

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 or 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 THE SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers 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 be sent to 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, SEPTEMBER 23, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural inventions.....	202	Inventions, miscellaneous.....	202
Alligator industry, the.....	199	Inventions, recent.....	201
American Institute Fair, the.....	192	Inventions, textile.....	202
Balsa of Lambeyagua.....	196	Inventions, electrical.....	202
Boilers, steam improvement in.....	198	Mechanical inventions.....	202
Bone black, manufacturing.....	194	Metallurgical inventions.....	202
British Association, the.....	193	Meteor, fall of a.....	194
Car coupling, improved.....	201	Notes and queries.....	203
Corn crusher, improved.....	194	Paper and pineapple fiber.....	201
Crayons in vibrant colors.....	194	Parasolant, the.....	208
Decisions relating to patents.....	196	Patent decisions, recent.....	196
Disinfectants, true.....	197	Plant life in America.....	194
Drag-sawing machine, Norris.....	201	Pliocene man in Nevada.....	192
Earth's evolution, new view of.....	198	Postage stamp frauds.....	192
Egyptian campaign ended, the.....	192	Railway cheap, a.....	198
Electrical inventions.....	202	Rats, fishing for.....	198
Enbalming.....	192	Rosalia, Nathan.....	192
Engineering inventions.....	202	Roseline color, patent No. 250,247.....	192
Farro, seed, Bloomsdale.....	195	Safe deposit vault, massive.....	192
Fish curing in New York.....	194	Seed farm, Bloomsdale.....	195
Fur seal at sea, the.....	193	Seed industry the.....	191
Geological survey, national.....	197	Showcase for needles, Roeder's.....	201
Greenhouses, heating, steam for.....	192	Smoke, utilization of.....	198
Heliograph experiments with the.....	194	Solar constant.....	201
Hygiene, museum of, national.....	197	Spinning frame, improved.....	192
Industry, seed, the.....	191	Telephone association, National.....	197
Inventions, agricultural.....	202	Telephonic hoax, a.....	192
Inventions, electrical.....	202	Textile inventions.....	202
Inventions, engineering.....	202	Trap, animal, Hamilton's.....	201
Inventions, index of.....	202	Washing machine, improved.....	194
Inventions, mechanical.....	202	Water, boiling, by direct sunlight.....	201
Inventions, metallurgical.....	202	Water jugs, a city of.....	200
		Water, reddening of, natural.....	199

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT, No. 351, For the Week ending September 23, 1882.

Price 10 cents. For sale by all newsdealers.

	PAGE
I. ENGINEERING AND MECHANICS. —The Rolling Stock of the St. Gothard Railway. By R. ABT.....	5582
Ventilation for Ships.—8 figures.—Boyle's system of ventilators for ships.....	5594
New Russian Torpedo Boat.—1 figure.....	5595
The New British Torpedo Ship Ajax.—1 figure.....	5595
Pullman Sewerage. By BENNETT WILLIAMS.—The separate system of sewerage for the new industrial town of Pullman, near Chicago, Ill.—1 figure.—Screening tank and pressure regulating valve.....	5595
Syllwasch's Air Blast for Sweeping Chimneys.—1 figure.....	5597
Dujardin's Continuous Press for Beet Pulp.—2 figures.....	5595
II. TECHNOLOGY AND CHEMISTRY. —The Every-Day Formulæ.—The gelatino-bromide process.—The wet collodion process.—Printing process, etc.....	5602
A New Solar Microscope.—2 figures.....	5602
On the Cause of the Blue Color of Sapphire, Lazulite, and Lapis Lazuli.—The Green of Emerald, and the Purple of Amethyst. By Lieutenant-Colonel W. A. ROSS.....	5604
The Aroma of Beer.....	5605
Method for the Rapid Determination of the Densities of Gases. By C. CLAMOND.—2 figures.....	5605
Absorption of Metallic Oxides by Plants.....	5605
Brilliance and Surface of Luminous Paints.....	5606
III. ELECTRICITY, LIGHT, ETC. —A Practicable Selenium Photometer.....	5600
Partz's System of Electric Lighting by Reflection.—1 figure.....	5600
An Electric Battery of Flames.....	5601
Clamond's Incandescent Gas Lamp.....	5601
On Singing Condensers. By W. HOLTZ.....	5602
Harmony and Application of Natural Laws. By B. T. GIRAUD.....	5602
British Association.—President's address.—Advancement in theoretical and applied science.—Electrical measures.—The Transmission of Energy.—Electric lighting.....	5603
IV. ARCHITECTURE, ART, ETC. —New Country House at Godden Green, Kent.—3 figures.—Garden front.—Entrance front.—Ground plan.....	5598
Ornamental Turning.—1 figure.—Candelabrum in black wood and ivory.....	5598
Suggestions in Decorative Art.—Ornaments etched on arms and utensils.—Bavarian National Museum.—9 figures.....	5599
V. HYGIENE, MEDICINE, ETC. —The Resuscitation of the Drowned.....	5606
The Graphical Method as Applied to the Feet.....	5606
VI. MISCELLANEOUS. —The War in Egypt.—2 figures.—The armored trains on the railway near Alexandria.—Machine guns, etc. An armored train.....	5591
Cairo. By REV. JAS. M. LUDLOW.—1 figure.—The Square of Boumeleh and the Mosque of Sultan Hassan.....	5591

