Car Axles and Bearings.

The *National Car Builder* states that, at a recent meeting of the Car Builders' Association, discussions took place in regard to Mundy's friction roller journal box. In this device the roller, six inches in diameter, turns on a solid spindle, the bearing of the roller being the whole length of the spindle. It was claimed that this was better than the ordinary plan of making the spindle and roller in one piece. The improved arrangement, it was claimed, provides a larger bearing, and prevents the escape of oil therefrom.

Mr. Garey described the following experimental tests which he had made of the power required to move cars with different sized journals: A passenger car with $3\frac{1}{4}$ inch journals, and weighing 44,674 pounds, required a force of 800 pounds, as shown by a dynamometer, to move it along a level track as slowly as the engine could be made to move. The car was in good running condition and the journals well fitted. Another passenger car, which was new and had run only 90 miles, weighing 46,770 pounds, and with $3\frac{7}{8}$ inch journals, required just 700 pounds, as indicated by the same instrument, to move it on the same track and in the same way as the other; thus showing that 100 pounds less force was required to move the heaviest car with the large journals. Specimens of the Ainsworth friction metal bearings were shown, one of which was stated to have run 40,363 miles under a Pullman car without heating. The metal is claimed to be 25 per cent cheaper than brass, three times more durable, and requires 50 per cent less oil.

Mr. D. A. Hopkins called attention to the advantages of lead-lined bearings. They had been tried under heavy palace cars, and had run 58,000 miles without heating or wearing out. The lead should not be more than 1-16th of an inch in thickness; it then accommodates itself to the journal, and gives a true bearing; but if thicker, will be pressed out at the sides and ends.

Mr. Garey remarked that in the course of his experience he had heard much of the antifriction metals, but had rarely or never seen any. He did remember making a trial of one specimen, which, it was claimed, would run without any oil at all, and not get hot. And it did so for a considerable time, and then he had to throw it away. It was like the horse that undertook to live without eating; as soon as he got well under way, he died.

We understand that the metaline bearings, lately illustrated in the SCIENTIFIC AMERICAN, are to be tested on the cars of the Greenwich street elevated railway, in this city. This bearing, it will be remembered, is composed of compressed graphite and other substances, and runs without oil. In fact, oil is its worst enemy, for its presence quickly injures the metaline.

Improvement in the Manufacture of Beer.

The liability of beer to turn sour, ropy, etc., is due to the presence of special ferments derived from the air, and from the materials used. By boiling the infusion of malt and hops, cooling out of contact with air and fermenting with pure yeast in vessels to which only carbonic acid or pure air is admitted, a beer is produced of superior quality, which may be preserved without trouble for any time. Even a partial adoption of these precautions is attended with valuable results. In preparing pure yeast to start with, the author makes use of the fact that oxygen favors the growth of true yeast but hinders the propagation of the other ferments. Pure yeast being obtained, the beer is afterwards fermented in an atmosphere nearly destitute of oxygen, as its quality is thereby improved. Pure yeast when kept in pure air undergoes no change, even at summer temperatures. The *mycoderma vini* does not, as the author once thought, become changed in beer yeast on submersion in a nutritive fluid; under these circumstances it acts as an alcoholic ferment, but does not propagate itself.—*L. Pasteur.*

THE more machinery a nation has in operation, the more fully and profitably is its labor employed, the more rapid its material progress, and the more developed its civilization.

THE SEPARATION OF TAR AND THE MANUFACTURE OF SULPHATE OF AMMONIA FROM WASTE PRODUCTS.

The distillation of coal in closed receptacles, for the manufacture of illuminating gas, produces, beside the coke remaining in the retorts, tar and ammoniacal waters, which are collected in special apparatus, known as refrigerators and condensers. Large establishments have recently been erected in France for the purpose of obtaining these products in separate condition, in order that the coal tar may be utilized in the many ways now known to the arts, and the ammoniacal liquor chemically treated so as to yield merchantable sulphate of ammonia. Our engravings represent the principal portion of the extensive plant of the works, showing the apparatus for separating the substances and for subsequently extracting the salt above mentioned from the waters. The latter, when received from the gas house, are conducted into huge cisterns of masonry, A, in Fig. 1, situated as shown underground. Thence, by means of the pumps, B, actuated by the engine, C, the liquor is elevated to a series of large reservoirs, D F G, located in the upper story of the building. Reservoir D is subdivided by a partition into two compartments, into each of which the water successively passes. As indicated by the proportion of shaded lines in Fig. 1, the major part of the tar is deposited in this first reservoir; the water conducted by a surface pipe then enters the reservoir, F, leaving more of its tar, and is finally decanted into G in almost a pure state, whence it is drawn off by the pipe, L, into suitable vessels of a certain measured capacity. The tar that is deposited is removed from the bottoms of the reservoirs by the pipes, H I and K, the last two communicating with the pipe, H, which extends outside the building so as to deliver the tar into the vehicles designed to transport it to the factory where it is to be utilized. The total area of all the reservoirs, D F and G, is about 107 square feet.

