from an overdose of some of the elements contained in meteors. It might be plausibly maintained on evidence drawn from known facts and dates, that occasionally a meteoric system has brought a plague and pestilence with it. The "sweating sickness" even has been associated (though, we admit, not very satisfactorily) with the 33-year returns of great displays of November shooting stars. Without insisting on such hypotheses as these, which scarcely rest on stronger evidence than the notion that the destruction of Sodom and Gomorrah was brought about by an unusually heavy downfall of sodium-laden (that is, salt-laden) meteors, we may content ourselves by pointing out that the labors of eminent chemists have shown that the air is actually loaded at times with precisely such forms of metallic dust as the theories of astronomers respecting meteors would lead us to look for.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

I.—APPLICATION AND PROGRESS OF THE MANUFACTURE.

When we glance over the chemical products that influence to the greatest extent the useful arts of society, we find them among the acids and alkalies; for by the chemical reaction of these compounds, furnished by nature or art, the manufacturing and domestic arts generally obtain a multitude of useful compounds. But of all substances that have made their imprint on the modern progress of the arts, there is no one approaching sulphuric acid in importance, produced as it is from the cheapest materials furnished by nature, and of which there seem to be inexhaustible supplies. Glass making, soap making, bleaching, calico printing, dyeing, etc., are all debtors to sulphuric acid.

It is said that the consumption of sulphuric acid in any country will show, with that of iron, its industrial activity. The low price of the acid is one of its great merits; the ordinary form known as oil of vitriol, being the most concentrated form in ordinary use, is now made in France at a cost of about one and a quarter cent per pound, and in England for a shade less; in this country ill-advised legislation makes a much higher and fluctuating price.

No material change has taken place in the last ten years or more in the manufacture of sulphuric acid. The well-known method of converting sulphur into sulphurous acid, and completing the oxidation of it by the oxygen of the air, aided by one of the oxygen compounds of nitrogen, is still the predominant method; and, in fact, all of this acid that is manufactured, except the small quantity made by distilling copperas, and called Nordhausen acid, is made by this process.

It will not, however, be unprofitable to the readers of this report to enumerate some of the various attempts made in the last twenty years to supplant the present method in lead chambers. Lealand and Deacon, in 1854, suggested the use of chambers made of stone, or earthenware. Simon, in 1860, proposed vulcanized gutta-percha, but on trial this substance was found more destructible than lead. Peter Ward, in 1862, proposed a series of glass sheets to increase the surface and hasten the reaction; that, however, had been used before, and as the formation of sulphuric acid is not dependent on surface action, it is of no advantage. Philips and Kuhlmann, as far back as 1838, proposed the use of heated air, and sulphurous acid passed over spongy platinum, but this has been almost forgotten. Fouché and Lepelletier, in 1850, employed a series of large Woolfe bottles instead of the lead chambers, at Javelle, near Paris, but this has been long since abandoned. Kuhlmann proposed to pass a mixture of sulphide of hydrogen, obtained by proper means from soda waste, through nitric acid in stoneware bottles, but the method was never put in practice. Petrie, in 1860, applied a system of stoneware columns, filled with pebbles, through which currents of nitric acid and sulphurous acid in proper proportions were passed; but this has not been successfully applied. Several years ago Persoz accomplished the oxidation "by passing the sulphurous acid gas through nitric acid, diluted with from four to six volumes of water, and heating to 212° Fah., or through a mixture of nitric acid, or a nitrate with hydrochloric acid. The reaction takes place in a comparatively small vessel of suitable material; the gas arising from the deoxidation of the nitric acid is reconverted into nitrous acid by air and water. Theoretically, it works without a loss of nitric acid; nevertheless the process has never been adopted in practice, possibly from want of suitable material to withstand the combined action of the two strong acids.

II.—SUBSTANCES EMPLOYED IN THE MANUFACTURE OF SULPHURIC ACID.

Sulphur.—There was a most beautiful display of specimens of sulphur from the south of Italy and from Sicily; and these countries furnish all the sulphur that is employed in the arts and in agriculture, except some little that is employed for domestic use in countries producing it, of which notice will be taken a little further on.