ROSALINE COLOR PATENT, 250,247.

Nothing contained in the report of this case, given in our last number, was intended by us to convey the impression that there was any lack of confidence by the court, or anybody else, in the testimony of Professors Morton, Chandler, and Eudemann. The eminence and exalted character of these gentlemen forbid the harboring of such an idea. Judge Blatchford appears simply to have held that the defendants had not entirely made out their case. We understand that additional proceedings are now going on, from which results may be expected that will wholly change the aspect of the litigation.

THE EGYPTIAN CAMPAIGN ENDED.

The war in Egypt is substantially ended. The British advance from Ismailia, on the Suez Canal, toward Cairo, along the line of the fresh water canal, made an early morning dash upon the Egyptian position at Tel-el-Kebir, September 13, and carried it with a rush.

The resistance was brief. The untrained Egyptians did not preserve the slightest semblance of order, but fled a confused rabble almost as soon as the attack began. The British loss is reported to be nine officers and forty-five men killed; twenty-two officers and three hundred and thirty men wounded. The Egyptian loss was about fifteen hundred killed and wounded.

The British pressed on promptly to the railway center at Zagazig, and thence to Cairo, which was entered on the morning of the 14th. The authorities of the city promptly yielded to the victors. Arabi is reported a prisoner, and, to all appearances, the revolt, which threatened to lead to a serious war, is practically crushed.

A TELEPHONIC HOAX.

Among the regular press dispatches from London, on the day of the bombardment of Alexandria, was one purporting to come from Malta, the cable station nearest the seat of war, stating that the firing of the guns was distinctly heard there by telephone through the cable.

Afterward the report was apparently confirmed by a paragraph in a morning paper stating that the experiments at Malta, by means of which the firing "was heard through 1,000 miles of ocean cable," were conducted by Mr. H. H. Eldred, formerly of Passaic city, New Jersey.

These statements were noticed in our issues of August 5 and 19.

We are now informed by Mr. Cyrus Field Willard, of the London and Globe Telephone and Maintenance Company, of which company Mr. Eldred is managing director, that there is no truth in them.

The author of the hoax was clever enough to make his story plausible by saying that though the cannonading could be heard no oral communication was possible. The fact is well known that there is an unsurmountable, perhaps unsurmountable, obstacle to telephoning speech beyond a quarter of the distance named; but in the absence of actual test, under all the conditions that might be possible during a bombardment like that of Alexandria, no cautious person would hazard the assertion that the novel conditions could not give the result reported. In the absence, too, of any obvious reason for misrepresentation, the report has naturally attained considerable currency.

We take pleasure in relieving Mr. Eldred of any suspicion of complicity with the fraud with which his name has been coupled.

STEAM FOR HEATING GREENHOUSES.

The heating of greenhouses of more than five thousand square feet of glass in the plant by steam, although of comparatively recent adoption among horticulturists, is fast growing in favor for large houses, as favoring a more perfect control in regulating the temperature to the variations of the weather than has been heretofore obtained with the water system. The economy of steam in fuel and boiler attendance has been tested in a number of large greenhouses with satisfaction to their owners, and in some cases claim of large percentage.

The fact of its affording a ready power for pumping water for watering with sprinklers under pressure, and for other purposes, is in itself quite a saving item.

The objection to steam heat on account of its dryness is found to be a myth, for the fact is fully admitted that iron pipe gives out heat and not moisture, whether it be filled with steam or hot water.

The pressure allowed in boilers used for this purpose may be from 3 to 10 pounds per square inch. With pumps now especially constructed for pumping with low pressure steam, no more than 10 pounds per square inch need ever be carried when the pump is in use.

The amount of pipe or radiating surface required in large greenhouses heated with steam varies very little from 1 square foot of heating surface to 6 square feet of glass, where the peak is not more than 12 feet high.

This heating surface should be distributed in lines so as not to overheat any one side or center, and a single line may be carried along the ridge, or peak, to advantage, each line having valves so that a fine adjustment of temperature may be made at all times.