In Figs. 2, 3, and 4, are represented end and sectional views of the distilling apparatus, which is composed of a double set of boilers and mechanism. G is the vessel which receives the decanted liquor from the reservoirs through the cock, *a*. A part of the water is thence directly conducted to the vessels, E, in which a quantity of lime is previously introduced, and in which is machinery for agitating the contents. Receptacle E is connected by tubes, M (Fig. 3), near the bottom,

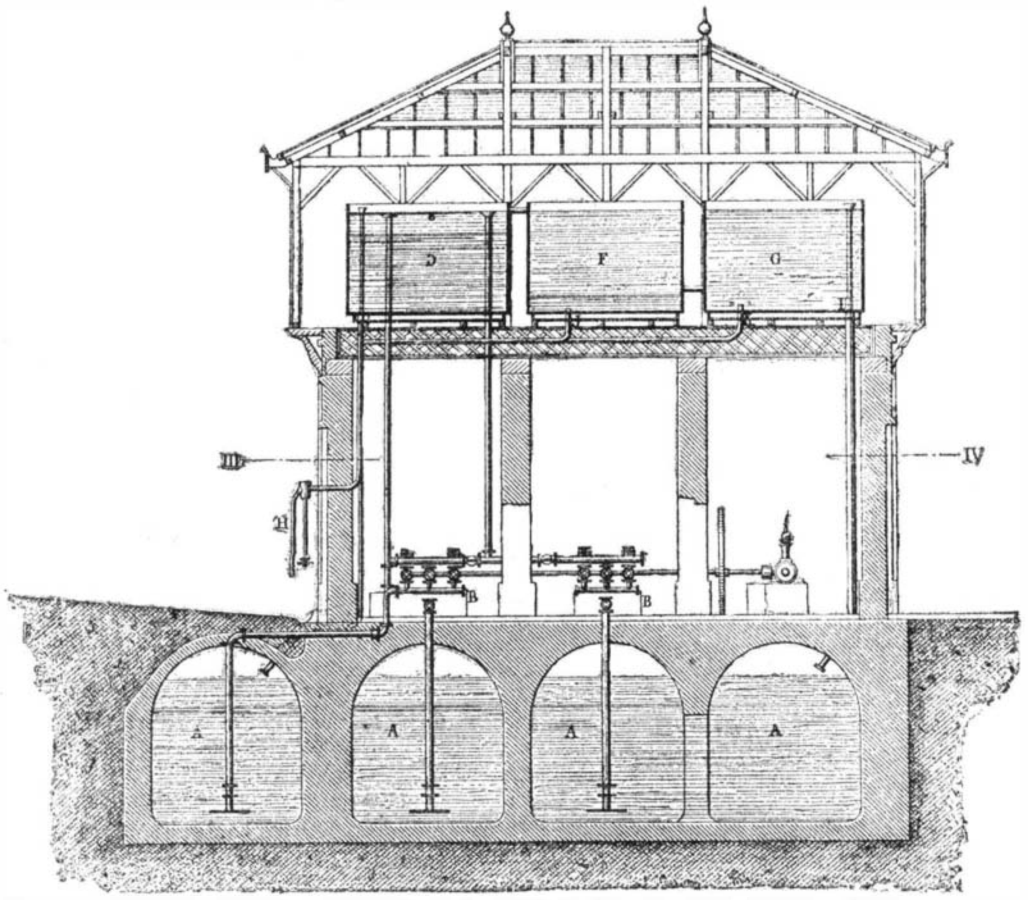


Fig. 1.—APPARATUS FOR DECANTING AMMONIACAL LIQUOR FROM COAL TAR.

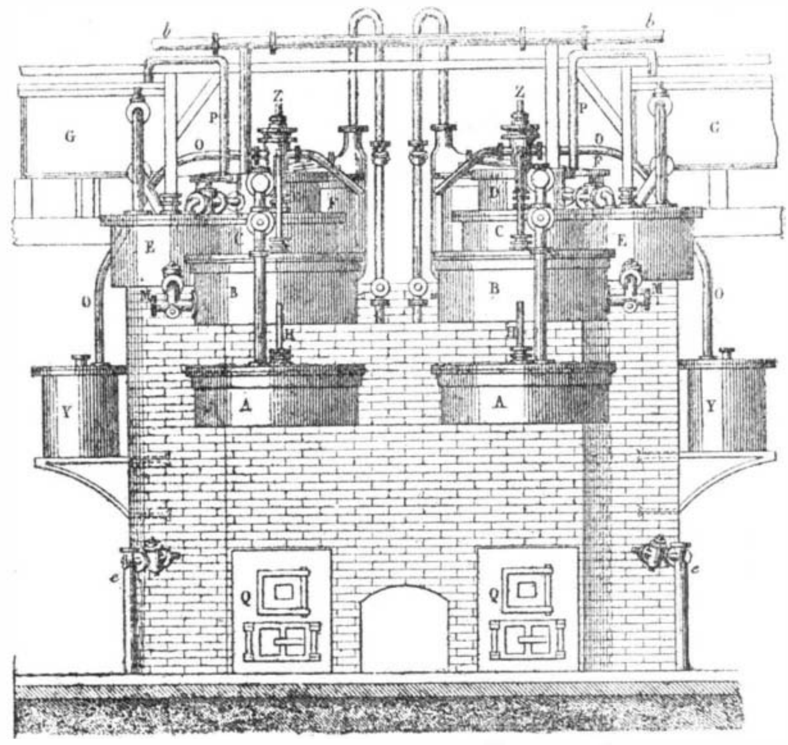


Fig. 2.—DISTILLER—END VIEW.

