Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included.......................... $3 20

One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each: additional copies at same proportionate rate. Postage prepaid.

Remit by postal order Address

MUNN & CO., 261 Broadway, corner of Warren street, New York

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 261 Broadway, corner of Warren street, New York

NEW YORK, SATURDAY, MAY 20, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 338,

For the Week ending May 20, 1882.

Price 10 cents. For sale by all newsdealers.

KLINKERFUES' WEATHER COMPASS.

It is well known that the barometer only becomes a guide to forecast the weather when it is taken in combination with the hygrometer. To combine the advantages of both, Professor Klinkerfues, of Goettingen, has devised a new form of instrument, to which he gives the name of "weather compass." Although not without its faults, this instrument, says the *Polytechnisches Notizblatt*, is suitable for ordinary use, and will probably supplant the barometer as a weather glass. It is in fact a kind of barometer resembling Bourdon's aneroid barometer combined with a hair hygrometer, which acts upon the pointer that indicates the atmospheric pressure, so as to increase or diminish its motion according as there is a greater or less amount of moisture in the air. Beside this, the direction of the wind is also taken into account according to the influence which experience has shown that the wind has on the state of the sky, and atmospheric precipitation. For example, observations extending over many years have shown that the change from west to east improves the weather prospects on an average about as much as a rise of 9 millimeters (three-eighths of an inch), or a decrease of 50 per cent in relative moisture. A change from east to west has a correspondingly bad effect.

This new weather glass gives us, in the simplest possible manner, information regarding the weather to be expected in the next 12 to 24 hours, whether a clear or clouded sky, dry or wet weather. But this is the most important thing that we wish to know beforehand, if it is only approximately correct and reliable. Out of 100 forecasts about 90 are correct. This kind of prognosis has the advantage of being local, and therefore is especially valuable to farmers.

The weather compass compensates for the action of the barometer and hygrometer in such a manner that a falling of the barometer with a decrease of relative moisture, or a rise of barometer and with an increase of relative moisture, acts upon the pointer in opposite directions, and if one is proportional to the other, keeps it at rest. The basis for the calculation of the dial of the instrument is the simultaneously observed variations of the barometer and hygrometer and the relations between atmospheric pressure and moisture, namely, 1 millimeter of pressure is equal to 6 per cent of relative moisture. Thus pressure and moisture, direction of the wind, and present weather, become factors in determining the weather, and are rated at their proper worth. On the face of the campass is a small revolving disk, on which is marked east, $\frac{\text{N. E}}{\text{S. E.}}$, $\frac{\text{N. W.}}{\text{S. W.}}$, west, for the direction of the wind. Around the circumference of the larger disk are the words wet, very wet, dry, clear, etc. There is also a pointer or index, which extends inward from the edge of the face. To set the instrument, it is only necessary to turn the two disks so that the pointer will point to the present state of the weather on the weather disk, and to the present direction of the wind on the wind disk. This is evidently necessary, because regard must be had to whether one and the same change will lead to wet or to dry weather. In 10 or 12 hours, if the direction of the wind remains unchanged, the pointer will indicate the coming weather directly. If there is a change in the wind in the meantime, then the outer or weather disk must be turned so that the state of the weather at that time will correspond to the new direction of the wind. This will bring the weather that is to be expected under the pointer. The price of the weather compass in Frankfort is about $12.50.

SUFFOCATION BY COAL GAS.

