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IMPROVED SELF-ACTING FIRE TANK.

The alarming frequency of fires within the last few months has awakened an unusual interest and provoked a deal of newspaper discussion as to the best means for the prevention and extinguishment of conflagrations. The lesson of the Boston fire is one that has often been pointed out, but seldom heeded, namely, that when a fire has reached a certain stage, it gets beyond the control of any apparatus whatever, and takes, for the most part, its own course. Any improvement in our present systems should be in the direction of a greater promptitude in extinguishing incipient fires before they reach the dangerous stage.

The point aimed at in the construction of apparatus heretofore has been the projection of the largest possible bulk of water upon the fire. The result has been an enormous increase in the item of water damage, without a proportionate gain in the celerity of action which is the real element of success at fires.

Considerable attention has been given, within the last few years, to the perfecting of devices which should take advantage of the extinguishing properties of carbonic acid gas. This material seemed to promise the condensed power requisite to portability in the transportation, with the utmost expedition in generating pressure and manipulation, while possessing the additional recommendation of quenching fire without water damage. Coupled with these advantages, there seemed to be a certainty of action and a marvelous power over flame, unattainable by any other known method.

The only system in which this principle has been made practical is that in which chemical action is used, not only to impregnate the stream with the desired extinguishing quality, but also to propel it, and in which water is used to dissolve the chemicals, to hold the gas in mechanical combination, and to give momentum to the projected stream.

The small machines called "extinguishers," which combine the points enumerated, have made a splendid record, and in scores of instances have put out fires that were apparently out of all proportion to the means used. The limit of the extinguisher is in its capacity. As the operator must carry on his back the engine, hose and material, the weight is restricted to 85 lbs., and the stream to a diameter of one eighth of an inch and a duration of perhaps five minutes. The principle was perfect, but its full development seemed to call for a continuous stream of such volume as would control a fire in the more advanced stages. The first practical success in this direction is found in the street engine of the Babcock Fire Extinguisher Company. The engine is constructed with two copper tanks of a capacity of 120 gallons, tested to a pressure of 500 lbs., and mounted on wheels. The hose is connected

and ready for instant action, and the stream, of thirty times the volume of that of the "portable," is thrown 100 feet from the nozzle. On arriving at a fire, a pressure of 200 lbs. is raised in ten seconds, and so ready is the manipulation that the stream is on the fire in less than a minute. This celerity of action is due not merely to the instantaneous generation of pressure, but to the fact that no suction hose has to be connected, and no leading hose laid, preparatory to playing. The result of this promptitude, together with the marvelous extinguishing power of the stream, is, in a large proportion of instances, the putting out of the fire before it

four fires in advance of the steamers, and has made so favorable an impression that the chief engineer recommends the purchase of four more. At Holyoke, Mass., the engine extinguished 13 fires, out of the 19 that have occurred in the last two years, before the steamers could get a stream on. At many of these fires, the engine has shown an efficiency little short of the miraculous.

