Scientific American

NEW YORK, MAY 10, 1851.

Cannel Coal of Virginia.

We have now before us a beautiful specimen of the Cannel Coal of Kanawha, Va., and as our acquaintance with this kind of fuel is not inconsiderable, we have no hesitation in saying we believe it to be equal to any coal of the same kind in the world, and far superior to any other coal whatever for a great number of purposes. Cannel Coal breaks with a dull fracture, but is capable of receiving a polish like marble, and it can be worked with a knife or chisel into any form. We have seen beautiful ornaments made of it, and in a foreign paper, we recently noticed that a sofa had been made by a Scottish miner, for the Great Exhibition, out of this material. But beautiful though this fuel is, with its clean and hard, yet pliable grain, its value consists in its usefulness and superiority, as an article of fuel and a producer of light and heat. No coal can equal it for producing gas, either in quantity or quality, and this is a fact to which we hope some attention will be paid by our gas companies. It is stated to be better than the Cumberland coal of Maryland for raising steam, and is free from any liability to spontaneous combustion. Those bituminous coals which are liable to spontaneous combustion, contain a considerable portion of sulphur; this is the reason why they generate so much heat when packed together, and made wet with water.

If one part of water is added to six parts of strong sulphuric acid in a glass vessel, the liquid will be raised to nearly the boiling point. This generates the carbonic and hydrogen gases in the coal, and a spark will do the rest to set the whole on fire. It is not long since we gave an account of three vessels being burned by the spontaneous combustion of the coals which formed part of their cargoes. It is the absence of sulphur in cannel coal, which makes it so valuable for good gas. We would like to see more of this coal in our city, and hope that we may induce some to use it for domestic purposes. It burns in a grate like a candle, with a fine white flame, and leaves only a few white ashes behind. The coal fields of America are of greater extent than those of all the world beside. We have anthracite, bituminous, and cannel coals in abundance. Our people in New York know what the Liverpool and Pennsylvania coals are—bituminous and anthracite, but few, very few of them know anything about the beautiful cannel coal; not one in a thousand, we believe, has ever seen a sample of it. We trust that what we have said may be the means of bringing it more prominently into public notice.

Anhydrous Steam---"Stame."

It is well known to our readers that Mr. James Frost, engineer, of Brooklyn, has published a pamphlet wherein it is stated—and the method of performing the experiment is illustrated—that when steam is heated apart from water, it is doubled in volume by an addition of 4° of heat. This new property he denominates *stame*. All the chemists and engineers, from Black to Watt, Gay Lussac, and Dalton, assert "it requires 480° to double the volume of steam." It will be observed, if 4° of heat doubles the volume of steam, this is the great discovery of the age. Mr. Frost submitted his pamphlet to the *savans* of Cambridge, Mass., who, through Prof. Horsford, reported against its correctness, and Mr. Frost replied through our columns, as we had published the said report. We have always had a great respect for the statements of Prof. Horsford, as he is exceedingly precise in all he puts forth, but Mr. Frost is also a man of great scientific and practical knowledge. Thus the matter rested for more than a year, although we had many inquiries about "the correctness or incorrectness" of Mr. Frost's experiments.

The only person who seems to have given this subject his profound attention is Dr. Haycraft, of Greenwich, England, who has published his views in the London Mechanics' Magazine, in reply to Mr. Frost's pamphlet, which was also published in that periodical. He speaks with great respect of Mr. Frost's experiments, but he does not coincide with his ideas of the doubling of the volume of steam by an increase of 4°.