While we now obtain the larger proportion of sulphuric acid made in Europe from pyrites, it is very much to be desired that new and abundant supplies of sulphur may be found, for the acid made from this substance directly is purer, and the apparatus required less expensive than when pyrites is used. Besides the sulphur exhibited from Southern Italy and Sicily, there were specimens from Apt, in France, which locality furnishes a poor sulphur mineral. Also in the neighborhood of Constantine, in Algiers, there is native sulphur. In central Italy, near Bologna, there is a vein of sulphur ore about fifteen miles long, but the mineral is not rich, and is necessarily taken from a great depth, sometimes over 800 feet. About 12,000 tuns are produced here annually, which is almost entirely consumed in the neighboring country for diseases of the vine. From the Papal States there were also specimens of sulphur, but the quantity produced there is very small, not exceeding 500 tuns. The Spanish specimens come from Murcia and neighboring localities, where there are some fine mines of sulphur.

Besides the above, there were specimens on exhibition from Galicia, near Cracovy, from Corinthia, in Hungary, from the Grecian island of Milo, from Tripoli, Isthmus of Suez, on the borders of the Red Sea, province of Rio Grande, in the north of Brazil; but, as already stated, it is from Sicily that we obtain the great bulk of sulphur used in the arts. In this island the strata of sulphur extend over a length of about 170 miles, superimposed one on the other to a depth of from three to twenty-five feet and containing about thirty per cent of sulphur. The mines are owned by various influential individuals, who, by restricting the supply and by rude and imperfect mining, keep up the price to the present standard. There have been as many as 1,000 mines opened, but at the present time not more than one half are worked.

The manner of obtaining the sulphur has been frequently described, and was formerly of a crude character. The method now in most frequent use is that of Tucci, the inspector of of mines of Catanisette and Catania. It is by means of a species of furnace called *calarones*, by which very large amounts of the mineral can be operated upon at once. These *calarones* are simply circular furnaces of a conical form, having an inclination of from 20° to 45°, according to the nature of the gangue (which is calcareous or of gypsum), so that the viscous sulphur can descend and run off at the bottom. The walls of the furnace are about one foot thick and ten feet deep, and made of a capacity to hold more than 1,000 cubic yards of the ore; at the bottom of the furnace there is a hole to run off the melted sulphur, being the outlet of a channel coming from the interior of the furnace, which channel is continued for a little distance outside the furnace, and is branched and arched over by laying masses of the mineral so as to form little tunnels leading to a reservoir.

The furnace is charged by putting large lumps in the middle, and then smaller fragments on the outside, and finally covering all over with previously exhausted ore. Around the upper part of furnace are several small chimneys going down a foot or two; by these the furnaces are kindled at the top and air is supplied by percolation from above. One operation requires about twelve or fourteen days. The sulphur which has been collected in the reservoirs is cast into molds. The furnace requires twelve or fourteen days to cool down, when it is cleaned out and recharged; and this operation is repeated so long as the furnace lasts.

There are recent processes of separation proposed by Fangére, and by Emile and Pierre Thomas, depending on heat, but they deserve no special notice.

The most novel method is that of Deiss; namely, to dissolve out the sulphur by sulphuret of carbon, and an apparatus has been erected to extract by his process several tuns of sulphur daily, but practical difficulties still exist and prevent it from becoming a complete success. The quantity of sulphur produced in Sicily has gradually increased from 46,000 tuns in 1832, to 300,000 tuns at this time, worth from $22 to $24 a tun at the port of exportation. This increased consumption of sulphur, in spite of the diminished use of it in the chemical arts (for it will be shown a little further on that pyrites to the amount of 800,000 tuns, representing 250,000 tuns of sulphur, has taken its place), is due to the very large and increasing amount used for preventing diseases of the vine—diseases that have been almost exterminated by its use; but its use is kept up, as it is considered of great importance to give the vineyards an annual treatment of sulphur. If, however, sulphur should fall in price a little below what it is now, it would again come into general use in the manufacture of sulphuric acid.