The size of radiating pipe for most perfect circulation under low pressure, for houses 200 feet long, should be 2 inch, and for 100 foot houses, 1½ inch to 1¾ inch. This with large supply pipe will insure a proper return of the

water of condensation to the boiler with the gravity system, where the water surface in the boiler is 3 feet or more below the level of the greenhouse floors. The gravity system is much preferred for its simplicity, but if the situation is such that it cannot be used, the return trap system is practicable and reliable, but requires some care.

The fire, being under the control of a damper regulator, only requires attention at intervals of a few hours. All of the water of condensation being returned to the boiler, the only waste of any importance occurs when the pump is running. This requires the use of a connecting pipe from the force pump to the boiler and its proper attention while the pump is running.

THE AMERICAN INSTITUTE FAIR.

The fifty-first annual exhibition of the American Institute will begin in its building, corner of Third avenue and Sixty-third street, September 27, to continue into December.

To the present writing a large number of entries have been made, and there is abundant promise of a display of more than average value and variety.

The manufacture of pottery will be represented for the first time at one of these fairs. Another novelty will appear in the manufacture of silk, beginning with the reeling of the raw material from cocoons. The light machinery in operation will include, also, machines for making clasps, spiral springs, tacks, wire nails, safety pins, etc. The making of wooden boxes by machinery will be exhibited for the first time.

Among the heavier machinery will be a considerable number of mills for quartz crushing and the separation of ores, an industry which is especially prominent in this year's entries. A number of new steam engines are promised, among them one of special novelty to be used in driving dynamos for electric lighting. The illumination of the building will be effected for the first time by means of incandescent electric lamps, 168 in number, to be supplied by the United States Electric Lighting Company. Other systems of electric lighting will also be shown.

It is to be hoped that intending exhibitors will excel those of previous years in getting their exhibits ready and in place for the opening. Too often, for the first week or two, the value of the exhibition is seriously marred by incompleteness and the disorder attending the installation of tardy exhibits.

POSTAGE STAMP FRAUDS.

In our paper for August 26 last, we gave a resume of the probable modes by which frauds were committed by the use of postal stamps, and we pointed out some of the directions in which improvements might be made with probable advantage.

The principal losses to the government appear to be, in brief, from the following causes:

1. Stamps are not canceled, or are so slightly defaced that they readily pass into second use and escape detection.
2. Canceled stamps are removed from the letters, the canceling ink washed off, the stamps regummed, and sold for reuse.
3. Uncanceled stamps are removed by rogues in the post offices, and old canceled stamps substituted. This probably is the way that a large loss is occasioned.

It would seem that the inventor who can make a really serviceable postage stamp that can be readily applied to an envelope, but which cannot be removed without the total obliteration of the stamp, will have produced a valuable improvement. By a serviceable postage stamp is meant one that will bear reasonable handling without injury, that has no poisonous qualities, that is easily applied, and, as just stated, that cannot be removed intact after it is once put on the letter.

PLIOCENE MAN IN NEVADA.

The frequent occurrence of wrought stone implements with remains of extinct animals in the gold gravels of California and elsewhere on the Pacific coast, has satisfied all who have critically studied the evidence so afforded that the advent of man in those parts must have been before the close of the latest division of the Tertiary period. There is, therefore, nothing startling in the discovery of foot prints, apparently of men wearing sandals, in Pliocene sandstone in Nevada; yet we may be sure that the deductions of the California scientists who have investigated the matter will not be suffered to go unchallenged.

The scene of the discovery is a quarry in the yard of the Nevada State prison, near Carson. The prison is situated in a valley three miles from the base of the Sierras, the site having been chosen on account of a ridge of sandstone there, in the quarrying of which the labor of convicts could be utilized. The prison was established about twenty years ago. In the process of quarrying from fifteen to thirty feet of rock has been removed from a space of an acre and three-quarters. The layers of sandstone alternate with seams of clay, and at the level of the tracks the rock appears to be the consolidated mud of an ancient lake or pond, which had been afterward buried under many feet of sand deposits.

As described by Dr. H. W. Harkness, who was sent by the California Academy of Sciences to study and report upon these supposed traces of ancient man—perhaps the earliest hunting party on record—there are six separate series of tracks of men with sandals or other foot gear, with from eight to seventeen footprints in each series, besides

numerous other tracks of birds and animals, including the mammoth, deer, wolves, and possibly a horse.