Cases of poisoning by illuminating gas are sufficiently frequent to make one suppose that greater care would be taken to prevent their recurrence. Not long since a man in this city attempted suicide by means of gas which he inhaled through the mouth, but the timely interference of neighbors prevented its having the intended effect. A few days later a Fall River steamer came to her pier with two of her passengers insensible from the same cause. Coal gas contains from 5 to 9 per cent of carbonic oxide, to which its effects are chiefly due. M. Tourdes says that *pure* coal gas is instantly fatal, but the case of attempted suicide, as well as the rare occurrence of fatal poisoning in gas works, where workmen are sometimes exposed to gusts of undiluted gas, makes this seem at least doubtful. The same authority says that one-eighth of gas will kill a rabbit in five minutes, and one fifteenth in ten to fifteen minutes. In one case that proved fatal Dr. Taylor estimated the quantity at 3 per cent. Even small quantities, which are only perceptible by their odor, cause unpleasant symptoms, headache, and nausea, if inhaled for a long time. Time seems to be an important factor in gas poisoning, for in most cases where persons are exposed to its influence for a few hours they can be resuscitated, but if left a longer time this is not possible.

Carbonic oxide, as already stated, is credited with being the principal factor in gas poisoning, a question that could be quickly settled by the spectroscopic examination of the victim's blood. Two of the large gas works in this city supply us with gas still richer in carbonic oxide, sometimes reaching 25 or 30 per cent. It was expected that this would prove particularly fatal to its users, but accidents have thus far been fortunately few, which may perhaps have been due in part to its vile odor, which serves as a warning.

One of the most convenient safeguards against possible poisoning by gas is to sleep with an open window where fresh air can always enter to dilute it in case of any escape. A person has been known to sleep in safety the entire night in a room where the deadly (?) water gas was escaping from an open cock at full head, the secret of his escape being the open window. Attempts have been made to construct automatic alarms that should report escaping gas, but none of them are so efficient as might be desired, are liable to get out of order, and are not likely to awake the person who is destined to be the victim.

METALLIC CÆSIUM.

For the past thirty years chemists have been anxiously waiting for somebody to isolate the metal cæsium, which, with rubidium, was the first discovery made by the aid of the spectroscope. Bunsen prepared rubidium, as he has so many other metals, by the electrolysis of its salts, but he did not succeed in obtaining cæsium. So great is its affinity for oxygen and the metalloids that it is placed at the positive end of the list, the most electro-positive of all metals. From Liebig's *Annalen* we learn that C. Setterberg has succeeded in preparing metallic cæsium by the electrolysis of a mixture of the fused cyanides of cæsium and barium. It is a silver white metal, very soft and ductile, nearly twice as heavy as water (specific gravity 1·88), and melts at 29·5° C. (85° Fah.), so that it resembles gallium in this point. It takes fire spontaneously in the air, and if thrown upon water burns like potassium and rubidium, to which it is most nearly related. The color of the flame is not stated. If true, this will be the first metal known that takes fire in the air, although all the alkali metals oxidize rapidly.

Ammonia from its Elements.

Numerous methods have been devised to utilize the atmospheric nitrogen for making ammonia. The latest of these is a French process in which metallic zinc is employed to furnish the elements titanic iron to effect their union. Melted zinc falling into water sets free the hydrogen, falling through the air it liberates nitrogen, oxide of zinc being formed in both cases. The nitrogen is passed over titanized spongy iron, and is absorbed by it. When the hydrogen is passed through the retorts containing this spongy iron it will release the nitrogen from the titanium and combine with it to form ammonia. The oxide of zinc is reduced in retorts with carbon, and carbonic oxide is set free, which needs only to be burned in order to convert it into carbonic acid, which is then allowed to combine with the newly-formed ammonia to form a carbonate. Or, platinized pumice or charcoal are substituted for the spongy iron and the gases made to act upon it under 10 to 15 atmospheres of pressure. C. Z.

THE PARASITE OF THE CLAM

BY C. F. GISSLER

We often meet in opening the shells of the "long clam" (*Mya arenaria*) with a whitish, more or less semi-transparent worm, which Professor A. E. Verrill described under the name of malacobdella obesa.

It is about thirty millimeters in length and some thirteen to fourteen millimeters in width. It has a nearly circularly round sucking disk on the under side of its hind or posterior end, resembling, therefore, and is generally taken for a sort of leech. In reality it belongs to the kind of worms called *nemertines*. Its front or anterior end has no sucking disk, as is the case with all kinds of leeches, and its internal structure or organization is also widely differing from that of the leeches.