Sulphur from Soda-Waste.—In the German section were shown the results obtained by the process of M. Mond, a chemist, of Utrecht, by which he extracts sulphur from soda-waste. The soda-waste has ever been a great nuisauce, as well as a great loss in the manufacture of soda by Leblanc's process. It has become so great a nuisance in many of the large factories, that stringent sanitary laws have been passed concerning the disposal of it; and in some places, where it has been scattered over large surfaces, birds have been known to be asphyxiated while flying over it, and to fall to the ground.

A large amount of sulphur is thrown away in this waste, so that for forty or fifty years chemists have endeavored to solve the problem of turning it to some account. The prospects now are that it can be made to yield up much of its sulphur, and the residue to furnish a valuable fertilizing agent, instead of a pestilential nuisance. Some idea may be formed of the abundance of this waste when it is stated that for every tun of alkali manufactured one and a half tuns of dry waste is produced, furnishing the accumulations referred to, that during moist and rainy weather emit sulphureted hydrogen gas, and in solution, poisoning waters of all kinds in the neighborhood.

Besides the process of Mond there are two others brought forward, one by M. Schaffner, and the other by P. W. Hoffman; and seven works exhibit sulphur prepared by one or other of these processes. All the processes are based on the same principle—the conversion of the insoluble sulphide of calcium in the waste into soluble compounds, by bringing it freely in contact with air, in order to oxidize it; lixiviation of the oxidized mass, and precipitation of sulphur in these liquids by a strong acid, as muriatic acid.

(To be continued.)

Reverie is not thought, though many people mistake it for thought. Thought is systematic; reverie is disjointed and fragmentary. Thought is laborious; reverie is the reverse.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Heat from Percussion and Heat from Friction.

Messrs. Editors:—On page 149, current volume, under the head of "Hammering Iron until it is Red Hot," I find the following, which I quote: "It has been asked whether iron could be hammered cold until it became red hot." And it is stated that, as an experiment to prove the affirmative, "when a piece of very tough iron was hammered with a moderately heavy hammer it became hot, but would not scorch a piece of paper. It was then hammered by two men, one of whom used a sledge hammer, but with no better result. Presently another workman took a horseshoe nail, and after hammering for less than two minutes with a light hammer part of the nail was brought to a bright red heat. The blows were light but frequent, and the nail was partly turned at each blow."

Now, is this not in strict accordance with the vibratory theory of heat?

No doubt a great part of the muscular force imparted to the hammer was, in both cases, changed into sonorous vibrations in the material sustaining the shock; this, of course, would produce the sensation of sound instead of heat.

The blows of the heavy hammer did not, directly, produce heat, but as the iron was not sufficiently elastic to recover from so great a compression, it was condensed, which caused a certain part of its latent heat to become sensible, but beyond this nothing was obtained. The light hammer, if at all, condensed the iron very little, and, the blows being "light but frequent," its force was expended in producing the very rapid molecular vibrations necessary in bringing it to the red heat which it acquired.

The human arm is incapable of striking very rapid blows, but if to the periphery of a wheel a series of small hammers be attached so that by the revolution of the wheel they will rapidly and in succession strike on a piece of iron it would probably produce a red heat much sooner than is possible by the hand alone. By greatly reducing the size of the hammers and increasing their number we would nearly approach what would seem to be the best mode of producing the desired result. Now let us look at the file, the saw, and the grindstone, and see if they do not furnish direct proof in support of theory.

What else than percussion would a piece of iron receive if pressed against the teeth of a revolving circular saw? Except the saw be put in too rapid motion the jumping of the iron from one tooth to the next would, in effect, be the same as so many distinct blows.

The same holds in relation to the grindstone. As it revolves hold one end of a nail against it, and it will soon, by leaping from one granule of the stone to another, acquire such an inconceivably rapid molecular vibratory motion as to become red hot. That a piece of iron under these conditions will soon become intensely hot is well known. The coarser the grit of the stone the more apparently is its action analogous to percussion.

These remarks lead us to see the close connection between friction and percussion—the one being insensibly graduated into the other; the difference is only in degree. Who can draw a line of separation? Spectrum.

Havana, N. Y.

The Gerner Boiler.