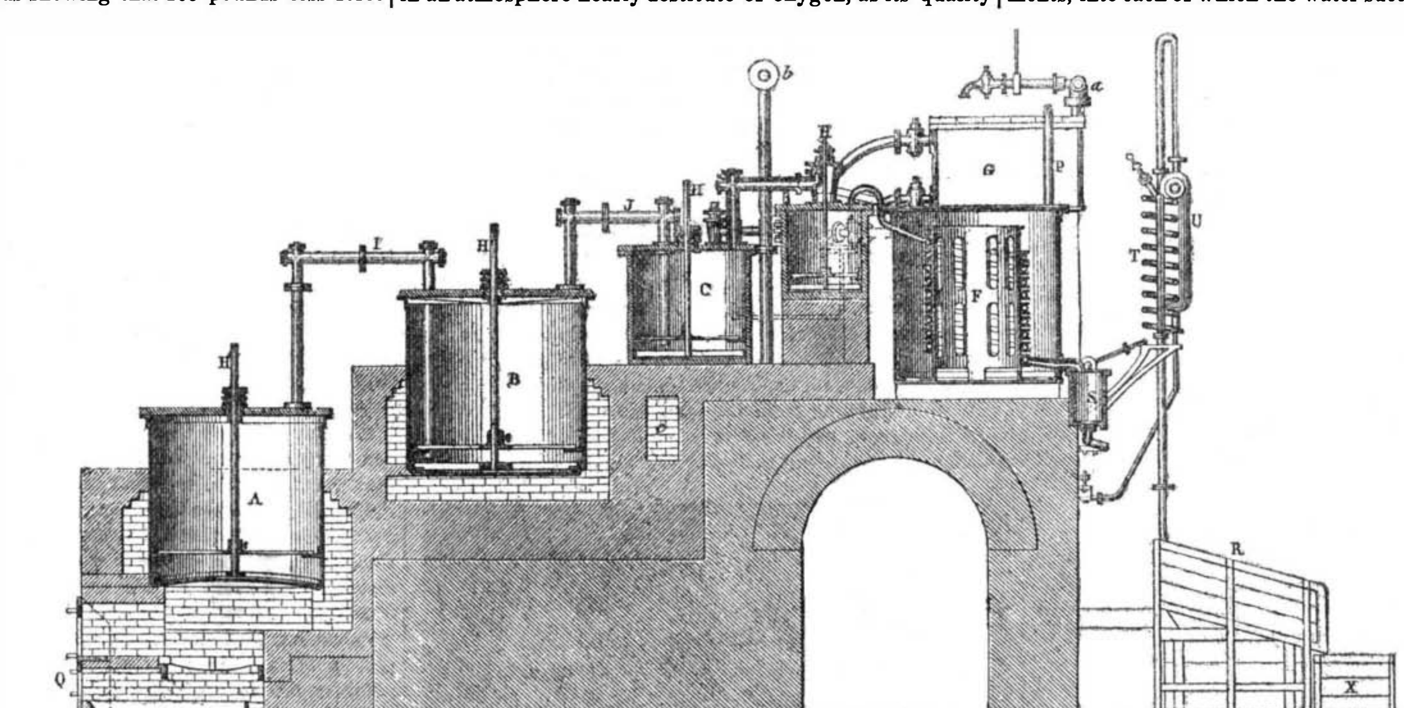


Fig. 3.—APPARATUS FOR MAKING SULPHATE OF AMMONIA

with the boiler, B, this with the boiler, A, and also with the boiler, C, which also communicates with a tank, D. All four of these vats are provided with agitators, H, and the vapors from each one pass into the others by tubes, I and J. Boiler A is heated directly by the fire beneath, B by the escaping products of combustion, and C by the vapors from B. The vapors entering D pass through a serpentine tube in F, which is surrounded by water, also drawn from G. This worm passes into a receiver, S, Fig. 4, whence any products of condensation that may occur are led to a secondary receiver, T, from which, by the tube, O, they are (Fig. 2) carried back to D. The ammoniacal gas then passes to the worm, T, Figs. 3 and 4, and, finally, to the crystalizers, V. At U are devices