The under or ventral side of this curious worm is smooth and flat; above the body is slightly convex and transversely wrinkled. Between and on the wrinkles are innumerable very minute spots and rings, looking like openings. Its head or anterior part appears as if cut off and hollowed out to some distance of the body. It moves but very slowly its sides in a peculiar wave-like manner, and occasionally contracts its whole body. Under the microscope we perceive that its whole exterior surface is covered with extremely fine and short hairs or ciliæ, which are seen to move rapidly in certain directions. These fine hairs can only be seen with a compound microscope, and present to the eye a very fine and interesting object; very small pieces cut off from the side of the worm still show the motions of those hairs for some time.

If we place live specimens of the clam parasite into strong alcohol we notice that some of them protrude a small cylindrical organ a little above the mouth on the upper or dorsal side of the animal; this is the proboscis or tusk. Its hinder end is inclosed in a small sac in the body of the worm, into which sac this tusk can be withdrawn. The mouth is situated not in this tusk, but below it on the front or head part of the worm; meandering through the body is the alimentary canal or stomach and intestine. The intestine is convoluted or folded about six or seven times, until it reaches the extreme hind part, terminating in a small orifice or opening on the upper side, just above the sucking disk.

They probably live on the same food the clam lives on; that is, small particles of organic matter, such as the lowest organisms, infusorials, wheel-animalcules, etc., which abound on the bottom of the sea. These clam parasites have no eyes, as do most parasitical animals.

Our parasite occurs in the branchial or gill cavity of the "long clam," and has been found to occur in Massachusetts, Connecticut, New York, and New Jersey. Another different kind, the *Malacobdella mercenaria*, occurs in the "round clam" (*Venus mercenaria*); it is somewhat smaller and narrower, but of the same color and general appearance. Oystermen usually do not throw them away when they find them, as it is positively known that they do no harm whatever in the human body.

Cremation.

BY DR. SAMUEL KNEELAND.

The four principal ways of disposing of the dead have been: First, mummification; second, burning; third, interment; fourth, aerial exposure. Of the first, practiced chiefly by the ancient Egyptians, and of the fourth, by many savage nations, I need say nothing at this time.

In most nations, savage and civilized, from time immemorial, it has been the custom to inter the bodies of the dead in the ground, or to seal them up more or less tightly in tombs. Though these may answer all sanitary purposes, and fulfill all the sacred obligations of the living to the departed, in scattered populations, they are attended with danger, always increasing in populous communities.

This danger has practically been recognized by the fact that cemeteries have generally been placed without the limits of thickly inhabited districts. When persons, dead from infectious diseases, are buried in graves, they leave behind them to the public, as residuary legatees, a fearful amount of danger; and faithfully and impartially is the deadly legacy divided among all dwelling with'n a circle of one thousand to three thousand feet of such graves. Earth will, to a certain extent, deodorize, but cannot destroy or impede the escape of minute poisonous germs.

The danger from this source has never been fully appreciated by the public, entirely ignorant of the process of decomposition, and the products thereof. Of course, the decay of the body committed to the grave depends as to rapidity entirely on the soil and temperature. In the Arctic regions decomposition is imperceptibly slow; in dry, torrid sands desiccation takes the place of putrefaction, and a kind of natural mummification takes place. In low, damp, or wet soils, in temperate zones, decay may be complete in one to one and one-half years, giving off deleterious gases for that length of time, with perhaps the seeds of contagious disease. In dry, high, and airy soils the process is much slower and less dangerous.

What is decomposition of the human body? What are its products? What its dangers?