Messrs. Editors:—Permit us to correct an error in your statement, in your issue of October 9, respecting the amount of heating surface in the small Gerner boiler you tested at Paterson, N. J.

The boiler is 10 feet long, 2 feet front, and 3 feet rear diameter, giving a total heating surface of $83\frac{30}{100}$ square feet, instead of 144, as stated. The results obtained by you being over 15-horse power shows $5\frac{1}{2}$ square feet in these boilers to be sufficient to produce a horse power, and illustrates the efficiency of the heating surface. Kasson & Co.

New York city.

On the Flow of Elastic Fluids.

Messrs. Editors:—On pages 50 and 118, of the current volume of the Scientific American, are articles "On the Flow of Elastic Fluids through Orifices or Pipes." The theory of this subject which appears to be accepted by the writers of these articles, is the old theory, and the only one, so far as I know, that has as yet found its way into treatises on physics. It is, however, a theory which is widely at variance both with sound theoretical philosophy and with the results of experiment. It is, in fact, nothing more than the theory of inelastic and inexpansible fluids applied to those which are elastic and expansible; it being assumed that there is no difference between the two in respect to the law of their flow except what is due to the smaller ratio of weight to pressure in the elastic fluids.

The effect of the expansibility of elastic fluids is such as to take them entirely out of the law which governs the flow of those that are inelastic. It causes the flow into a vacuum in a given time to be only half as great as the old theory calls for; and this, not because the velocity of the flow is less than that theory assigns, but because the density of the flow is only half as great as the theory assumes it to be.

Another curious and important fact which results from the expansibility of a fluid, is that when it flows from one vessel into another containing fluid of less density, the fluid in the receiving vessel has no effect whatever to obstruct or retard the flow, unless its density exceeds half the density of that in the other vessel. In other words, steam at 20 pounds pressure in the cylinder, will discharge itself into the condenser already containing steam, of not exceeding 10 pounds, just as

rapidly as into a perfect vacuum. The bearing of these facts on the question of the proper size for ports and pipes in steam engines will be readily seen.

It appears from the first clause of the article on page 50, that some of the readers of the SCIENTIFIC AMERICAN are seeking information on this subject. I would refer such to the *American Journal of Science*, 2d series, vol. 5, page 78, where they will find the true law of the flow of elastic fluids set forth and mathematically demonstrated, and to vol. 12, page 186 of the same journal, where they will find the same law completely confirmed by experiment.

New Haven, Conn. ELI W. BLAKE.

Business Correspondence.

MESSRS. MUNN & CO.:—I herewith acknowledge the receipt of the official notice allowing a patent for my Can Opener, and I deem it my duty to thank you for your prompt and able management of my case. This is the third patent which you have obtained for me this year.

I have received several circulars from various patent attorneys residing in Washington, who offer their services free of charge until a patent is obtained. But I assure you, gentlemen, that I would sooner pay you your charges in advance, and run the risk of losing the amount along with the first Government fees, than to trust such agents with any business of mine. Therefore I care not whether they are capable or honest so long as I am satisfied with your manner of doing business.

I will cordially recommend your Agency to such of my friends as may need the assistance of patent attorneys.

I am, sirs, very respectfully yours,

WM. M. BLEAKLEY.

Verplanck, N. Y., Sept. 29, 1869.

MESSRS. MUNN & CO.:—I have received the two patents, one on a Bolt Heading the other on a Hook-Bending Machine, which you have obtained for me. Allow me to express my appreciation of the able manner in which my specifications and claims have been prepared, and to thank you for having so speedily obtained favorable decisions from the Patent Office.

Any influence which I can have in this part of the country, I assure you will be in your favor. Truly yours,

D. G. MORRIS.

Catasauqua, Pa., Sept. 16, 1869.

MESSRS. MUNN & CO.:—I received the patent on the 17th and the copies on the 20th.

I am so well satisfied with the manner in which you prosecuted the application to a successful termination that I shall give all such business to you in the future, and will influence any person—needing the services of a trustworthy and intelligent attorney—among my acquaintances, to give their business into your hands. I am truly yours,

LEVI S. IVES.