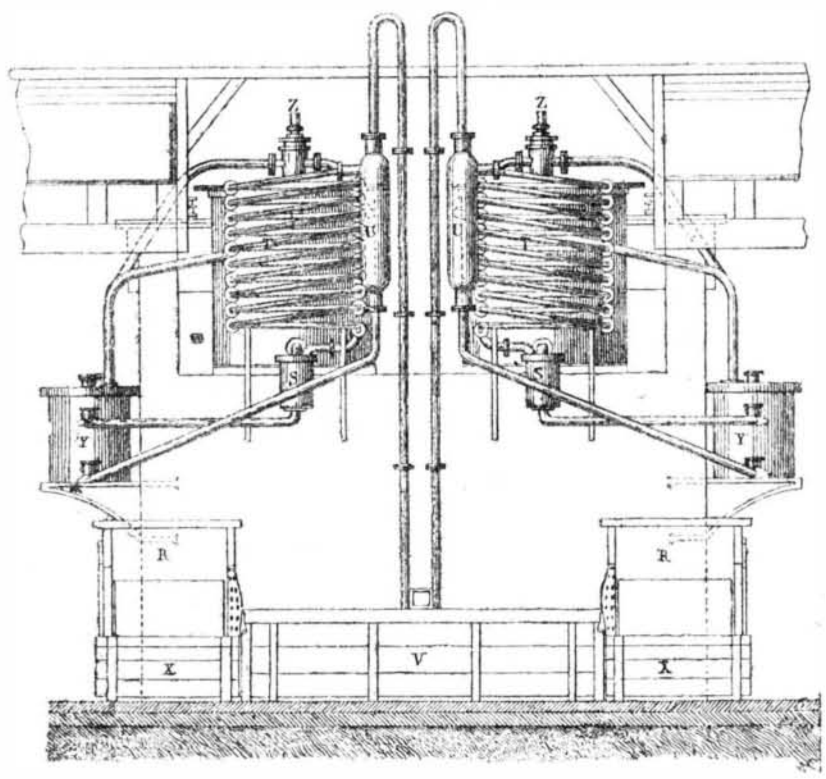


Fig. 4.—DISTILLER—SECTIONAL VIEW

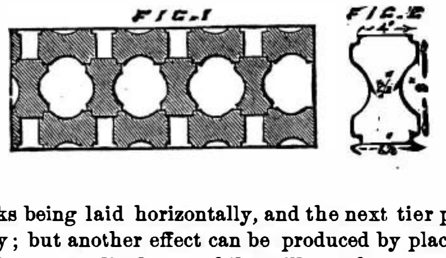
arranged to prevent the absorption of the water in the receivers into the crystalizers, and P are also safety tubes leading the vapors formed by the water in the cistern, F, back into G. R are the dropping boards for the sulphate of am monia, and X, leaden vats receiving the mother liquor. Fig. 5 represents a vertical section of one of the sulphuric acid vats, in which the ammoniacal vapors resulting from the distillation are treated. It is hermetically closed by the cover, M, and the products are led into it by the conduit, N, until the acid is saturated. The noxious vapors engendered are carried off by the subterranean flue, O, which connects with the chimney of the works, in which they are burnt up, the contents of the shaft being always kept at a very high temperature.

The *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, in commenting on this improved apparatus, says that the ammoniacal water is delivered perfectly pure and limpid, and that the deleterious and disagreeable vapors arising from the distilling processes, which generally converts the operation into a nuisance to residents of the neighborhood, are completely suppressed. Owing to the feeble strength of the waters, and the consequent expense which would be incurred if it were attempted to transport them by rail to a separate establishment, the distilling apparatus is set up directly in the gas works.

Italian Ornamental Brick.

Our engraving shows a form of brick, used at Mentone, in constructing ornamental screenwork on the upper portion of walls, and worth the notice of our readers. It is capable of producing various effects according as the bricks are combined. In the engraving (Fig. 1), the bottom layer is made by

FIG. 1 FIG. 2



the bricks being laid horizontally, and the next tier perpendicularly; but another effect can be produced by placing all the bricks perpendicularly, while still another may be obtained by placing them all horizontally. In each case the effect produced is very good, and the frequency with which it is met with about Mentone testifies to the partiality the people have for it. The brick (see Fig. 2) is 8 inches long, 5½ inches broad at the widest part, and 2½ inches in the middle. It might be advantageously introduced into this country, and made in ordinary brick earth or in terra cotta.

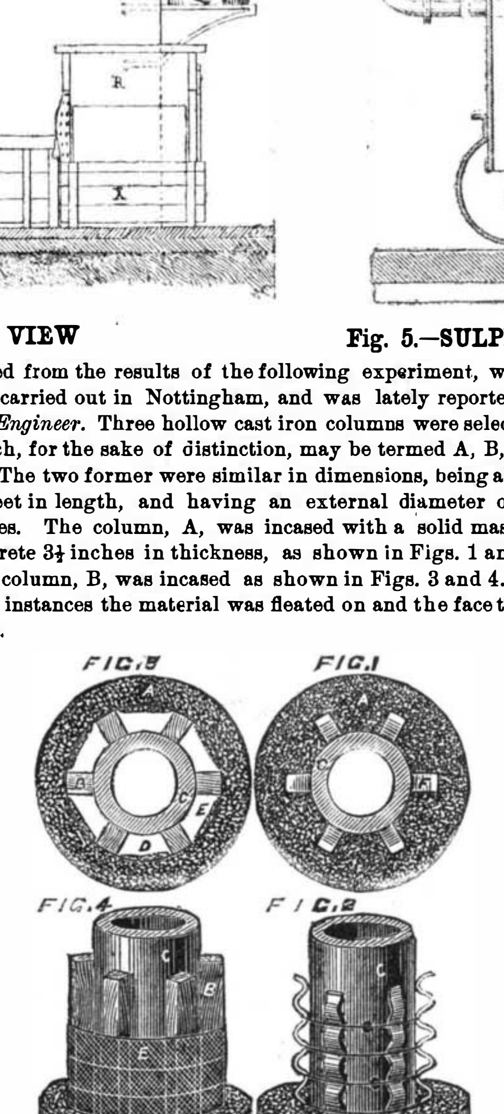
Iron and Fireproof Construction.