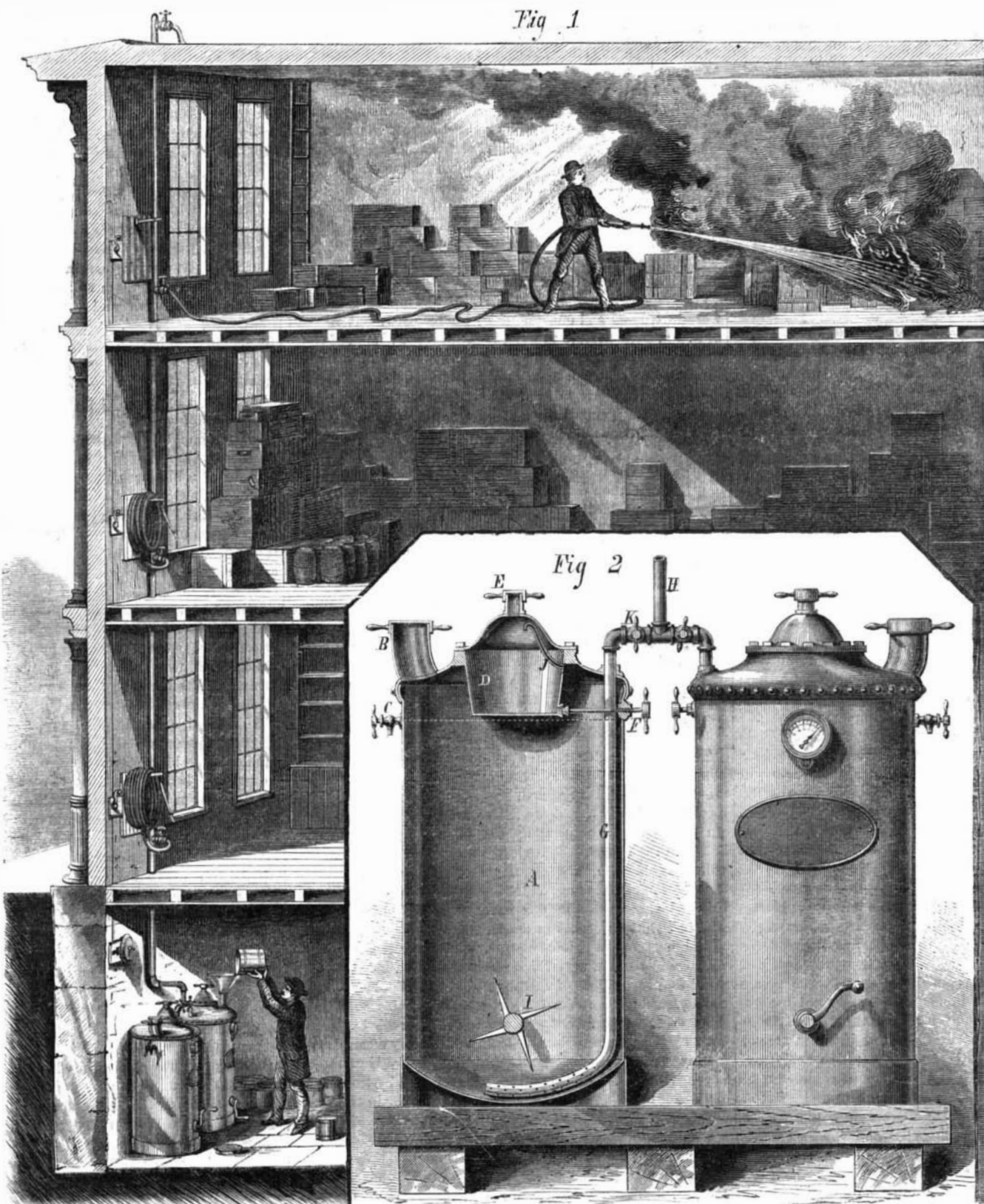
Every town that is supplied with these engines has reduced its fire and water losses materially, generally to less than fifty per cent of the average before its adoption. At Holyoke the loss at three fires, in the five months previous to its introduction, was \$375,000. During the remainder of the same year (seven months), the loss in six fires was \$1,665. In nearly every instance the first building is saved, and often almost without damage. A still more astonishing claim is that, out of 300 fires heard from, in only three cases has a second (detached) building burned. At Westfield, Mass., the engine handled four fires at once, and saved all the buildings. It has been used under every variety of circumstance, and has never failed to throw its stream.

The wonderful success of the forms mentioned has led the company to the development of the same general principle in a form particularly adapted to the protection of the interior of large buildings, factories, theaters, sailing vessels, etc. By reference to the accompanying illustration, the construction of the apparatus will be readily understood.