Pittsburgh, Pa., Sept. 21, 1869.

MESSRS. MUNN & CO.:—We have received our patent, and are highly pleased with the way in which the business has done. The ability which carried it through, and the care bestowed on its preparation, are above praise, and we will gladly intrust to your hands any further business we may have to do. Very truly yours,

J. H. WILDASIN & J. A. PECK.

St. Charles, Iowa, Sept. 24, 1869.

[We are constantly receiving warm commendatory letters like the above, from our many clients. The Patent Soliciting Department of this Office is going on with marked success, and inventors who contemplate taking out patents for their improvements can always avail themselves of our advice and assistance on the most favorable terms.—EDS.

New Cornish Engine.

We learn from the *Press* (Philadelphia) that the Cornish engine just started to work at the Schuylkill Works differs from the ordinary Cornish engines in having the heavy lever beams placed down upon each side of the cylinder, with their bearings resting directly upon the bed-plate and stone foundation, instead of over the cylinder, in the usual manner.

By this plan much greater stability is secured, and expensive alterations and additions, which would have been necessary with the ordinary form of engine, were avoided.

The size of the steam cylinder is 72 inches diameter and ten feet stroke, and the pump plunger is 36 inches diameter and ten feet stroke. The beams weigh about 28,000 pounds each, and the load in the plunger is about 60,000 pounds. This machine is capable of raising 7,500,000 gallons of water per twenty-four hours.

The action of the engine is peculiar. The steam is admitted upon the top of the cylinder, and after the piston has passed through about one-third of its stroke, the steam is cut off, the rest of the stroke being made by the expansion of the steam in the cylinder. The plunger has now been raised to the top of its stroke; a valve is then opened allowing the steam on the top of the piston to pass to the underside of it, thus putting an equal pressure on both sides of it, and allowing the plunger and its weight to fall by its own gravity and thus force the water to the reservoir. It will be seen that this plunger must, therefore, be heavy enough to lift the load of water in the main, and also to overcome the friction of the water in the pump and pipes.

The engine was designed by the Chief Engineer of the Water Department, Frederick Graff. In order to be able to make the contractors for the building of the engine (Messrs. Merrick & Sons) entirely liable, they were intrusted with the design for the details of parts, and are by their contract held responsible for the strength and proportions of these details. The engine is a splendid specimen of massive machinery, and reflects great credit upon Mr. Graff and Messrs. Merrick & Sons. The water is forced into the stand-pipe at the works, and thence through a main 36 inches in diameter and 312 feet long to the reservoir.

The engine is at present worked by the old boilers. The appropriation for the new set of boilers intended for her was delayed more than eight months by the refusal of the Democratic members of Select Council to vote for the loan asked for their erection. They are now in place at the works, and will be put into use in a few weeks.

(For the Scientific American.)

DETERMINATION OF THE AMOUNT OF EXPANSION OF MINERAL OILS.

BY PROF. VANDER WEYDE.

In order to remove all doubts concerning the amount of expansion of petroleum, to prove that it does not expand more than whisky, and less than alcohol and most of the acids and oils, as stated in my communication to the SCIENTIFIC AMERICAN, page 38, current volume—I give here some of the data on which my statement was founded; and will exhibit only a few of a great number of determinations which I have made to settle this question, selecting those which recommend themselves by simplicity, because of the round numbers obtained

First Method by Means of the Specific Gravity Bottle.

A small bottle, with ground-glass stopper, made so as to contain, when entirely full, exactly 50 grammes of pure distilled water at 65° Fah., was filled with heavy kerosene, the product of the last stages of distillation, marking 30° on Baumés hygrometer; it contained at 32° Fah. exactly 44 grammes of the oil. When heated to 212°, a certain quantity of oil did overflow, and after cleaning and cooling [the weight of a hot object cannot accurately be determined on a sensitive balance, because of the air currents generated; this as a hint to young chemists] it was found to contain 41·15 grammes, proving an expansion of 2·85 grammes, or 6·5 per cent of the whole. As, however, the glass of the vessel expands, according to Regnault one 290th of its volume, this fraction of the 44 grammes has to be added for correction; it is nearly 0·15 grammes, which makes the expansion of the oil from 32° to 212° Fah., equal to 2·85 + 0·15, or 3 grammes, which is one 14·7th part of 44 grammes, and an expansion of 6·8 per cent., or 0·068. Other determinations with the same oil gave sometimes 0·069, 0·070, and 0·071.

