Correspondence.

The Recent Boiler Explosions.

To the Editor of the Scientific American:

We notice, in your issue of February 22, an article on boiler explosions at Conshohocken, Pittsburgh, and elsewhere. The information in regard to our lamentable catastrophe appears to come from Mr. Le Van, of Philadelphia, and as we know you well enough to believe that you do not wish to misrepresent or injure any one by a false report, we give you the facts in the case: The boiler was ordered and made in 1853, and was put in use in 1854. It was of the best charcoal flanged iron, the shell being of the thickness of No. 2 wire gage, and the flues were ¼ inch thick. The boiler was 54 inches in diameter, 18 feet long; the flues were 16 inches in diameter, and not 18 inches; the shell is fully ¼ inch now, and the flues are very little under the original thickness. The quality of the iron has been pronounced, after testing since the explosion, to be very superior, and not poor and crystallized. It will bend or flange either when hot or cold, without showing the smallest fracture, and it will stand a tensile strain of 70,000 lbs. to the square inch, which is 20 per cent stronger than ordinary shell or cylinder iron, now used for boilers, is. Your informant also says: "It exploded whilst the steam gage showed only 53 lbs." The fact is that there was no steam gage attached to the boiler, as it was shut off from the rest, having been stopped for repairs. The engineer, who had had charge for 10 years, was under the impression that the steam was not high enough to open the valve to equalize with the other boilers, as it was not blowing off at the safety valve; and he was preparing to open it when the explosion took place. The boilers that were at work at the time were carrying 70 lbs. as indicated by the steam gage. We cannot see how Mr. Le Van arrives at the conclusion that the boiler exploded at a pressure of 53 lbs., or how he or any one could say it was 53 or 153 or more. Who can tell whether the safety valve was stuck or not, or how much pressure was on it, or what was the real cause? We would give a good deal to know. We are under the impression that this boiler would have carried 150 lbs. pressure without exploding, and, from the terrible results shown, it must from some cause have had more on it. The manner of firing and starting in this case was the same as had been followed for 20 years, without a single accident or the loss of a single life. It really seems unaccountable to us. Many flying reports and rumors have been put in circulation by the reporters of some of our sensational newspapers, who catch at every thing without knowing anything about the facts. It would be foolish in any man to suppose that we would risk our lives, the lives of our workmen and our property by running a boiler that there was the least reason to suspect of being unsafe. I. WOOD & BROTHERS.

Philadelphia, Pa.

Ignition by Steam Pipes.

To the Editor of the Scientific American:

In your issue of February 8, you publish a communication from A. F. Nagle, Mechanical Engineer of the Providence Waterworks, which, although true in every fact stated, does me great injustice by not stating all the facts; and it must lead to the conclusion that the Miller boiler is dangerous, as it will set buildings on fire when other steam generators would be perfectly safe. I would therefore request the insertion of this communication as an act of justice, as well as for the further light it may throw on the question of superheated steam.

The pumping engines at the Providence Waterworks, as Mr. Nagle states, are covered with felting and black walnut lagging; this lagging has been repeatedly saturated with linseed oil, rubbed down till it acquired a fine finish. The engine is one of Worthington's compound cylinder engines, in which two cylinders are placed horizontally side by side; the steam chest is situated between the two cylinders and above the same; and the lagging generally, conforming to the cylindrical shape of the engine, forms here a square box with a level top. In this top was a trap door; and in the square box, below this door, the fire originated. The engines were new, the lagging was new and had not yet reached the perfect finish which the engineer expected to see on it when it would be more thoroughly saturated with oil and rubbed down. The level top of the steam chest and the joints of the door certainly facilitated the admission of oil to the felting; and when you consider that this felting was over the level surface of the steam chest (where the effect of heat would be greatest) and that this level surface was a convenient place for a temporary deposit of oily waste when wiping up the engine, it is evident that here spontaneous combustion would be most likely to take place. That the higher temperature of the steam from the Miller boiler may have facilitated the ignition, I am ready to concede, but must object to the inference that it caused the ignition of the felting. The steam generated in the Miller boiler, before reaching the steam chest, had to ascend the main steam pipe four feet, thence, pass on a level through the said main over the tubular boilers (some sixty feet), and then descend 8 or 10 feet to the steam chest. The whole length of this pipe is felted and well lagged, and the temperature of the steam in this pipe must, of necessity, be greater than in the steam chest, being from 8 to 10 feet higher, and from 40 to 80 feet nearer the source of heat; and yet this steam chest, with every provision for spontaneous combustion and every probability of a lower temperature than the steam main, is the place where the fire originated.

