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,

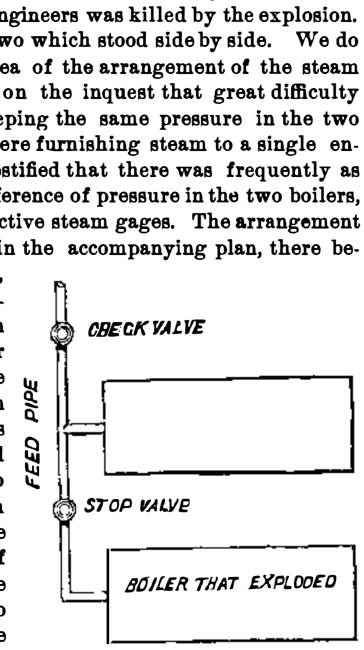
which is equal to a fair average guano.

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. ...25, 1873. The inventor desires to dispose of rights ... a partner with means to develope the invention. ... particulars, address Mr. H. Stevens, Brazoria, ...ty, Texas.

...PE.—A steep slope may be grassed over ... first smoothing the surface and then ... or mortar of clay, loam, and horse water. The grass seed, which should ... blue grass and white clover, should ... upon the moist surface of this ... bank. The plaster should ..., and a thin layer should be ... should be kept moist, and a ...lizer would help the ... grass should be cut ...until 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 firebox.

"It is often necessary to employ a special pipe with a stopcock 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	½ 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.*