Twenty years ago he entertained nearly the same views as Mr. Frost, and had a small steam engine constructed of a 4 inch cylinder, tubular condenser, and steam jacket. The jacket was furnished with steam from a high pressure boiler. On working the engine with common steam, it required 85 revolutions to fill a given measure with condensed steam, but on applying steam of 500 lbs. pressure to the steam jacket, it required 920 revolutions to fill the same measure—a very great saving, as any of our readers will see, for the engine in both cases carried the same weight. From this experiment he was induced to believe that anhydrous steam—the *stame* of Mr. Frost—was ten times more economical than common moist steam. He afterwards had a large engine built with a fire around the cylinder, but the parts soon gave way; however, it confirmed him for a time in his former opinions. It occurred to him, one day, to make a calculation of the actual working of his engine, when he was astonished to find that his *stame* was just about equal to what it should be, supposing it to have the rarity of Watt—1728 times greater than water. On examining this he recollected a remarkable admission of that greatest of engineers, (Watt) that, in his best engines, there was a consumption of steam double of what was required by calculation. To prove whether there was a loss by escape of steam in a well-constructed engine, or a great increase of volume by super-heating it, Dr. Haycraft filled a graduated tube with mercury, closing one end and introducing into a part of it oxygen and hydrogen, in the same proportions in which they form water. These gases he detonated by wires and reduced them to water. The whole was placed in an oil bath, which was gradually heated to 210°, when steam was formed, filling the tube to a marked point. On this a calculation was made, which proved it to be increased in volume about 1728. Having ascertained this point, he began to increase the temperature of the oil to test the theory of Dalton, viz., that it required 480° of extra heat to double the volume of steam. He increased the temperature to 360°, all that his tube could bear, when he found that it made no sensible increase in the volume of steam. This experiment was repeated several times with the same result. This is at variance with Mr. Frost's experiments. He believes that Mr. Frost's tubes were moist on the interior surface, and that this moisture was not taken into account in calculating the quantity of experimental common steam.

Dr. Haycraft believes that the loss in common engines is attributable to a cooling in the interior of the cylinder every stroke of exhaustion; James Watt had a glimpse of this idea himself, when he applied the steam jacket, and according to Mr. Frost the steam engine has even retrograded since Watt's day. The Cornish engine, as it exhausts only every alternate stroke, consequently has less cooling inside, therefore it is easy to account for the great economy of fuel in those engines. Dr. Haycraft recommends a steam jacket to be applied to all locomotives especially.

One great drawback on the effective powers of engines is priming—the carrying up of a great deal of moist particles into the cylinders along with the steam. Dr. Haycraft recommends the strictest attention being paid to contrivances for preventing moisture being carried into the cylinder.

We must say, along with him, that this subject is not weighed with a sufficient estimate of its importance by our engineers, although the fact of its necessity is well known to all. Some locomotives, with the same pressure on the *balance* are 30 per cent. more effective than others. Why? "They shed their water better." Dr. Haycraft and Mr. Frost do not differ about the practical results, they only differ in theory. Mr. Frost believes that steam, subjected to a higher temperature is converted into *stame*. Dr. Haycroft believes that *stame* is only what is known by the name of anhydrous steam (steam free from watery molecules).

In the last number, (April 12th) of the London Mechanics' Magazine, Mr. Frost has a reply to Dr. Haycraft, but it does not touch the main points of this new theory, viz., that 4° of heat doubles the volume of steam and changes it into "stame." We have been informed that Prof. Stevens of the New York University, purchased the patent of Mr. Frost for the principal kingdoms of Europe, and that Mr. Collins purchased part of the English, if not the whole of it, and has stated that the reason why he did not apply Mr. Frost's discovery to his fine new steamers, was not owing to his disbelief in its merits, but because, he said, (as we have been told, but we do not give it as on our own authority), "if it were applied, it would enable small capitalists to compete with large ones in steam navigation." This opinion is contrary to what we would expect, and we are inclined to believe that there must be some mistake about it.

Paving Streets by Torch Light.

Why don't our Street Commissioners get the cobble stone pavements repaired by torch light? Let a section be taken up and completely laid down by morning, and do not let a single stone be touched during the hours between 10 A. M. and 6 P. M. It is confusion confounded in our streets whilst being repaired, (and when are they not) for whole lines of stages, like moving caravans, have to turn abrupt angles, and deploy out of line hundreds of times in one day, all owing to twenty or thirty men digging and driving away at the repairing of some small piece of pavement. The streets never need be obstructed on this account, and thus thousands, by tear and wear, in making long circuits and losing time, would be saved to the citizens every year. It may be said that this would be more expensive to the city. It would not; it would be a great saving, for every mile a carriage is saved in travelling so is there less wear of pavement, and who can doubt but 10,000 vehicles have to travel, every day, more than one mile each out of their direct routes, by obstructions in the repairing of streets. This amounts to the astonishing number of 3,650,000 in a year. If we take the half of this, we have nearly two millions of miles of unnecessary travel, and the time lost is incalculable. Plenty of men can be found who will work at night, if paid fair wages; and we venture to say that they will do more work in the same time, by torch-light, than they can by sun light. Why? because they have to be continually on the look-out for horses prancing up to the flanks of their barricades. Their work is generally hurried and miserably done—it certainly could not be performed worse blindfolded. Let the Common Council try an experiment—a fair experiment, and with perseverance they would soon come to the conclusion that our streets can be kept in better repair, never be obstructed, and city funds will be saved by adopting the plan of paving our streets (for repairs only, we mean,) by torch-light.