But unfortunately, to most of your readers, the ugly fact still remains, that the steam of the Miller boiler was superheated beyond the temperature at which saturated steam would have been at this pressure; and this is the difficult part of my defense. You, Mr. Editor, and most of your readers, are aware that I have frequently, in your columns, expressed my conviction that the amount of water, passing through a steam boiler per pound of coal burned, is no criterion as to its value as an economic generator of steam. We do not want to evaporate water; we want to get the largest amount of power from the smallest amount of coal, and it is a well known fact that the motor in which the difference of temperature between the inlet and exhaust is greatest produces the most economical power. The Miller boiler erected at the Providence Waterworks was specially constructed to test the question whether it is, in reality, economical to generate steam on my system, in which the water is progressively exposed to increasing temperatures until made into steam, this steam, dried and superheated, instead of being stored up in large steam domes, being at once sent to the engine to do its work. The lifting of a certain quantity of water from a given level to another higher one being the most perfect and satisfactory test, I spent a large amount of money, besides time, care and labor, to settle this important question, which must be valuable to the engineering as well as to the manufacturing community. I therefore ask you to publish the results of this trial, sent herewith; and your readers will see if the test proves that dry and even superheated steam is economical. If asbestos be used instead of fet,l no danger from fire need be anticipated. In conclusion, let me say that many of our largest establishments are using steam generated by the Miller boilers; and a Corliss engine will cut off at 65 lbs. when using this steam, but will not cut off with 85 lbs. using ordinary steam, doing the same work. These boilers have been in use for two years and over, varying in power from 75 to 500 horse power; and in no case have they suffered from the high temperature, nor have any fires ever been caused in any of the establishments using them.

Whether the burning of the lagging in this case was caused by the steam or by spontaneous combustion, I leave to the intelligence of your readers to decide; whether dry steam is a desideratum, the trial must establish.

JOSEPH A. MILLER, C. E.

TRIAL OF THE COMPARATIVE ECONOMY OF TUBULAR AND MILLER STEAM BOILERS, DOING THE SAME WORK THROUGH THE SAME ENGINE AT THE PUMPING STATION OF THE PROVIDENCE WATERWORKS, AUGUST 14 AND 22, 1872.

Date.	*Tubular.*		*Miller.*
Elevation of center of engine		23·062	
Mean elevation of water in river	7·993		9·878
" " " inlet chamber	179·420		179·660
Steam pressure in lbs. per square inch	61·75		63·30
Water " " "	70		70
Vacuum, inches	[illegible]		26·5
Temperature of river water Fah	[illegible]		77°
" " hot well "	122°		120°
" " feed water "	131°		128°
" " flue to chimney, Fah.	257°		247°
Weight of a cubic foot of river water, pounds	62·19		62·22
" " feed water, "	61·55		61·57
DUTY BY CORNISH RULE.			
Volume swept through per minute, cubic feet	337·356		433·600
Resistance, lbs. per square foot	10·731		10·758
Work done per minute in foot pounds	3620·157		4662.501
Coal consumed per minute, pounds	9·366		7·667
Work done per 100 lbs. of coal in foot pounds	38652·000		60815·000
" " combustible	46254·000		72757·000
Water evaporated per minute, pounds	78·113		72·174
Work done per lb. of water evaporated, foot pounds	46·345		64·601
DUTY BY WEIR MEASUREMENT.			
Volume swept through per minute, cubic feet	306·002		422·844
Resistance, lbs. per square foot	10·731		10·758
Work done per minute in foot pounds	3283·707		4546.844
Coal consumed per minute	9·366		7·667
Work done per 100 lbs. of coal, foot pounds	35060·000		59,306·700
" " combustible, foot pounds	41955·000		70,952·000
Water evaporated per minute, pounds	78·113		72·174
Work done per lb. of water evaporated, ft. pounds	42·038		62·998
COMPARATIVE RESISTANCES.			
Pressure in pump by indicator, lbs. per square inch		68·25	
Calculated resistance of delivery valves " "		0·56	
Pressure in main by indicator, lbs. per " "		67·70	
Correction for difference of levels		0·69	
Pressure in main, by indicator, corrected by level of gage		67·01	
Pressure in main by gage		70·	
Discrepancy, lbs. per square inch		3·	
Hight of indicator above river, feet		15.819	
Calculated friction in suction main		·046	
Total resistance " "		15·865	
" in lbs per square foot		·987	
Pressure in main by indicator, in lbs. per sq. foot		97·49	
Total resistance in lbs. per square foot		107·36	
Hight of water at inlet chamber above river, feet	171·427		170·782
Calculated friction in mains	1·004		1·907
Resistance in check valve in force main, feet	0·12		0·13
Total head	172·551		172·819
" lbs. per square foot	10731		10758
COMBUSTION AND EVAPORATION.			
Area of grate, square feet	55·00		57.5
Coal consumed per hour per square foot of grate	10·217		8·00
Water evaporated per lb. of coal	8·34		9·41
" " combustible	9·98		11·26
" to and from 212° per lb. of coal	9·25		10·47
" " " combustible	11·07		12·53
CAPACITY.			
Net area of plunger in square feet		2·60965	
Average length of stroke, feet	3·895		3·875
Number of strokes per minute	33·18		42·88
Speed of piston per second	1·077		1·3845
Gallons pumped per 24 hours	3296·000		4554·640