Iron should be used in a building as the bones are used in a human being—to give strength; but it should be protected, as the bones are by the flesh and muscles. A well-known means of protecting iron is that of Messrs. Dennett & Co., of Nottingham, shown in the accompanying illustrations.

In Figs. 1 and 2 the column, C, is first provided at intervals with vertical pieces of corrugated hoop iron, F, which are retained in position while the concrete casing is in progress, by horizontal rows of wire binding them to the circumference of the column. The concrete casing is 3½ inches in thickness, and the object of the corrugated hoop iron is evidently to cause it to bend, and to avoid the possibility of a straight joint all around the circumference of the column. In Figs. 3 and 4 the arrangement is somewhat different. In the place of the corrugated hoop iron, fillets of wood, B B, are employed and held in place by a wrapping of iron wire mesh. It will be observed that in this case the thickness of the concrete is reduced to 1⅞ inches.

The relative value of these two arrangements will be perceived from the results of the following experiment, which was carried out in Nottingham, and was lately reported in the *Engineer*. Three hollow cast iron columns were selected, which, for the sake of distinction, may be termed A, B, and C. The two former were similar in dimensions, being about 10 feet in length, and having an external diameter of 7½ inches. The column, A, was incased with a solid mass of concrete 3½ inches in thickness, as shown in Figs. 1 and 2. The column, B, was incased as shown in Figs. 3 and 4. In both instances the material was floated on and the face troweled.

FIG. 3 FIG. 1 FIG. 4 FIG. 2



The columns, A and B, were fixed erect on the ground about 4 feet apart, and their caps and bases were entirely inclosed by the concrete.

The column, C, was incased in a manner exactly similar to A, but the concrete was laid thereon only a week before the experiment, whereas A and B had been incased a month previously.

Strips of lead were fixed vertically along the whole length of each column under the concrete and in contact with the iron, it being fairly assumed that, if the lead were prevented by the protection of the incasement from melting, a temperature would be preserved below that which could injuriously affect cast iron.

A gage rod, with a self-registering card and pencil, were placed inside each of the columns, A and B, for the purpose of testing the expansion of the iron lengthwise.

All three columns stood within a distance of a few feet from each other, and a fire of wood and shavings, saturated with gas tar, was lighted around their bases, and maintained at as fierce a degree of heat as possible for a space of four and a half hours.

After the fire had been burning about an hour, the hollow incasement of column B showed a crack about 3 feet in length. This was caused probably by the expansion of heated air or steam within the hollow space, the experimenters having inadvertently omitted to form escape holes in the concrete casing, as had been intended. No signs of injury to the incasement of columns, A and C, were visible, although the flames reached above the caps of the columns.

After two hours had elapsed it was determined to have one of the columns laid horizontally in the middle of the fire, so as to insure a uniformly intense degree of heat along its whole length, as the other columns, when in an upright position, were obviously more severely affected for a few feet above their bases than near their caps. The column, C, was therefore pushed over so as to lie horizontally in the fire, and remained in that position until the close of the experiment.

The fire was eventually extinguished by a quantity of water thrown on suddenly, and a careful examination showed that no cracking, blowing, or disintegration of the concrete had resulted from this severe test. Portions of the concrete were then removed as speedily as possible from each column. In no case had the strips of lead melted, nor did they show the least sign of injury. The hand could, immediately after the removal of the concrete, be borne on its inner surface, or upon the iron columns, without discomfort; and the registering cards attached to the ends of the gage rods showed no indication whatever of expansion.

The wood fillet, immediately opposite the crack in the

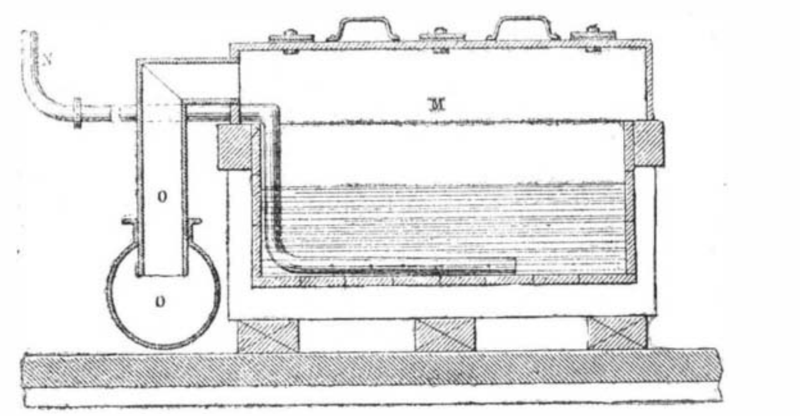


Fig. 5.—SULPHURIC ACID VAT FOR AMMONIACAL VAPORS.

casing of column B, was charred somewhat on its outer edge; the sides and the edge of this fillet next the iron, as well as the two adjacent fillets, were discolored by smoke for 2 feet or 3 feet of their length, and the other fillets remained as white as when they came from the saw. A strip of lead near to the crack in the incasement of column B, and another strip in that side of column C, which had been laid downwards to the fire, were considered to have suffered the most severe test, but neither of these strips showed indications of melting, and were removed by the hand without inconvenience.