A is one of a pair of tanks holding from 50 to 100 gallons each, and filled with soda solution to the level of the gage cock. C, through the opening, B. D is the acid chamber which is filled through the opening, E, and discharged by the valve, F. On discharging the acid the pressure is shown by the pressure gage, and on opening the gate, K, the stream flows up through the exhaust pipe, G, into the main, H, finding vent through the hose on every floor where a

cock is opened. The agitator, I, is for stirring the fluid to facilitate the dissolving of the soda in re-charging. The practical working is admirably illustrated by the picture in the background, and will be comprehended at once. The plan is virtually the same as was lately presented before the Polytechnic Association, by Mr. D. J. Tapley, where it attracted much attention.

The peculiar advantage of this form is that it gives an instantaneous stream of a sufficient volume to control any fire that can be built in an ordinary interior. In theaters and churches it will throw a stream to the highest part of the ceiling, and even from the roof a stream can be used to protect from fires in adjoining buildings. The power of the tanks is sufficient to force a stream through 300 feet of per



THE BABCOCK SELF-ACTING FIRE TANK.

is fairly started. Statistics prove that fires are, eight times in ten; discovered in the earliest stage, and the fate of the building is usually decided by the action of the first five minutes.

Thus far the engine has been introduced into the departments of some fifty cities and towns, and has already made a history such as no other apparatus has ever approached. At Chicago the engine puts out fifty per cent of the fires within its range, without the aid of the steamers. The mayor, in a late communication to the fire commissioners, recommends the purchase of fourteen more of these engines for the department, at a cost of \$2,000 each. At Boston the single engine that was ordered since the fire there has been in the department two weeks, during which time it has put out

pendicular pipe, or any length of horizontal hose or pipe. The stream seems to possess the wonderful property of clearing a room of smoke almost instantly, though filled to suffocation. The gas also seems to interpose a wall of non-conducting vapor between the hoseman and the fire, which protects him from the heat. In fact, experience is developing every day new advantages for this system.

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Contents.

(Illustrated articles are marked with an asterisk.)
Academy of natural sciences, Phila. 145
Adephiis. 149
Accident, a singular railway. 146
Answers to correspondents. 154
Architecture in Paris, street. 146
Astronomical notes. 148
Bucking brush, box and holder. 148
Boiler explosions, the recent. 148
Boiler inspection, local. 147
Boilers, collapse from low water in. 146
Bottle stopper, a new. 147
Brakes, power railway. 144
Brooklyn to New York, the annexation of. 145
Business and personal. 154
Camphor wood. 148
Clean greasy vessels, how to. 151
Clock, registering tell tale. 149
Drying varnish. 149
Explosions produced by high tones. 144
Fire tank, self-acting. 148
Gridstones not extinct. 148
Heater and filter. 147
Honor to whom honor is due. 144
Hoose tunnel mineral water. 146
Iron workers, a good year for. 151
Key, novel form of. 147
Measuring fibers, instrument for. 150
Metric commission, the. 145
Notes and queries. 154
Parliament house in Berlin, the new. 151
Patent decisions, recent. 148
Patented in England by Americans, inventions. 148
Patents, official list of. 153
Patents, recent American and foreign. 152
Rail question, the creeping. 146
Rate, legendary. 151
Richmond, Va., the resources of. 146
Safety valve, improved. 146
Saws, attaching handles to. 150
SCIENTIFIC AMERICAN, what our friends think of the. 147
Scientific and practical information. 149
Sewing machine monopoly, the. 145
Ship, new German war. 146
Signal lantern, self-lighting. 147
Steam pip, ignition by. 148
Stone saw, diamond. 150
Sulphate of lime in cider. 148
Traction engine, a novel. 144
Variety manufactory, a. 147
Water meters in cities. 145

HONOR TO WHOM HONOR IS DUE.