REMARKS BY THE EDITOR.—When we published the letter of Mr. Nagle, we stated in our comments that the combustion which he attributed to the steam pipes was probably due to the presence of oil, either in the wood casing or the felting. Mr. Miller's statement confirms our supposition, and conclusively shows that the case is properly to be classed among examples of spontaneous combustion due to the presence of oil in combustible materials.

We do not think that any of our readers would be apt to regard Mr Nagle's letter as in any sense damaging to Mr. Miller's boiler. If so, any such idea will be removed from their minds on examining the very full and satisfactory report of the boiler trials, which Mr. Miller gives above.

Sulphite of Lime in Cider.

To the Editor of the Scientific American:

Your correspondent, William A. Barnes, on page 4 of the current volume, says that if I will study the chemical effect of sulphite of lime, I will see that it has no disposition to appropriate the oxygen already combined. If I understand the philosophy of breathing, free oxygen is absorbed by the blood in its passage through the lungs, which afterwards, while passing through the capillaries and other blood vessels in all parts of the body, combines chemically with fatty and other combustible matter, producing heat and carbonic acid. Or, in other words, the oxygen absorbed through the lungs supports the combustion that furnishes the animal heat, at the same time burning out from the blood certain waste products which would prove injurious were it not for this means of purification. As most substances, after being digested in the stomach, are carried by the lacteals to the blood vessels, I thought the sulphite might rob the blood of a portion of its free oxygen, but from an experiment that I have since made, I think that it does not do this to any considerable extent, if at all.

So much for theory; now I will give my experience. Last fall, I procured a pound of sulphite of lime in three packets, marked with the name of a well known chemist, and said to contain the proper quantity for one barrel. I treated several gallons of new cider with the quantity of the sulphite indicated by the directions. It did keep the cider from getting sour, but it in a great measure destroyed the flavor of the cider, beside imparting a disagreeable taste of its own. After exposing some of the cider in an open tub for about six weeks, it has nearly lost the taste of sulphite of lime, but has not in my opinion half the flavor that it had when new. The sulphite was marked neutral, and it did not change litmus paper. A mouse, fed on dough made of Graham flour with one part of the sulphite to three or four of flour, died in about thirty-six hours; and on a repetition of this experiment, another mouse died in about the same length of time, while a third mouse in another cage fed on a similarly prepared mixture of *sulphate* of lime remained healthy.

I attempted to test the excrement of one of the mice for starch, to find if the sulphite interfered with digestion, but found that the sulphite would mask any reaction with iodine, even after the addition of boiled starch. And on further experiment, I found that the sulphite would instantly destroy the blue color of iodide of starch. Can you explain this reaction? HENRY A. SPRAGUE.

Charlotte, Maine.