The following report of some experiments made by the professor of chemistry at the Massachusetts Institute of Technology, at Boston, Mass., upon Dennett's concrete, with regard to its fire-resisting qualities, has been forwarded to us by the patentees. Since the recent calamitous fire in that city, great interest has been manifested in the question of fireproof c nstruction, and these experiments were made at the request of Col. Seaver and other gentlemen, for the purpose of testing the value of this material, with a view to its use in the construction of the floors of several important buildings which are about to be re-erected.

"The point first investigated was the relative power of resistance of the brick and the cementing material. For this purpose a very intense heat was employed, probably much higher than would be produced in an ordinary conflagration. The specimens, numbered one to four, have been heated in crucibles to a temperature between the melting points of cast steel and wrought iron. The temperature measured was about 1,200° to 1,500° centigrade, or about 2,200° to 2,700° of the Fahrenheit thermometer.

"*Behaviour of the Building Material at* 2,200° *to* 2,700°.—Nos. 1 to 3 show partial fusion of the brick, and in No. 1 the brick in the interior has partially melted and run away from the cement, leaving it intact. In no case was the gypsum melted except on the surface, and then a portion has been changed, by the reducing action of the furnace gases, into sulphide of calcium. By pulverizing the pieces which had been subjected to the most extreme heat, and boiling them with water, unaltered gypsum (sulphate of calcium or sulphate of lime) was extracted. These facts prove that the cement is less affected by fire than the bricks, and that it may protect them to a certain extent from the action of a very fierce flame. The fragments of brick contained in the specimens shown me happen to be rather more infusible than many samples in this neighborhood, as is shown by specimen 4. A piece of ordinary red brick, also labeled No. 4, was heated in the crucible, together with a piece of the building material, and the result was that it served as a flux to melt the whole into a slag or glass in which fragments of unmelted cement may be seen. All the specimens (Nos. 1 to 4) were heated at the same time, in the same furnace, to a temperature which was measured and found to be between the melting points of cast steel and wrought iron, as stated above.

"*Behavior of the Building Material at about* 1,800°.—The process of manufacture of the building material gives reason to suspect that it might be vulnerable at a lower temperature, but the following experiments show this is not the case. The plaster of Paris is made to set and bind the bricks by mixing it with water, which combines chemically with it; and it might be supposed that, when the moisture escapes as steam, on first heating it, the cement might crumble. In order to test this point, the furnace was maintained at about 1,000° C., or 1,800° Fah., and the specimens marked 5 and 6 were introduced suddenly, and were closely watched. There was no appearance of crumbling, although the lower side of each became red hot in three minutes. Each was taken out from time to time, as it became gradually hotter, and allowed to fall a distance of two feet on a brick pavement. It will be seen, on inspecting the pieces, that the molded faces still preserve their sharpness, and that the specimens have only broken on the edges and corners. No. 6 was taken from the furnace when red hot, and a strong jet of water from a faucet was directed on its smoothest face; small flakes, less than 1-16 inch in thickness, scaled from the surface in the lower part, and a small piece fell away from one corner. The injury was very slight. When taken away from the jet of water, No. 6 was put immediately into the hot furnace, but did not appear to suffer from the rapid change of temperature. No. 5 has been heated half an hour, and No. 6 one hour, at a temperature which was measured and found to be about 1,800° Fah. (between the melting points of gold and silver). Under these tests, probably more severe than a portion of a building would be subjected to during a fire, this building material has undoubtedly suffered and lost in strength from the calcination of the plaster of Paris, but apparently not to an extent which would endanger the safety of an ordinary construction. The freedom from crumbling of the plaster of Paris cement, which is extraordinary, may be due to the high temperature at which (as I am informed) it has been burnt before mixing with water."—*Building News.*

A New Fertilizer.

In many of the large tallow-rendering factories of Texas and elsewhere, the fatty matter is separated from the bodies of the cattle, after the animal has been skinned, by boiling the entire carcass in a strong, tight vessel of large capacity, under steam pressure, until the meat, muscle, and offal are thoroughly disintegrated and the bones softened and crumbled. The tallow thus liberated rises to the top of the mass, and is then drawn off from the vessel. In Texas, where animals are slaughtered in immense numbers for the hides and tallow, the residue in the tank being mixed with a large amount of water, and the bones so crumbled that they cannot be separated, is thrown away, thus wasting a vast quantity of the most valuable material for fertilizing purposes.

The process below described, which has for its object the utilization of this waste, is susceptible of very extended application, and is based on a peculiar action of plaster (which the inventor claims to have discovered) upon animal matter, in that, when aided by a gentle heat of about 250° Fah., the plaster entirely absorbs the moisture of the meat and destroys its tendency to recombine therewith. All decomposition, we are informed, is prevented, while the valuable constituents, most of which, in many processes, are lost through the effect of the high degree of heat necessarily employed, are preserved indefinitely for use.

