young ladies of its last class in calico dresses, as pleasing to the eye of taste as to the hand of economy. This was brought about by the thoughtful suggestion of the superintendent and the hearty acquiescence 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.