REMARKS BY THE EDITOR.—Where an excess of sulphite of lime is used, some of it dissolves and imparts a disagreeable flavor, and may prove dangerous. If pure sulphite is taken in proper proportions, it prevents fermentation by absorbing free oxygen, and is changed to the sulphate, which settles to the bottom. The blue iodide of starch was bleached by the sulphurous acid of the sulphite; and to prevent this, only minute quantities must be taken. The same reaction takes place when we liberate iodine from iodide of potassium by means of chlorine. The blue color will disappear in an excess of chlorine. The experiments of our correspondent seem to show that sulphite of lime is fatal to lower animals and to indicate the necessity of using no more to keep cider sweet than will be at once converted to sulphate.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes (which give only approximate places), I am indebted to students.

M. M.

Position of Planets for March, 1873.

Mercury.

On the 1st of March Mercury rises at 7 A. M. and sets at 6h. 20m. P. M. On the 31st it rises at 5h. 53m. A. M., and sets at 7h. 12m. P. M.

According to the *American Nautical Almanac*, Mercury has its greatest elongation on the 18th. It souths at that time an hour after noon, and should be visible after sunset.

Venus.

On the 1st Venus rises at 8h. 12m. A. M., and sets at 9h. 48m. P. M. On the 31st it rises at 6h. 57m., and sets at 9h. 57m.

According to the *American Nautical Almanac*, its greatest brilliancy is on the 29th of March.

Mars.

Mars rises on the 1st a little before 11 P. M., and sets at a little after 9 A. M. On the 31st it rises at 9h. 5m. P. M., and sets at 7h. 20m. A. M.

Mars has become more conspicuous from its increasing diameter, and is a very noticeable object in the early morning.

The star *Antares*, which resembles Mars in its reddish light, is well seen at the same time, east of Mars some 24° and south of it (when on the meridian) about 12° on the 1st of March.

Jupiter.

Jupiter rises on the 1st of March at 4h. 16m. P. M., and sets at 6h. 6m. A. M. On the 31st it rises at 2 P. M., and sets at 4 in the morning.

On the evening of February 4th, the fourth satellite of Jupiter was seen to pass across the disk of the planet. Being between the earth and the planet, it seemed to be projected upon the planet, as a grayish brown spot, not quite circular in shape; as it left the planet's disk, it seemed, for more than three minutes, to hang upon the limb.

The third satellite, at about its greatest distance from Jupiter, showed, through the large telescope, a disk irregular in shape and hazy in outline.

The broad central belt of Jupiter was slightly reddish.

Saturn.

Saturn is increasing in apparent size. It rises on the 1st at 4h. 44m. A. M., and sets a little after 3 P. M. On the 31st it rises at about 10m. before 3 A. M., and sets a little after noon.

Uranus.

Uranus rises at 2h. 23m. P. M. on the 1st, and sets about 5 A. M. On the 31st it rises 20 minutes after noon, and sets about 3 A. M.

Neptune.

Neptune rises at 8h. 26m. A. M. on the 1st, and sets at 9h. 23m. P. M. On the 31st it rises at 6h. 30m. A. M., and sets at 7h. 30m. P. M.

Sun Spots.

About February 18, a long chain-like group of spots could be seen on the sun. Although some of them have already passed the center of the disk, the last of the group may be seen for some days.

SCIENTIFIC AND PRACTICAL INFORMATION.

IRON YELLOW AND IRON GREEN PIGMENTS.

It is desirable to have yellow and green pigments free from lead and arsenic, as both of these metals are the occasion of much mischief. An iron yellow, called *siderin yellow*, has been introduced to the trade: it is prepared by adding a saturated solution of bichromate of potash to neutral chloride of iron. A bright yellow precipitate forms, which, after thorough washing, proves to be a basic chromate of iron of a fixed chemical composition. This pigment, known as siderin yellow, can be used as a water color, also with drying oil, and, when combined with soluble glass, makes a fine yellow cement that sets rapidly and is insoluble in water.

If siderin yellow be mixed with ultramarine blue, fine green results, which can be also mixed with soluble glass, and could be substituted for the dangerous arsenic green in many arts. In the preparation of iron yellow, the following are the proportions to be taken: 433 parts of weight of crystallized chloride of iron, in which there are 325 parts anhydrous chloride, require for complete decomposition 1,473 parts bichromate of potash. After mixing and boiling the aqueous solutions of the above salts, 378 parts by weight of basic chromate of iron, siderin yellow, is precipitated. There remain in solution 1,049 parts chloro-chromate of potash and 389 parts yellow chromate of potash.

PROTECTING PETROLEUM FROM FIRE.