Thayer's Bridge.

Mr. George W. Thayer, of Springfield, Mass., called upon us last week, on his way to North Carolina, to erect one of the Bridges which bear his name, with a span of 200 feet, on the line of the Wilmington and Weldon Railroad. Mr. Thayer has put up one of his bridges on the Georgia Railroad, and it gives universal satisfaction to the engineers. We published an illustrated description of Mr. Thayer's bridge on page 190, Vol. 2, Scientific American. Since that period many improvements have been added by the inventor, and it is not too much to say he has built some of the best railroad bridges in our country.

When we take a retrospective view of the inventions which have either been illustrated or noticed in our columns, since the commencement of the Scientific American, it gives us no small satisfaction to know that so many of them are now in successful operation. It is not possible for any man to keep up with the progress of improvements in the arts unless he takes a paper devoted to the propagation and discussion of science and art. There is scarcely a day passes over our heads but we have to refer to the back pages of our paper, to show that such and such a thing has been described by us before. We have, in a number of cases, had to refer to Mr. Thayer's bridge, as embracing the principle of what an inventor considered something new. One man, after he had spent about two years on an improvement in boiler feeders, came on to New York with his model, and after showing it to us, we pointed out its homologue in Vol, 2 of our paper. He declared it would have saved him $400 if he had been a subscriber to it from its origin.

Light Locomotives.

We learn by the "South Boston Gazette" that Mr. Seth Wilmarth, of the Union Works, in that place, has built a locomotive which only weighs eight tons, for the Cumberland Valley Railroad. The boiler is 9 5-12 feet in length, and 2 3-12 feet in diameter. The cylinder is 8½ inches in diameter with a stroke of 14 inches. The heating surface of the fire-box is 13 square feet, the heating surface of the tubes is 190 square feet. There are 64 tubes, each 7 feet in length, and 1¾ inches in diameter. The locomotive and tender form a part of the same frame, the tank being capable of holding 400 gallons, the boiler, 168 gallons. The whole length of the locomotive is 18 feet, which is placed upon a pair of leading wheels 30 inches in diameter, a pair of trail wheels of the same dimensions, and a pair of driving wheels 4½ feet in diameter. It has been used on the Brookline branch of the Worcester Railroad, much to the satisfaction, it is stated, of the engineers, and Mr. Wilmarth has entered into contracts to build two more of the same size. For branch railroads, on which there are but light trains, it is folly to employ heavy engines, but the grand point is to hit the weight suitable for the work to be done. Engineers in America and Europe are now giving this part of engineering great attention, but certainly no more than it deserves.

Electrotyping---Our New Heading.

The heading of the "Scientific American," this week, is a specimen of the progress of science. Hitherto types were either cast or carved, but the "heading" spoken of was performed by the same element as the lightning which cleaves the oak of the forest, and shatters the mast of many a gallant ship. The characters are of copper done by the electrotype process, by Mr. J. W. Wilcox, of Boston, who has been engaged in the business for the last five years, and has perfected the art so that it is no longer an experiment, but one of the "fixed facts" of science. Duplicates of wood-cuts, copper plates, type, &c., are warranted perfect, and copies of wood-cuts print as well as the wood itself, while they last ten times longer than either wood or types. It is a splendid art for the stamps used in cotton factories and bleaching establishments.

This is an art of very extensive application. It is very useful but it requires great skill and practice to be master of it. Those who desire copies of figures in hard enduring metal, Mr. Wilcox is the man to perform the work desired in the very best manner.

Banvard, the American Artist.

John Banvard, the artist, whose Panorama of the Mississippi excited so much attention both at home and in England, is now in the Holy Land. He was wrecked on the Nile by a real African Simoon. He lost his gold watch and all his money, but luckily, he says, his sketch-book and drawings were saved, and this made him forget all the rest. A number of Americans were along with him, and were very kind. The Rev. Dr. Scott, of New Orleans, and Capt. McCallum, of the West Point Military Academy, were very attentive and kind to him, they being one mile ahead and in a place of safety, came to the rescue with great dispatch.

Banvard will bring home some rare specimens of oriental scenery—true to nature in every respect. He paints no imaginary scenes, like Gliddon's Nile, and some other panoramic nonsense.