After the fat has been removed from the tank, the residue is carried to a suitable vessel, and the solid matter allowed to settle. The supernatant liquid is drawn off into another vat and rapidly evaporates by the action of heat to a sirupy consistency. With this is then mixed the solid residue and a quantity of plaster of Paris equal to about twenty per cent of original weight of the meat. The mass becomes converted into a friable substance which can be ground to a fine powder, and which possesses, it is claimed, fertilizing properties equal to good guano. The plaster, beside absorbing the water, the inventor states, fixes the ammonia and nitrogenous elements, and destroys the hygrometric properties of the meat, so that it will keep in any climate for any length of time. The plaster itself is also valuable as a fertilizer.

An analysis, of the product made from the waste of rendering tanks, by the chemist of the Agricultural Department at Washington, gives its composition as follows:

Phosphoric acid	6·87 per cent
equal to bone phosphate	15·00 per cent
Nitrogen	5·11 per cent
equal to actual ammonia (NH_3)	6·21 per cent,

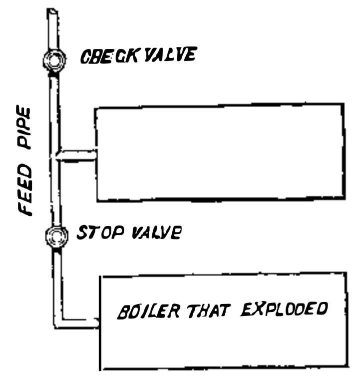
which is equal to a fair average guano.

Dead animals and the waste of abattoirs, by simply hashing them, by means of a powerful machine, with a small proportion of plaster of Paris, may thus be advantageously utilized, and would produce a fertilizer richer in manurial constituents than that shown in the above analysis. The [cost] of manufacture is said to be very small. Patented No[v.] 25, 1873. The inventor desires to dispose of rights [or] a partner with means to develope the invention. [For] particulars, address Mr. H. Stevens, Brazoria, [Coun]ty, Texas.

[SLO]PE.—A steep slope may be grassed over [by] first smoothing the surface and then [...] or mortar of clay, loam, and horse [...]ater. The grass seed, which should [be b]lue grass and white clover, should [be sowe]d upon the moist surface of this [...]e bank. The plaster should [...]k, and a thin layer should be [...]uld be kept moist, and a [...]lizer would help the [...] grass should be cut [u]ntil a thick sod is [...].

RECENT BOILER EXPLOSIONS.

A correspondent sends an account of a boiler explosion at the Binghamton water works, on March 10, together with the report of the inquest and the finding of the jury. The explosion seems to have been very violent, pieces of the boiler being carried several hundred feet and firmly imbedded in the earth. One of the engineers was killed by the explosion. The boiler was one of two which stood side by side. We do not get a very clear idea of the arrangement of the steam pipes, but it was stated on the inquest that great difficulty was experienced in keeping the same pressure in the two boilers, though both were furnishing steam to a single engine. The engineer testified that there was frequently as much as five pounds difference of pressure in the two boilers, as shown by their respective steam gages. The arrangement of feed pipes is shown in the accompanying plan, there being only one check valve, so that, when the pressure was the same in both boilers, the water would stand at the same level in each; and when the pressure in one was increased, water would be forced out of it into the other. Even with two check valves, there could be no certainty of maintaining the same water level in the two boilers, with a single pump, since the water would go into that boiler in which the pressure was least. The whole system of connections in these boilers, both in steam and water spaces, appears to have been very faulty: and in addition, much testimony was taken to the effect that the boiler was not well built, so it does not seem difficult to find reasons for this explosion.



It is not an uncommon thing to see boilers connected in this manner, so that the steam pressure is frequently different in them. But it is a source of danger, and should be remedied at once. We hope that our remarks may arouse the attention of some who are thus inviting disaster.

Another correspondent sends us a newspaper containing an account of a boiler explosion in Burlington, Iowa, the boiler having neither fire nor water in it, being under repairs at the time. According to the account, a tube in the boiler had been stopped with plugs, and on striking one of these plugs with the hammer a violent explosion occurred in the tube. The writer of the account did not see the explosion, apparently, and may possibly have colored it to suit his theory—that explosive compounds, as violent in their action as dynamite or nitro-glycerin, are formed from the earthy matter contained in the water, and are liable to be exploded by a blow. From his own account, however, it does not appear that the explosion, violent as it was said to be, injured the boiler or the workmen.

Explosive compounds of nitrogen produce great destruction by their decomposition. The case, however, as presented in this newspaper slip, is sufficiently curious. We would be glad to hear from some of our correspondents who are acquainted with the details of this explosion also.

Mr. E. B. Martin, Chief Engineer of the Midland Steam Boiler Inspection and Assurance Company of England, in his last annual report to the company, makes the following statement:

"The experience of the past year confirms the opinion that no form of boiler is free from the danger of explosion, if not well looked after; and that the best means of preventing explosions is to insist upon frequent inspections and careful attendants."