Charles A. Jordery of Paris has discovered that a small quantity of soap wort (*saponaria officinalis*) powder produces in combination with petroleum an emulsion of the consistency of lard or, rather, thick glue. This mixture flows with difficulty, and does not infiltrate into the fissures of leaky vessels. When ignited, it burns with a weak flame, easily extinguished and having no resemblance to the fierce deflagration of the light oils in their ordinary state. A small quantity of an aqueous extract of the powder is necessary, to which about thirty times its volume of petroleum is added little by little, and continually stirred. The result is very much the same as mixing salad dressing, the oil gradually thickening until a pasty mass is obtained. In this condition it is suggested that petroleum may be stored for any length of time or transported long distances with little danger from fire.

To regain the oil in its limpid condition it is only necessary to add a few drops of carbolic acid, or a somewhat larger quantity of crystallized acetic acid. The reaction takes place instantly, and in a very short time the petroleum appears pure and clear with all its properties intact floating above the soap wort extract. It is stated that the augmentation of the price of the oil through the use of this process would not exceed one quarter of a cent per quart.

This saponine process for giving to petroleum the consistency of thick gum was patented in the United States May 7, 1872, No. 126,552. The specimen we have seen resembles closely the paste employed by bill posters, and could be transported in ordinary wooden tubs, and would not be likely to take fire unless exposed to great heat; but the cost of treating petroleum on a large scale in this way would put the article on a par with sperm oil or paraffin. In fact, we should think that paraffin candles would be more economical than the patent oil. The whole thing is too much like combining butter with lime, to be subsequently set afloat by sulphuric acid after it reaches the city. Neither process is feasible on a large scale.

USES OF BISULPHIDE OF CARBON.

From a new work of Dr Rudolph Wagner, "*Die Chemische Fabrik-Industrie*," we extract the following: Until 1850. the only technical application of bisulphide of carbon consisted in vulcanizing and dissolving caoutchouc. Since that time, however, this substance has been applied to a good many purposes. 1. For the complete extraction of fat from bones for the preparation of bone black. Ten or twelve per cent of fat can be obtained. 2. For the extraction of oil from seeds and olives; large quantities of olive oil, rape oil, linseed oil, hempseed oil, palm oil, and cotton seed oil are obtained in this manner. 3. For the extraction of sulphur from sulphurous earth (according to Moussu) and of bitumen from bituminous rocks. 4. For separating fat from wool, woolen tissues, and rags from machine shops, by Seyferth's patent. 5. For the extraction of the soluble principles of spices, according to the process of Bonière of Rouen, France. 6. For the manufacture of yellow prussiate of potash according to Gélis, and of sulphocyanide of ammonium for the fabrication of the toys called Pharoah's serpents. 7. For the preparation of the Fenian or liquid fire, a solution of phosphorus in bisulphide of carbon, with which projectiles for rifled guns are filled. 8. In silver plating a small quantity of bisulphide of carbon is added to the silver bath, so that a brilliant deposit may at once be effected. 9. For killing rats, mice, moths, ground worms, and other vermin. 10. As a motor for steam engines; all systems of steam engines, with or without expansion, can be run with bisulphide of carbon, which, as well known, boils at 115° Fah. The construction requires no essential alteration, but, since bisulphide of carbon dissolves fat and oil with ease, water must be used for lubricating.

ENAMELING PUMP CYLINDERS.

Cast iron cylinders can be enameled in the following manner, according to Amtmann: To separate the graphite, they are laid for two or three hours in an acid bath, and then well washed off with water and brushes. A mass, consisting of 34 parts quartz, 15 parts borax, and 2 parts carbonate of soda is then uniformly spread on; the pipes are then heated for ten minutes in a muffle of a semicircular cross section of the width of 36 inches, and 9 feet in length. They are then withdrawn, cooled, and coated uniformly with a glazing composition consisting of 34 parts felspar, 19 parts quartz, 24 parts borax, 16 parts oxide of tin, 4 parts fluor spar, 9 parts carbonate of soda, and 3 parts niter. The mass is prepared by melting the materials together in a crucible and then grinding them in a mill, with the addition of water. After the cylinders have been covered with the glazing, they are heated in a muffle to a white heat for twenty minutes, whereupon they are withdrawn and coated with coal tar before they are quite cold. In practice, they have been subjected to a pressure, and showed no cracks, proving that the combination of the materials was thorough and complete. Attempts to glaze lead pipes have hitherto been unsuccessful.