☞ Reported expressly for the Scientific American, from the Patent Office Records. Patentees will find it for their interest to have their inventions illustrated in the Scientific American, as it has by far a larger circulation than any other journal of its class in America, and is the only source to which the public are accustomed to refer for the latest improvements. No charge is made except for the execution of the engravings, which belong to the patentee after publication.

LIST OF PATENT CLAIMS
Issued from the United States Patent Office.

FOR THE WEEK ENDING APRIL 29, 1851.

To I. L. Cady, of New York, N. Y., for improved compound Metallic Door, for vaults, safes, etc.

I claim a door or wall, for a vault or safe, made by securing to each other, at a certain distance apart, two plates of sheet metal provided with a rim or curb, and filling the vacant space between them with immaleable cast iron, poured in while melted, substantially as described.

To Oliver Etnier, of Shirley Township, Pa., for improvement in Winnowing Machines.

I claim placing the screen in an inclined position above the fan, and extending the whole length of the machine, by which the wheat is thoroughly sifted before being acted on by the blast, in combination with the direction of the blast, at right angles to the screen, as above set forth.

To J. C. Smith, of Stoughstown, Pa., for improvement in Spring Saddles.

I claim the pommel spring, in combination with the seat spring, substantially as set forth.

I also claim the method of suspending the stirrups, by connecting them with the same springs which support the seat, whereby the elevation and depression of the one is simultaneous with the elevation and depression of the other.

To J. G. Goshon, of Shirleysburgh, Pa, & Wm. H. Towers, of Bucyrus, Ohio, for improvement in apparatus for giving ease to the arms in writing.

We claim constructing an arm supporter or rest, so formed and shaped as to fit the arm below the elbow joint, and serve as an elastic or flexible support or rest, on which the arm of the penman is supported and balanced and permitted to move or turn with the motion of the arm, with the utmost freedom and ease to the writer, by which all numbness, contraction of the muscles of the fingers, and crampness or stiffness of the arm, is effectually prevented and the arm rendered free in its movement, and under the complete control of the writer, as described.

To Ira H. Smith, of Wolcott, Conn., for improvement in machinery for making matches.

I claim, first, the mode of feeding in the plates of wood, by means of the feeding apron with its cleats, spring, pulley, and rollers.

Second, the mode of separating and dipping the splints, by means of the grooved cylinder, cutter, endless bands, and revolving wheels.

To R. G. Babcock, of New London, Conn., for improved Horse Shoeing Machine.

I claim, in combination with a rotating travelling draw roller, adjustable pattern, and clamping tool for forming the shoe, the gauge plate for holding up the roller, so as to allow it to return over the shoe thus formed and smooth down the feathered edges raised by the chamfering tool, as described.

To L. W. Boynton, of South Coventry, Conn., for improvement in Bats for felting.

I claim preparing the web for felt fabrics, by the introduction of layers of flock between or upon the layers of wool, without passing the flock through the carding machine, but by preparing it in a separate machine, and introducing it immediately from that machine on to the web of wool, while it is passing from the carding machine, in the manner substantially as described.

And I also claim the combination of the endless apron, which feeds the flock to the cylindrical brushes, with the series of cylindrical brushes by which the flock is taken up from the inner extremity of the endless apron, and, passing through the series, is prepared and sent down through the spout or conductor, and deposited on the web of wool, as before described, when the same is constructed and combined, substantially as described.

To L. L, Gilliland, of Dayton, Ohio, for improvements in Splint Machines.

I claim a cutter wheel, constructed substantially as herein set forth, to split, point, and gauge the size of match splints, in combination with the method of preventing the splitting knives from cutting across the grain of the wood, by supporting the block upon a stock, which is constructed to turn, as herein set forth, to present the grain of the wood, where the splitting knife is acting in line with the plane in which the knives revolve.

To Wm. Mt. Storm, of New York, N. Y., for Flexible Hose or Float, for supporting vessels.

I claim, first, a plan of supporting a vessel, in whole or part, upon or by means of a flexible, movable, endless hose or air-float, or on an endless movable chain of flexible, buoyant compartments, for the purposes set forth.

Second, I claim making my flexible hose air-float, or its equivalent, collapsible, for the purposes herein set forth.

Not limiting myself, in or by these claims, to any particular forms or arrangement of the buoys or floats, &c., so long as the peculiar features of my invention, as described and claimed, are substantially fulfilled.

RE-ISSUES.