The successful working of these boiler-inspecting companies in England for several years, together with the publicity given to the results of their inspections, have gone far to overthrow the mysterious theories that were always advanced when a boiler exploded. On the occasion of an explosion in England, careful reports are usually made by the engineers of these companies, and the yearly report gives accounts of all disasters of this kind, with brief statements of the causes. But the most effectual deathblow to the mysterious theory is that the boilers under the care of these companies do not explode, showing that boiler explosions can be prevented. We have frequently called attention to this fact, and desire to impress it upon our readers. Experience shows that government inspection, as at present conducted, is of no service in preventing boiler explosions, and that thorough inspection, under the auspices of reliable private companies, is efficacious. Those of our readers who use steam power will do well to consider these statements, and act accordingly. Our readers know that we improve every opportunity to call attention to this matter.

Mr. Martin reports that, during the year 1873, the Midland company had 3,555 boilers under their care, and made 14.377 inspections. The number of explosions reported in England in 1873 was 88, 66 persons being killed and 94 injured. (In this country, as our readers may recollect, there were also 88 explosions, by which 139 persons were killed, and 164 injured.) The particulars of all but four of these explosions were obtained, and Mr. Martin classes them under the following heads:

1. Thirty-six explosions from causes that might have been prevented by inspection, such as weak tubes, bad repair, faulty connections, bad material or construction.

2. Nineteen explosions from causes that could only have been detected by inspection, such as corrosion.

3. Thirty-three explosions from causes that could have been prevented by attendants, such as overpressure, scale, low water, and careless blowing off.

Compound Engines.

Jonathan Hornblower, who built the Newcomen engines, patented the use of two cylinders, to effect the expansion, in England on the 13th July, 1871, No. 1298. He said that he employed the steam, after its action in the first cylinder, to do work in the second expansively.

Hornblower's engine met with small success. As it used steam at low pressure, it had but a limited expansive power, and the advantages became of no account; rather they became negative on account of the resistance due to the use of two pistons.

But when higher pressure was employed, Woolf did, for the engines of Trevithick, Evans, and others, what Hornblower had done for those of Watt; he applied to them the principle of the double cylinder. As he could make use of high pressure, there was promise of success for the invention, and it did succeed, so that he has given his name to engines having two cylinders.

Woolf's patent was taken out in 1804.

In 1834, Ernst Wolff (a German, we infer from his name) took out a patent (No. 6,600) for an engine described as compound, as now-a-days constructed, which indicates the possibility of modifying existing engines so as to adapt them to the new mode of action.

This patent is very interesting, and it is singular that English authorities hardly refer to it.

It is certain that compound engines with two cylinders and intermediate reservoir, to which the name of Woolf has been given, though they have not the same mode of action, should be called "Wolff engines."

We give the essential part of this patent: "The invention consist of the combination of two or more engines, each complete in all parts, and so disposed that, while the first receives steam at one, two, or more atmospheres of pressure, the next engine is moved by the steam that escapes from the first. In the last engine the steam is condensed in the ordinary way or escapes into the atmosphere. The work supplied by the several engines is applied to the same shaft, or to several combined, or to independent shafts.

"As in steam vessels and other applications, two conjoined engines are generally employed. The present invention is especially adapted for this purpose, as it presents economic advantages; as it reduces the expence of the apparatus without increasing its application.

"It is sometimes useful to have between the cylinders an intermediate reservoir to regulate the pressure; this may be placed with advantage at the base of the chimney, so as to maintain or raise the temperature and the pressure of the steam in its passage from one cylinder to the other. Indeed, if necessary, the heat may be supplied by a special fire-box.

"It is often necessary to employ a special pipe with a stop-cock to admit the steam from the boiler to an intermediate reservoir in order to give the machine the power of starting any crank. This direct introduction may be employed to increase for a time the power of the engine."

The writer then explains a method of modifying old engines by adding to a high pressure engine a low pressure cylinder; or, in the case of a marine engine, by substituting for one the of low pressure cylinders a high pressure cylinder.

The drawing annexed to the patent shows a pair of marine beam engines.

The compound marine Wolff engine is at present built in many English shops; though some maintain the Woolf type, with superposed cylinders. In France, all engines are of the first kind.

The Transfer of Varnish Negative Films.

For the purpose of peeling off the film from a varnished negative, I prepare in the first place a mixture composed of the undermentioned materials, namely:

Gelatin	60 parts
Acetic acid	90 "
Water	180 "
Ordinary soap	⅓ part

The above ingredients are mixed together, and then poured rapidly over the varnished film in such a way that every part of the surface is uniformly covered, and no portion treated a second time. The superfluous liquid is poured off and thrown away, for it cannot be employed again for the same purpose.

The film is then allowed to dry, and, when perfectly desiccated, some thick normal collodion is poured over it, to which a little castor oil has been added. This leather collodion, having dried uniformly over the negative film, will be found capable of being peeled off, bringing the collodion image with it.

Should the film, when separated from the glass, lack thickness, and it is desired to secure the *cliché* film of a stouter and more compact nature, the same may be treated with a solution of gelatin (without soap) after the leather collodion has been applied, and even with a second application of collodion if such is deemed necessary.

By employing this plan of proceeding, I may mention that I have stripped upwards of a hundred negative films from glass, all of which had been previously varnished, without having had a single mishap. They were from plates prepared by the ordinary wet collodion process; but whether dry plates (and especially those which have been prepared with a substratum of albumen) could be so readily treated, is a matter of which I have no experience at present.—*Koch Reigh, in Photographisches Archiv.*