Common kerosene of 49° Baumé was placed in the specific gravity bottle, and one of the samples gave, at 65°, exactly 40 grammes; heated to 125° it gave, after correction for glass expansion, 1 gramme less, being 0·025 for 60°, consequently 0·075 for 180°. When cooled to 35° it gave a contraction in bulk of 0·048 gramme, or 0·012th part of 40 grammes, corresponding to an expansion of 0·012 for 30°, or 0·072 for 180°. When heated from 120° to 180°, the expansion was found to give a co-efficient of nearly 0·079.

On these facts I founded my statement referred to, that the rate of expansion is less between 32° and 60°, and more at about 180° than the mean expansion, which is 0·076.

Light gasoline of about 90 Baumé was experimented upon, one sample gave for contents of spec. gr. bottle at 30° Fah., 32·43 grammes, and at 60° exactly 32 grammes. This gave an expansion of 0·43 grammes for 30° Fah. of heat, or one 74th part of the whole, which would give for 180° a little more than one twelfth, or 0·083—a rate of expansion only slightly larger than ether and turpentine, equal to most animal oils, but considerably smaller than alcohol, nitric acid, olive, and linseed oil.

In crude petroleum the expansion was found always between 7 and 8 per cent, and in proportion as they were heavy or light, it was nearer to the first or to the second of these numbers.

Second Method by Means of the Hydrometer.

When placing a thermometer and hydrometer in kerosene of 40° Baumé, at 65° Fah. temperature, and heating it to 125°, the hydrometer will sink and indicate 46°; as now 40° Baumé corresponds with a specific gravity of 0·83, and 46° Baumé with 0·819, it indicates an expansion of 0·83—0·819, or 0·021, which is the 40th or 0·025th part of 0·83, this amount for 60° gives 0·075 per 180°, the same as found above.

It will be found, in general, that for every ten degrees increase of the thermometer the hydrometer sinks one degree lower, and *vice versa*. For the lighter oils, a little above nine degrees Fah. will correspond with one degree difference in the hydrometer, and for the heavier oils 10·5° to 11° Fah. of heat will be required to make this difference, but in general ten degrees heat for one degree gravity is near enough for practical purposes; and, in fact, this is so well known that it is depended upon by experts as a necessary correction in determining the quality of different grades of oil. As 50° and 60° Baumé, respectively, correspond with a specific gravity of 0·785 and 0·769, the difference of these last numbers, 0·076, correspond with 18° of Baumé's scale, which, again, correspond with the expansion for 180° heat. Every degree of Baumé's scale corresponds thus with 0·076 divided by 18, or 0·00042, nearly, for the corresponding difference in specific gravity.

Third Method by Means of the Thermometer alone.

When taking a correctly graduated alcoholic thermometer, breaking the top open, heating the bulb so as completely to remove the alcohol, and then filling it with petroleum to such an extent as to make the freezing point of water 32° Fah. on the scale, to correspond with the surface of the petroleum in the tube when cooled to 32°, then placing this thermometer in hot water of 122°, as indicated by another thermometer, then the petroleum thermometer will only indicate about 100° on the scale; as the scale was constructed for the alcohol, its degrees are as much too large for the petroleum degrees as the expansion of alcohol exceeds that of petroleum; in this case it is found that 122—32 or 90 parts of alcohol correspond with 100—32 or 68 parts of petroleum; these numbers—90 and 68—are nearly in the same ratio as 0·100 and 0·076, the numbers expressing the ratio of expansion of alcohol and petroleum—another verification of the statements in the table published on page 38, already referred to.