An English writer has defined the human body, chemically, as 45 pounds of carbon and nitrogen dissolved in 5½ pailfuls of water. Oxygen, though the principle of life, is also the great destroyer; the moment life ceases, our carbon by its agency is converted into carbonic acid, which escapes into the air, or is taken up by the roots of plants, according to the mode of sepulture; our nitrogen combines with some of the hydrogen of decomposition, forming ammonia, which escapes in a similar way; the water which forms about two-thirds of our weight is lost by evaporation. We are resolved, therefore, into gases, and the only dust which remains behind is the four or five pounds of lime salts which constitute our bones and hard parts. Nature provides sufficient animate and inanimate agents for the removal of decaying animal substances in the air, on the ground, or just beneath its surface, and the more speedy in the hot and damp climates where the results of decomposition are the most deleterious, provided man in his folly do not interfere with her processes. Man, by his mode of interring human bodies, contrives to prolong as much as possible the decay of his deceased brethren, thereby increasing to the utmost the possibility of poisoning the air, infecting the earth, and contaminating the water in the neighborhood of living beings. Air and surface burial permit free access to the myriads of minute living creatures whose office it is to convert into their own harmless substance the bodies of dead animals and man.

In the grave of six feet or more in depth light and air are in great measure excluded, and there is no access to the insects from whose eggs emerge the grubs or worms, from whose jaws popular belief expects the rapid and total destruction of the body. The truth is that the devouring worm is a myth, as much without foundation as the "dust" into which we are supposed to be resolved, and the results of decomposition are horrible enough in reality without adding any imaginary sensational accessories.

The modern process of cremation is performed as follows: The crematory at Washington, Pa., is a brick structure one story high, thirty feet long, twenty feet wide, divided into two rooms, a reception room twenty feet square, including walls, and a furnace room twenty feet by ten feet, including walls. Cremation is performed in a fire clay retort, such as is used in the manufacture of illuminating gas, but of a somewhat different shape, heated to a red heat before the body is introduced, which work requires about twenty-four hours. The body is placed in an iron crib made in the shape of a coffin, with small round rods, with feet three or four inches long to keep it up off the bottom of the retort. These feet are inserted into a flat strip of iron two inches wide and a quarter inch thick, turned up at the ends so that the crib with the body will slide into the retort easily. In addition to the ordinary burial garments, the body is covered with a cloth wet with a saturated solution of sulphate of aluminum (common alum), which, even when burned, retains its form, and prevents any part of the corpse from being seen until the bony skeleton begins to crumble down. During the cremation there is no odor or smoke from the consuming body, as the furnace is a self-consumer of smoke and other vaporable matter. The time required to complete the operation is about two hours, but improvements in the process will doubtless shorten the time. A very small portion of the remains is ashes, but the mass is in the form of calcined bones in small fragments, very white, odorless, deprived of animal matter, and may be preserved any length of time without change.

There are four to seven pounds of these remains from various sized adult bodies; they can be placed, for preservation, in a one-gallon druggist's bottle, with large ground stopper, into which a photograph of the deceased, with appropriate record, can be placed before introducing the remains. This bottle can be placed in the *columbarium* of the crematory, kept among the cherished memorials of the family of the deceased, or placed beside other remains previously buried in cemeteries or graveyards.

This building, with its appliances, cost about $1,500. A plainer one, equally efficient, could now, at the reduced cost of labor and materials, be built for $1,000. An impression prevails that this crematory was erected for public accommodation, and that the owner of it follows cremation as a business for fees. This is a mistake. It was built for the use of its present proprietor and friends in the vicinity who concur with him in this reform. No fees have been charged, nor ever will be while in his possession.

A not unimportant item in this process is the great diminution in the expense of funerals. The average expenditure for each body buried is $100, the average cost by cremation is $20; the aggregate saving in the United States, from the adoption of this system would annually amount to millions of dollars. The expense of cremation is less than that of an ordinary burial case.