To Frank Cheney, of Manchester, Conn., for improvement in machinery for doubling, twisting, and reeling thread. Originally patented Oct. 9, 1847.

I claim the described combination of doubling, twisting, and reeling mechanism, or elements, constructed, applied, and operating together, substantially as herein described, whereby I am able to double, twist, and reel each thread by the same machine, substantially in the manner specified.

DESIGNS.

To Thomas Ball, of Boston, Mass., for Design for Bust of Jenny Lind.

(For the Scientific American.)

Practical Remarks on Illuminating Gas.

[Continued from page 262.]

Having now traced this aeriform fluid through its various and diversified mutable course, from the crude coal to the pure dispenser of light, it may not be improper for me to recapitulate a little and speak of the available products accruing from the destructive distillation of coal. In the first place I would call the reader's attention to the residuum remaining in the retort after the gas has been extracted; this residue is a carbon of dense granular composition, and is called coke. This is the most valuable of the secondary products of a coal gas establishment. It bears the same relation to coal as does charcoal to wood —it is excellent for many purposes, and is extensively used both in the arts and manufactures; for domestic use it is unobjectionable, and may be burnt both in the drawing-room and kitchen with much economy and comfort. Coke has become a very general favorite as a fuel for family use within a few years, wherever it has been introduced; the demand at gas manufactories is constantly increasing, as its merits become better known and its true value appreciated, and the result has been that all coke manufactured finds a ready market at good remunerating prices. The price of coke generally bears a proportion to the cost of the coal from which it is produced; and in some works the price is fixed from time to time, to cover the price of the coal used to make it, and the other residuums considered of no value for sale. As a fuel, where intensity of heat is requisite, coke is unequalled. In the smelting of ores at Silisia, it was found, in one experiment, that 1 measure of coke was equal to 3 measures of charcoal; and in another experiment, that 1 measure of coke equalled in effect 5 measures of charcoal or 3 measures of pit coal.

Coal, although it decreases in weight while undergoing distillation, increases in bulk; 1 measure of coal producing $1\frac{1}{2}$ measures of coke: Pictou coal increases about 20 per cent. in bulk while undergoing decomposition.

Coke is sometimes, though rarely, found in nature. A porous anthracite or natural coke has been discovered in Eastern Virginia, and from its position, it is thought that its presence must be ascribed to the thorough carburization and dessication of the vegetable matter before it was sealed in by the overlaying strata. Coke is then found to be pit coal deprived of its volatile ingredients by charring, whereby it is converted from a solid state into a light spongy mass.

Coke, as soon as manufactured, should be housed or placed under cover in some sheltered position, as owing to its great degree of porosity, it absorbs moisture from the atmosphere, which it becomes necessary to expel before a perfect combustion can be obtained, and which decreases the amount of heat generated; or rather, much of the heat derived from the coke is required to convert the water into steam, and thereby renders it unsuitable for giving the best attainable results.

Another secondary product is Coal Tar:— this is a black oily fluid, much resembling the vegetable tar in appearance, but has a much more pungent odor. This substance may be consumed in the fires under the retorts with advantage; when this is done, it is necessary to introduce a small quantity of water at the same time, as, owing to the excess of carbon contained in the tar, it is necessary to produce a flame, to give it a due proportion of hydrogen, and also a supply of oxygen for its support; and for this purpose water is used, (that containing both of these elements,) and the whole of its heating properties are made available; when this method is judiciously employed, it is capable of giving not only a great amount, but a very intense heat. The quantity required to carbonize one chaldron of coal varies from 24 to 27 gallons; 3 gallons being considered equal in value to one bushel of coke. Coal tar is used when boiled and mixed with oil, as a black varnish, for the protection of iron against oxidation; it possesses a beautiful lustre and serves as an excellent preservative; the most desirable feature in this varnish is, that it can be applied to red hot surfaces without injury, while other varnishes would crack off and lose their lustre. It has also been introduced, when mixed with any silicious substance, as a cement for floors, roofs, walks, &c. It is very desirable, when used as a floor, particularly in store houses where woollen goods are deposited, not only for its great durability, cheapness, and freedom from moisture. but the odor which is naturally attached to the tar, serves as an excellent preservative against moths. As a roof it is very durable, and is impermeable to water; and when employed as walks, is a most excellent substitute for stone or brick, its durability being fully equal to either of these substances, and in point of cheapness, far superior. It is not acted upon injuriously by the frost, as its elasticity allows it to yield without damage. It has been thoroughly tested, and its superior excellence is acknowledged by all who have used it.