When we consider the simplicity and reliability of all these methods, by which the rate of this expansion may be determined, and the perfectly accurate manner in which they corroborate one another, it is indeed surprising that M. Deville, before the French Academy, dwells so largely on the "very great expansion in bulk which mineral oils undergo by increase of temperature," and that when "barreled during the cold season it will expand largely with the first appearance of hot weather, and burst the vessels, on the same principle that ice ruptures our hydrants." [See SCIENTIFIC AMERICAN, page 376). That M. Deville does not communicate the ratio of this, according to him, so extraordinary expansion, is not truly scientific, and makes his whole statement unreliable.

I adhere to my opinion expressed before, that the cause of leakage of petroleum barrels by heat, is the elongation of the iron of which the hoops are made, which makes the staves loose; besides this, the staves will contract from the same cause, which increases the leakage; add to this the extreme penetrating power and volatility of the lighter portions, chymogene, gasoline, etc., which is so largely increased by any rise in temperature, and we have a perfectly satisfactory explanation of the increase of danger in hot weather.

Why Coffee is a Stimulant.

The changes which heat effects in the elements contained in the green coffee berry have been little studied; we merely know, from the researches of MM. Baitron and Fremy, on the one hand, and of M. Payen on the other, that the brown bitter substance and the aromatic principle are produced by the decomposition of that part of the coffee bean which is soluble in water, and that a large part of the caffeine disappears during the roasting. It is said that this (caffeine) is carried away with the volatile products generated in the operation.

By roasting coffee in an apparatus which allows of the recovery of all the volatile products, I have ascertained that if caffeine be carried away with the volatile products, it can only be in such small quantity as is not appreciable by weight, and cannot explain the considerable loss which takes place during roasting carefully performed. The loss is experimentally found to equal nearly one-half of the caffeine originally existing in the coffee. I have succeeded in demonstrating that the lost caffeine has been transformed into a volatile base—methylamine, or methylammonia (C_1H_5N), which was discovered by M. Wurtz. The following are the facts which prove the change of caffeine into methylamine during coffee-roasting:

If pure caffeine be submitted to the action of heat, and the vapor be carried through a tube heated to about 300° Cent. (about the heat which is necessary for roasting), and filled with fragments of pumice-stone, which delay the passage of the vaporized matters, only a feeble decomposition occurs; the greater part remains unchanged, and the little that is decomposed gives no characteristic product except cyanogen. This experiment tends to prove that it is not the caffeine which furnishes the volatile alkaloid existing in roasted coffee. But a very different result is obtained if, instead of acting on free caffeine, we experiment on caffeine in analogous circumstances to those in which it exists in green coffee. M. Payen has, in fact, shown that caffeine exists in that berry in the form of the *tannate, i. e.*, a combination of caffeine with a tannin peculiar to coffee. On submitting to the action of heat the tannate of caffeine which has been prepared with tannin of gall-nuts, we obtain, as with green coffee, methylamine: this compound behaves, under the influence of a temperature of about 300° Cent., in a manner similar to the tannate of caffeine first isolated by M. Payen. The whole of the methylamine produced during the roasting of coffee is not found in the solid residue; a certain proportion escapes with the volatile matters. It is easy to extract the alkaloid from roasted coffee by distilling the extract of coffee, made with cold water, with a weak base, such as lime. The addition of this alkali to an infusion of coffee immediately liberates the methylamine, the special ammoniacal odor of which is readily perceptible.—*M. Personne.*

Advertising Made Easy.

At a recent meeting of the "Society of Practical Engineers," one of the Society's M. D.'s read an elaborate paper on water meters, and closed with an eloquent description of a meter which the speaker had himself invented. He believed that he had made the most accurate, the most simple, the most durable, and the cheapest water meter in the world; and he invited for it the closest scrutiny and investigation of all concerned. This apparatus, he said, could be furnished at two dollars apiece.

This is certainly cheap enough; we had no idea that an accurate, simple, durable water meter could be had for so small a sum of money. Besides, we are pleased to notice the liberal conduct of the learned society, in permitting the discoverer to eulogize the merits of the meter in the proceedings of the evening. The Secretary of the Society will please send us its advertising terms.

THE Snorer's Comparion is the name of a newly patented device to be attached to the backs of church pews, forming a comfortable head rest, and enabling the owner to sleep through the dullest sermon with the greatest satisfaction.