Cremation certainly is not barbarous, for it never entered, nor could it enter, into the heads of barbarous people. It is not burning; there is no pile of wood or other combustibles, no visible flame, no smoke, no sickening odor; it is a process of great scientific skill, the reduction of the body to ashes by the application of intense heat, 1,000° to 2,000° Fahr., by which it is resolved into its chemical elements at once, and without the flame coming into contact with the body.

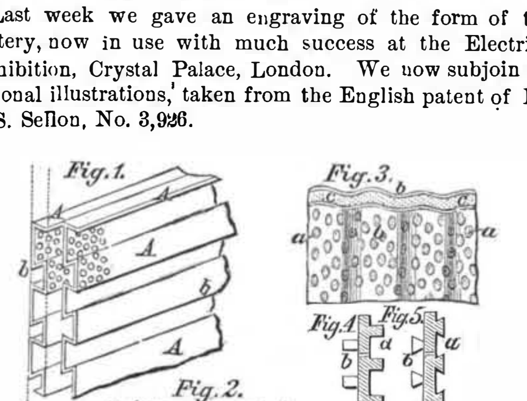
We are all, more or less, carried away by our emotions and sensibilities, especially in the matter of the treatment of the bodies of our dear ones. As rational beings we must not allow our instincts and emotions to run away with our reason, especially in a matter as important as this.

The history of cremation in the United States is very brief, as the progress of such a radical change in long-established customs must, of necessity, be slow. The earliest known instance was of Colonel Henry Laurens, in South Carolina, in 1796. Including that, to the present time not more than eight, or possibly ten, cases have occurred, the last in the current year, and three or four in the crematory at Washington, Pa. Among those who left instructions for the disposal of their remains by cremation was Dr. Charles F. Winslow, of California, a former member of the Society of Arts, whose body was cremated about five years ago, in Salt Lake City, in a temporary furnace erected by his command, by the administrators of his estate. The Washington, Pa., crematory has had nearly one hundred applications, which have been declined, as the trustees do not intend to follow it as a business. They will permit only an occasional cremation there for the purpose of keeping the subject before the public, and of hastening the disappearance of the prejudice which exists against this mode of disposing of the dead. It is believed by them that similar structures will be built at other places, and they will furnish for such laudable purpose any information which their experience enables them to give.

Leaving out of the question, then, all but sanitary reasons, cremation is far preferable to earth burial; and we cannot but think that by degrees this reform will supplant prejudiced superstition, the pomp and profits of undertakers, and give to the living that immunity from many diseases, arising from foul air, impure water, and poisoned earth, which they are entitled to receive from the progress of sanitary science.—*Proc. Soc. Arts, Boston.*

The Sellon Secondary Battery.

Last week we gave an engraving of the form of this battery, now in use with much success at the Electrical Exhibition, Crystal Palace, London. We now subjoin additional illustrations, taken from the English patent of Mr. J. S. Sellon, No. 3,926.



The invention relates to "the use in the construction of secondary batteries of perforated plates or sheets roughened, serrated, or indented, composed of lead, platinum, or carbon, upon, in, or against which plates spongy or finely divided lead, or other salts or compounds of lead, or other suitable substances or compounds are, or may be, held or retained." Fig. 1 represents a perspective view of a perforated battery plate, formed of dovetail section. Fig. 2 shows a section of a perforated plate formed with angular projections or grooves. This plate may be bent into a rectangular or cylindrical form. Fig. 3 shows an irregular section of a compound battery plate formed of two or more plates which may have flat or irregular surfaces. Figs. 4 and 5 illustrate a plate cast with slits and projections, the latter of which are flattened or riveted over during manufacture to cause the retention of the metallic oxide. A A are sheets or plates of lead, platinum, or other material, so formed that a large quantity of spongy or finely divided lead may be retained in or against them in such a manner as to be readily acted upon by the electric current. The plates may be formed of corrugated lead, or of lead cast with holes, *a*, either plain or with flutes, corrugations, indentations, or projections, *b*, in or on which the material, *c*, can be packed. In Fig. 3 the oxides are placed between the sheets, which are riveted or soldered together.