There is a large figure on a house in Center Street, New York city, which at most hours of the day may be seen vigorously engaged in turning a crank. Pedestrians on the street jostle each other while vainly trying to make out what the wooden man is about, and passengers in the cars stretch their necks to obtain a clearer view. The residents of that locality seem to take it as a matter of course and attend to their affairs as if nothing uncommon was going on; but the mystery still remains unsolved. We have caused an investigation to be made and have learned that, instead of the man turning the crank, it is the crank that turns the man. And upon this fact we wish to found a few practical observations. The sturdy figure, making itself very conspicuous before the world and attracting all the notice it can, may stand for the lucky appropriator of other men's discoveries. It very frequently happens that the man who discovered the principle upon which an invention is founded, and which is, in fact, the engine that moves the whole apparatus, is forgotten; but the noisy speculator who runs about the streets and gets up stock companies and makes a fortune, and, in the minds of many persons, is entitled to all the glory, is really little more than the lay figure moved, by an invisible crank, by a power discovered after years of toil and study by some unknown and forgotten personage. The man who reaps the fame and money is turned by the crank which, in his conceit, he fancies he moves himself. Giving honor to whom honor is due is a very rare occurrence. Mankind looks at results and cares very little for the secret springs that have proved the fountain head of success. There is nothing so successful as success; and under the glow of triumph and the applause of men, the money maker accepts the public testimonials, goes to all the grand dinners, has his portrait painted for some public institution, and finally claims the whole credit of a grand enterprise. There is no doubt that the men who furnish the capital and push inventions to practical use are entitled to a fair share of credit for what they have done; but they cannot be accused of unselfishness in the matter or of acting upon purely patriotic motives. "Rich fields and pastures new" are all that this class of persons demand; and if the dividends are all right, they ought to keep quiet. What shall we say for the silent worker who discovers a great principle from which springs a grand progeny of inventions? The misfortune is that we frequently lose sight of such a benefactor. Just as the sources of the Nile are hardly yet known to the world, while in the plains it becomes a grand river and flows through numerous mouths into the sea, so with the fountain head of discoveries: we often fail to trace the precise source, but in the results we have a mighty river of applications, known to the whole world. The rill which has its rise among the snows and rocks of the mountains finally flows quietly past smiling meadows and the haunts of men; and while it sings its pastoral, we forget the ice and snow and beetling crags whence it had its origin.

Professor Tyndall in his eloquent plea for original research has in mind the devoted band of workers who, in poverty and reproach, in the chill atmosphere of neglect, often amidst persecutions and opposition, have made the discoveries which are the pride and boast of our present civilization. He cautioned us to protect and foster all such persons, and he proved the sincerity of his notes and the strength of his interest by leaving in the hands of trustees all the net earnings of

his laborious lecturing tour in the United States, for the support of needy students who wish to devote themselves to pure science.

Any one who is willing to accept a career of this kind must be imbued with the true missionary spirit and not be actuated by anticipations of reward or desire for fame. Sooner or later, true honor may be accorded to the person to whom it is due; but this is rather the exception than the rule, and he who keeps public opinion before him as the spring for action will ask for bread and receive a stone. It is rare indeed that any great discovery has been made when sought with a view to immediate practical results. Nearly all of the grand principles upon which are based the leading applications of the age were discovered and worked out by men who never thought for a moment of the possibility of applying them. It would almost appear to be with original discovery as with humility: the moment it looks upon itself, it is gone. Let us glance at a few of the leading discoveries of modern times, and see if this statement be not true.

The doctrine of the correlation of forces—that force is not lost any more than matter—which in its importance is not inferior to the discovery of the law of gravitation, was first enunciated in a modest paper by Dr. Mayer, a practising physician in a small city in Germany. He could not possibly have foreseen the results that are likely to grow out of this law. Newton's analysis of solar light, Volta's battery and Oersted's electro-magnetism are further illustrations of discoveries which have grown out of a search for truth and not for fame. Although scientific writers have given due credit to these illustrious men, it cannot be denied that those who have made the applications have run away with popular favor and have gained all the prosperity. The great engines, propelled by the forces which were made known to us by Newton, Volta, Oersted and many others, keep in motion the crank that turns the busybodies of the world, and gives them a name for enterprise which they scarcely deserve. It would aid very much if the real benefactors could have due credit in their lifetime. There is little else that they desire, and sympathy and praise costs nothing, while it is often rich in the fruit that it may help to bring to maturity.