CAUSTIC SODA.

An important improvement has been effected in the manufacture of caustic soda by the introduction of a blast of air through the melted mass. The caustic soda, as prepared from from soda ash by means of lime, is contaminated with carbonate of soda, cyanides, and sulphur compounds; the latter are particularly deleterious in numerous operations, and much attention has been bestowed upon getting rid of them. Formerly some saltpeter was added to the lye and the sulphide of sodium was oxidized to Glauber salts, which was less objectionable, but the process is expensive and the result not satisfactory. W. Hebig, of Gera, Germany, has modified the operation by blowing air through the fused soda, by which the sulphides are oxidized and the cyanides decomposed. The operation is conducted as follows: The soda lye is evaporated in iron kettles, and a point is reached at which the cyanogen and ammonia compounds are decomposed and graphite swims on the top. Finally the contents of the kettle are heated to redness and melted to a thin liquid; while in this condition, a current of air is passed through. Graphite floats on the top which is sometimes saved but, owing to its crystalline texture, is not adapted to paint or pencils and is often burned up as useless. The air blast is made so strong as to keep the mass in agitation, and is continued until all of the sulphur is oxidized. The operation is then suspended, the air tube is removed, and the soda poured off the sediment and allowed to solidify. A good product is secured in this way more cheaply than by the saltpeter process. The graphite obtained as an incidental product is quite large in some establishments, and is made up into refractory crucibles.

A GOOD OIL TEST.

Inquiries have been made for a good oil test, and all sorts of nostrums of the "magic," "lightning," and other brands are to be found in the market. It is not easy to find a simple test that will prove decisive on all occasions, but an approximation can easily be made. A convenient test to those about a factory or workshop is the nitrate of mercury. To prepare this reagent, dissolve metallic mercury in an excess of nitric acid; after all the mercury is dissolved, evaporate the liquid over a water bath to sirupy consistence and add a little nitric acid, and store in a glass stoppered bottle. The nitrate of mercury must not be permitted to come in contact with the skin or clothes, as it will stain and destroy both. Pure standard samples of oil should be kept on hand for making comparative tests. Take one part of the nitrate of mercury and three parts of oil and pour them into a test tube; protect the thumb with a piece of india rubber, and shake well and notice the appearance of a specimen of pure oil as compared with a sample suspected to contain impurities. We can in this way soon learn by experience how to detect a poor article. After making the observation with the nitrate of mercury alone, add a few drops of oil of vitriol and note the changes. Some persons use watch glasses, into which they put 10 or 15 drops of oil, and test with bisulphide of carbon, oil of vitriol, chloride of zinc, and chloride of tin. The oil test usually sold under a variety of names is the nitrate of mercury prepared as above.

POISONING OF A HORSE BY THE PAINT ON A CRIB.

According to a communication of Professor Bollinger, of Zurich, Switzerland, a hitherto healthy Wallachian horse, of five years age, was subjected to veterinary treatment on account of a slight nasal catarrh. To effect a cure he was fed with boiled barley, which was given him in a painted cast-iron crib. Soon, however, he lost his appetite, became very feverish, and got a violent diarrhœa, which, in spite of all the medicines administered, could not be alleviated; and he died nine days after the feeding in said crib. A post mortem examination showed small discharges of blood into the lungs, a considerable swelling and fatty degeneration of the liver, and catarrhal inflammation of the intestines. No abscesses, however, were found in the latter. In general, the dissection gave the impression that the animal had died from either phosphorus, arsenic or lead. Accordingly a chemical examination of the milt, the liver, and of the contents of stomach and bowels was undertaken, in all of which small quantities of lead were discovered. The oil paint, moreover, yielded sulphate of lead and chromate of lead in abundance. It was of a blackish green color, and adhered to the iron in a loose, lamellar condition. There was no sure indication of arsenic, antimony, zinc or barytes. From the results of the examination, there is no doubt that the animal, being fed with the boiled barley, had taken large quantities of the lead in the oil paint of the crib.

REGENERATION OF BONE BLACK OF SUGAR REFINERIES.