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

HEALD *vs.* RICE.—STRAW-BURNING BOILERS.

Decided March 6, 1882.

In error to the Circuit Court of the United States for the District of California.

This was an action at law brought by Rice to recover damages for an alleged infringement of reissue letters patent No. 6,422, granted May 4, 1875, to him for improvements in steam boilers. The original patent was No. 146,614, dated January 20, 1874. The invention, as stated in the complaint, consisted, among other things, of a combination of a straw-feeding attachment with the furnace door of a return flue steam boiler, for the use of straw alone as fuel in generating steam ample for practically operating steam engines. The case was tried by a jury and resulted in a verdict and judgment for the plaintiff, to reverse which this writ of error is prosecuted.

A bill of exceptions sets out the exceptions of the plaintiff in error to the rulings of the court below and all the evidence. The court was asked at the close of the plaintiff's testimony, and again when all the evidence on both sides had been introduced, to instruct the jury to return a verdict for the defendant, the refusal to do which, among other rulings, is assigned for error, and thus the whole case on the merits is brought here for review so far as they rest upon questions of law.

Mr. Justice Matthews delivered the opinion of the court. The findings in substance were:

1. REISSUE—PATENT WITH DRAWING—NEW MATTER.—In cases of reissues of patents, inoperative or invalid by reason of a defective or insufficient specification, or by reason of the patentee claiming as his own invention or discovery more than he had a right to claim as new, it is imperative that the new patent, when issued, shall be for the same invention, and that no new matter shall be introduced into the specification when, as in the present case, there is a drawing, with reference to which the invention is described.

2. SAME—COMPARISON OF PATENTS—QUESTION FOR COURT.—If it appears from the face of the instruments that extrinsic evidence is not needed to explain terms of art or to apply the descriptions to the subject matter, so that the court is able from mere comparison to say what are the inventions described in each, and to affirm from such mere comparison that they are not the same but different, then the question of identity is one of pure construction and not of evidence, and consequently is matter of law for the court without any auxiliary matter of fact to be passed upon by a jury if the action be at law.

3. SAME—STEAM BOILERS—DIFFERENT INVENTIONS.—In the present case it appears from the mere reading of the two specifications that the invention described in the first is for the return flue boiler, while that described in the second, abandoning the claim for the boiler itself, is for a particular mode of using it with straw as a fuel by means of an attachment to the furnace door for that purpose. These two inventions are distinct, and a patent originally used for one cannot lawfully be surrendered as the basis for the reissue for the other.

4. SAME—EXPANSION OF CLAIM.—The rule reiterated that a patent for a machine cannot be reissued for the purpose of claiming the process of operating that machine, because if the claim for the process is anything more than for the use of the particular machine patented, it is for a different invention. (*Campbell vs. James.*)

5. RICE PATENT ANTICIPATED BY MOREY PATENT.—The invention, moreover, is anticipated in Morey's patent, which, in covering the combination of the feeding tube with any kind of thrashing engine or boiler, necessarily includes the combination of the feeding tube with the return flue boiler. This particular application of the feeding tube to the return flue boiler is within the scope and provision of Morey's invention, whether it had been tested by his experience or was anticipated by his foresight or not.

The "Buffalo Gnat" of the Mississippi Valley.

This dreaded pest has appeared this spring in immense numbers in Eastern Arkansas, Western Tennessee, and Western Mississippi, and the great destruction of cattle, horses, and mules caused by it has added to the distress of the inhabitants of those sections of the country caused by the unprecedented floods. The particular species of *Simulium* in question has not been determined. As a cheap way of protecting animals, Professor Riley recommends to wash them once or twice each day, or oftener, if required, with water which has been left standing for several days over coal tar, or in which a small quantity of oil of tar, or oil of turpentine, or any similar material has been stirred.