Professor Tyndall has set us a noble example of unselfish liberality. He had every right to carry with him to his home all the money that had been cheerfully given by those who were instructed and enchanted by his lectures; but instead of doing, so he prefers to hand it back for the benefit of those who gave it, and in aid of the common cause of scientific learning in which the whole world takes an interest. This is an example worthy of imitation. The trustees who have charge of the Tyndall fund will no doubt be glad to have the amount increased as largely as our wealthy citizens may desire. They cannot have too much money for the promotion of original research, and it is equally certain that no investigation founded upon correct scientific reasoning can be made in vain. Let us start as many rills of discovery as we can, knowing full well that they will swell to torrents and ultimately flow gently through the valleys until they empty into the common ocean of human wants. And we must not forget that every grand result had its origin in some apparently insignificant fact, which, by accretion and accumulations, becomes important and finally culminates in a successful application. Keep the fountains of discovery pure and bright, give honor to those who deserve it, and the streams of knowledge will not dry up and the world will not want for inventions.

A NOVEL TRACTION ENGINE FOR RAPID TRANSIT.

The interest, with which all plans leading to the accomplishment of a suitable system of rapid transit in this and other large cities is regarded, has been the means of calling forth many inventions designed to meet the existing need. An engraving of a novel apparatus of this class was published in the SCIENTIFIC AMERICAN on page 118 of our last volume, under the heading of "Lamm's Fireless Locomotive." One of these novel locomotives has lately been put in practical operation in our neighboring city of Brooklyn, with very flattering and interesting results.

The machine consists of a strongly made cylindrical reservoir, enclosed in a very thick clothing of felt and other material to prevent loss of heat by radiation. Connected with the reservoir is a steam engine which actuates the axle of the driving wheels. Before starting the reservoir is charged with very highly heated water from a stationary steam boiler, the heat being such that a high steam pressure is generated in the reservoir. As this pressure is relieved by the exit of the steam into the engine, a portion of the water in the reservoir is converted into steam by the heat with which it is surcharged. This conversion, continues until the temperature of the water falls to 212°, and the machine can therefore be operated during the interval until nearly that point is reached.

The experiments, which we witnessed, consisted in charging the reservoir of the machine with hot water having a temperature of 360°, which yielded a steam pressure of 145 pounds per square inch, and then running the locomotive for a distance of six miles, on the track of the Coney Island Railway. During the first half of the journey, which was accomplished in 15 minutes, the pressure fell to 90 pounds; and at the expiration of the trip, which occupied 33 minutes, the gage showed but 65 pounds, the rate of diminution being much more rapid under high pressure than when the same had become lowered. The speed attained was twelve miles per hour, the burden being a single six ton car for 35 passengers; we were assured, however, that the same time had been made with two carriages containing seventy persons. In actual use it is proposed to locate, at the termini or other points of the line, a sufficient number of stationary boilers

from which the locomotive may be charged or its power renewed when exhausted.

From the results of the trials and those that have been deduced from the successful operation of the device in New Orleans and elsewhere, we are inclined to think the invention one of considerable utility. It is perfectly safe, because the steam pressure can never increase but is always steadily lowering. Being without a fire, it is free from many of the defects of the dummy. Of course there is no smoke, while the noise of the exhaust is scarcely perceptible. Its speed and tractile power are, as practically proved, sufficient for ordinary purposes; the cost of construction is not great, and as regards economy, its use can probably be made less costly than that of horses. We noted especially that the motion was regular and easily governed or stopped by the engineer, and that the radiation of heat, which, it might be imagined, would rapidly take place from the reservoir in cold weather, was almost completely prevented by the thick surrounding casings. We are of opinion that the invention is worthy of thorough investigation from parties interested in street railroads. We should think it well adapted for the elevated railroad on Greenwich Street, New York, and for transferring freight from the steam terminus of the Hudson River and New York and New Haven railroads at 42d street down to their freight stations in the heart of the city; while for the underground railway lately organized in Brooklyn, and for the Broadway underground railway in this city, it may prove to be "just the thing."