Ammoniacal Liquor is another valuable secondary product, which is collected in passing over, upon the surface of the coal tar. It is highly charged with ammonia; 4 oz. of carbonate of ammonia have been produced from one gallon of this liquor. Its odor is exceedingly pungent. This liquor to the agriculturist must be of great value, for it is well known that carbonic acid, water, and ammonia contain the elements which support both animal and vegetable life, and when this is applied it supplies the deficiency of any of these elements, for the want of which his creps would fail, This liquor is also useful for the manufacture of sal ammoniac or chloride of ammonium The ammonia which chrystallizes in the various parts of the apparatus, and may be collected in quantities, as salts of ammonia or carbonate of ammonia may be used in preparing the popular sudorific called spirit of hartshorn.

The refuse lime from the purifiers is also a valuable product, and at some works it is sold at prime cost, as a manure, being considered, from its strong impregnation with ammonia, as being improved in quality for that purpose.

Another material which has been introduced for the manufacture of illuminating gas, is Oil, although to a very limited extent as compared with the use of coal. The oils are divided into two classes, "volatile" and "fixed." The volatile oils are so called because they are evaporable at a low temperature without decomposition, and because in them the odor or fragrance, or, as the old chemists termed it, the essence of the vegetable consists. Oils of this kind are generally obtained from vegetables, and are mainly fluid. The fixed oils are so called because they are incapable of being volatized without decomposition. All animals, except those included in the class of insects, contain oil; in the herbiferous animals it is hard; in the carniverous and in birds it is soft, and in fishes it is liquid. The latter class only will command our attention at the present time, it being the only oil which is used for gas illumination on a large scale. Its principal elements are carbon. hydrogen, and oxygen.

Oil Gas.—When oil is brought to a high temperature it is decomposed into a gaseous mixture, and new combinations are formed, which consist of bi-carburetted hydrogen, carburetted hydrogen, and carbonic acid gases. The two first named are formed by the combination of carbon and hydrogen, in the first instance 4 parts of carbon unite with 4 parts of hydrogen, the atomic formula being H^4+C^4, while in the latter case 2 parts of hydrogen unite with 1 part of carbon, and have a formula H^2+C. The carbonic acid is formed by the combining of 1 measure of carbon and 2 measures of oxygen.

It would appear both inexpedient and superfluous to distil oil for the production of gas, when we consider that oil can be burnt in lamps without further preparation, and that it loses carbon by deposition in the retorts. The oils most commonly used for gas purposes are those whose impurities will not admit of their being burnt in lamps, such as the train oils and the sediment of whale oils, and consist of phocenic acid and oxide of glycerle, which form, by the incipient decomposition of the animal matters, and are the cause of the nauseous odor. The manufacture, therefore, is not so absurd as at first sight it appears, as it is the means of using up such materials for the production of light, as would otherwise be lost. J. B. B.

(To be Continued.)

Mexican Cave.

A correspondent of the N. O. Picayune, in writing a description of an exploration of a mountain called Guieugola, about five leagues from Tehuantepec, gives the following account of the discovery of a cave in its side:—

After much hard climbing, near the top of a spur, we discovered a cave of a small entrance, and descended into it about seventy-five feet. From the top or roof of the cave we found suspended stalactites of limestone, some of which were of enormous size and of a brilliant snow white color. These stalactites, when struck by a hard substance, make a musical sound similar to that of an organ. In one part of the cave is a formation of them which very much resembles an organ, and is capable of producing as many different sounds. An apt musician could make beautiful music upon this natural organ. The general direction of the cave is downward, at an angle of about forty-five degrees. As far as we went there were several large openings or rooms, with a level floor, and passages from one to the other, varying from three to eight feet in diameter. How far it extends we do not know, as we did not explore it to the bottom. It has evidently at some period been inhabited, for we found several pieces of clay ware, one of which was in nearly a perfect state of preservation.

Rapidity of the Nervous Current.

In a paper presented to the French Academy of Sciences, "On the rapidity of the propagation of the nervous agency in the spinal nerves"—Helmholts described at length some experiments of his, from which he concludes that the nervous irritation passed over a space of 50 to 60 millimetres (about two inches) in from 0·0014 to 0·0020 of a second. The experiments were upon frogs. The lower the temperature, the less appears to be the rapidity of the nervous agent.