Eisfeldt and Thumb have introduced for this purpose exhaustion with ammonia, in place of the heating process hitherto employed. The animal carbon or bone black is first subjected to fermentation or boiling with soda; and, after being washed, it is placed in an iron cylinder with a perforated bottom, and boiled therein, with ammonia of two per cent, by the introduction of steam. This operation is repeated thrice, each time for an hour, until a sample of the lye, on being evaporated and heated with soda lye, yields no color. The ammoniacal vapors are condensed in the cooling worms and re-conveyed into the treating cylinder. This process is said to cost one third less than the ordinary one. The ammonia dissolves not only the organic substances, but also the gypsum and caustic lime, so that there will be much less muriatic acid required to keep the amount of lime constant. The waste of the carbon is greatly decreased, and much which otherwise would be consumed by combustion is saved.

The Resources of Richmond, Va.

A correspondent, A. S., says that Richmond, whose name, but a few years since, was on every tongue, being made famous by the active part she took in the late bloody struggle, is now an example worthy to be followed by any sister city, and more especially by those who stood by her in days of yore. Here swords have been turned into plowshares, and scarcely had the cannon ceased its deadly firing when the hammer and anvil struck their sweeter notes, and have made Richmond what she is, and have placed her where she is, with but few visible traces of the war.

This grand old city, capital of the State which has produced intellect, unsurpassed in the world, to represent her in Congress and elsewhere, when brains, honesty and virtue were the noblest traits of man, stands, as Rome does, on seven hills; but unlike Rome's ragged crags, her hills are beautiful terrene waves whose slopes are just adequate to afford the most perfect drainage, as the least fall of water cleanses her streets as a swept floor. Her climate is always comparatively mild, and she is noted for her salubrious situation, and many spend much time here seeking the greatest earthly boon, health.

The picturesque river James, whose current rushes madly over the rapids above, along half the length of Richmond, here settles into deep water, affording unlimited and unequalled water power, with a clear course to the sea for the largest vessels. Indeed, Nature seems to have spent some time in nestling here all the requisites for a manufacturing and shipping town, and to-day Richmond presents to the capitalist and mechanic inducements scarcely to be found elsewhere. Already have her manufacturers won for themselves high praise as to the quality and quantity of their wares. And while much capability lies dormant, the day is not far distant when she will laugh at the rivalry of her sister cities. The blaze of the furnace and the clash of the miner's pick are now seen and heard in her great storehouse, the valley of Virginia, where lie inexhaustible supplies of economic minerals: that is to say, of minerals in common use in the mechanic arts. And on January 30, 1873, the Chesapeake and Ohio railroad trains made the first through passage to the Ohio, and will in future transport to Richmond the heretofore untouched supplies of gold from the belt of Louisa, the roofing slates of Albemarle, the kaolin of Augusta, hydraulic cement and marble from Rockbridge, besides iron, limestone, coal of all kinds, granite, marl, copper, fire clay, salt and products of the soil lying along three hundred miles of this road.

Indeed, a new era has just opened upon Richmond. Labor is cheap and plentiful, but capital she much needs, as her merchants, reduced by the war, cannot enter much into the new undertakings which should and will soon adorn her. But let capitalists consider her offers and invest here, where eventually the continent will look for many of its supplies.

Philadelphia Academy of Natural Sciences.

The Academy now possesses more than 6,000 minerals, 700 rocks, 65,000 fossils, 70,000 species of plants, 1,000 species of zoophytes, 2,000 species of crustaceans, 500 species of myriapods and arachnidians, 25,000 species of insects, 20,000 species of shell-bearing molluscs, 2,000 species of fishes, 800 species of reptiles, 21,000 birds, with the nests of 200 and the eggs of 1,500 species, 1,000 mammals, and nearly 900 skeletons and pieces of osteology. Most of the species are presented by four or five specimens, so that, including the archæological and ethnological cabinets, space is required now for the arrangement of not less than 400,000 objects, as well as for the accommodation of a library of more than 22,500 volumes. A new building to cost half a million is now in process of erection.

ASSAYING LEAD ORES.—Previous to reducing the galena or other lead ore to the metallic state, A. Mascazzini converts the lead present in the ore into sulphate, by igniting it in a porcelain crucible with sulphate of ammonia, after which the ore is treated in the usual manner. The flux preferred by the author is that recommended by Plattner, consisting of 13 parts of carbonate of potassa; 10 of dry carbonate of soda; 5 of previously fused borax; and five of well dried starch.