EXPLOSIONS PRODUCED BY HIGH MUSICAL TONES.

The greater number of explosive agents contain nitrogen, which retains, with a very weak affinity, the element required for the combustion of the other ingredients; it resembles a spring which, when once set free, unwinds itself totally and suddenly. The starting of this spring is, in the case of gunpowder, gun cotton, etc., the heat-giving spark; with percussion powders, nitro-glycerin, etc., simply a shock is sufficient, while it has been discovered recently that there are substances which can be exploded by merely a sound of high pitch; such is the iodide of imidogen, easily made by placing pulverized iodine in liquid ammonia. In order to explain the reaction, we will state that there are three compounds of nitrogen and hydrogen: NH3, ammonia, NH2, amidogen, and N H, imidogen. The two latter are only formed in combination when one or two atoms of hydrogen are displaced by a third substance; so, when placing iodine in ammonia, two atoms of hydrogen combine with the iodine to form hydro-iodic acid, which dissolves a portion of iodine, forming a brown solution; while another portion of the iodine combines with the remaining N H, in which two atoms of H are displaced by iodine, and NH2 becomes NHI2; this forms a black powder, which is left as residue; when, after 15 minutes reaction, the brown liquid ammonia solution is poured off. The deposit is then filtered to free it from excess of ammonia; and, while wet, the filtering paper is divided into small pieces and dried separately, in order that any accidental explosion may not involve the whole mass.

There are other methods of making this compound. According to Mitscherlich, the iodine is dissolved in aqua regia and precipitated with an excess of ammonia, by which operation all the iodine is changed into NHI2. According to Serullas, a saturated solution of iodine in alcohol is mixed with an excess of ammonia; then water is added, as long as it produces a precipitation of a black powder, which is again NHI2. In this last form of preparation it is less explosive and less dangerous; while, if prepared by one of the former methods, the least pressure or friction causes the dry powder to explode, and it is a laboratory trick to distribute small particles of it while wet, on the floor of a room or hall; if, after drying, the people walk over it, a fusillade of small explosions is heard from under their feet.

The experiments to explode such powders by the rapid vibration of a high musical tone, were recently made by Champion and Pellet, and we have described them on page 20 of this volume. They form a valuable addition to the lecture room experiments.

The bromide of imidogen, produced by pouring bromine into ammonia, explodes much more easily, and, even at a distance, by any sharp noise; it is much more dangerous than the former. But the chloride of imidogen, produced by passing chlorine gas through liquid ammonia, is a liquid oily substance, and perhaps the most dangerous combination in existence. A single drop will explode most violently, on being merely touched with a greasy solid body. Berzelius gives a list of the bodies, upon the mere contact with which this formidable compound explodes. Undoubtedly it will go off by the vibration of the air produced by tones, but experiments in this direction are still wanting.

POWER RAILWAY BRAKES.

The Honorable Mr. King lately introduced in the House of Representatives a bill to compel all railway companies to provide their cars with power brakes, so arranged that the engineer may, at any moment, apply power to the wheels of every car on the train. Penalties are provided against companies who fail to employ the device mentioned. The introduction of the bill was followed by an interesting speech by Mr. King, who presented many useful facts concerning railways, and railway brakes in particular, from which we take the following:

"Power brakes, operated from the locomotive, are a very old invention, although they were never adopted by any railroad company in the United States until about three or four years ago.

The Cremer brake is operated by the engineer, in case only of an emergency, by pulling a cord extending the whole