The first series of sandal tracks seems to have been made in a layer of mud perhaps two inches deep. It consists of twelve tracks, to which four were subsequently added by tunneling into the rock, about fifteen feet of rock overlying the continuation of this ancient trail. In his report to the academy Dr. Harkness says:

"In each instance the mud had been raised by the pressure of the foot into a ridge which entirely surrounded it. This mud is only partially solidified, and is still flaky and easily broken on exposure. Each of the imprints furnishes us with evidence, as we believe, that the feet of the one making the tracks were protected by sandals. In no single impression, perhaps, do we find conclusive evidence of this fact, but when we study them as a whole we find that that which is wanting in one is furnished by others which follow. In nearly all the toe portion of the sandal is well shown, it being as smooth as the work of a mason for the distance of two or three inches. Backward from the toe we generally find the impression of the outer portion of the sandal. When studied as a whole we can determine with a good deal of exactness the actual length and breadth of the sandal, which we find to be nineteen inches in length, eight inches at the ball of the foot, while the heel is six inches in breadth. In its outline the impression follows clearly the shape of the human foot. From the great toe outward there is a really graceful curve, which draws in toward the heel; while from the great toe inward the line is drawn toward the instep and thence in an outward curve to the heel. In one series this curve is deeper, showing a slightly different form of sandal. The average length of the stride is two feet three inches. The distance between the feet or the straddle is eighteen inches. In all these tracks the toes are turned well outward."

Near the series of tracks described are eight other tracks which are attributed to the mammoth. The foot is twenty-one inches in diameter, only the general outline being preserved; also many tracks of wading birds, not differing materially from those of modern herons and the like.

Several quite distinct tracks of deer are also to be seen. Others, again, were found which in size and length of stride much resembled those of a wolf. At one point these tracks may be traced for a distance of twenty feet, where they also are lost in the ledge. There are also a few poorly defined imprints of what Dr. Harkness believes to be a horse. Near the western limit were clear indications of animals having wallowed and lain in the soft mud.

Touching the great size of the tracks attributed to man, Dr. Harkness supposes that the feet were protected by sandals of wood. It may be that foot-gear of exceptional size was used in hunting on soft and muddy grounds. The stride is that of a man of average height, and the straddling gait a natural one in walking over soft and slippery places.

It is proper to add that Professor Le Conte, of the California University, is not entirely satisfied that the supposed sandal tracks are human footprints. Their great size staggers him, though the peculiar outline of the human foot is distinct. Since Dr. Harkness and Professor Le Conte were at the prison, Warden Garrard has developed three more series of footprints apparently made by men.

One series of more than a dozen prints was uncovered by means of a stream of water turned on the floor of the quarry next to the ledge where the rocks are about thirty feet high. These tracks lead into the cliff, and appear to have been made by a man who was dragging a heavy load after him through the mud. The tracks are all turned sidewise, as they would be under such conditions.

THE BRITISH ASSOCIATION.

The fifty-second meeting of the British Association for the Advancement of Science began at Southampton, August 23. After mentioning the losses which the association had sustained in the death of its distinguished member, Charles Darwin, and that of its Secretary, Professor F. M. Balfour, whose promising career was recently cut short by accident in the Alps, the President of the Association, Dr. C. W. Siemens, proceeded to give the usual review of recent scientific progress and its conditions, dwelling, at first, especially upon the interdependence of theoretical and practical science.

Speaking of the facilities which the railway systems afford for the holding of scientific meetings among men, and of the extraordinary development of scientific journalism, he remarked that however much the means of acquiring scientific information have increased, the necessities for scientific inquiry have increased in a greater ratio. The time was when science was cultivated only by the few, who looked upon its application to the arts and manufactures as almost beneath their notice. That was left to others, who cared little for the pursuit of science for its own sake, but merely sought to turn scientific discoveries to practical account.

Progress could not be rapid under this condition of things, because the man of pure science rarely pursued his inquiry beyond the mere enunciation of a physical or chemical principle, while the simple practitioner was at a loss how to harmonize the new knowledge with the stock of information which formed his mental capital in trade. Under the new order of scientific and practical development the purely scientific man has become more inclined to consider the utility of his discoveries, while the practical man has become scientific, often taking the lead in scientific discovery. The application of chemistry to dyeing amply illustrates this change. So too does telegraphy and the new arts of

applying electricity to lighting, to the transmission of power, and to metallurgical operations, in which the practical man is beset at every turn with problems requiring for their solution not only an intimate acquaintance with, but often a positive advance upon, electrical science as established by purely theoretical research in the laboratory. Equally is this interdependence of theoretical and practical science the rule in the advancement of constructive engineering.

"It is to the man of science, who also gives attention to practical questions, and to the practitioner who devotes part of his time to the prosecution of strictly scientific investigations, that we owe the rapid progress of the present day, both merging more and more into one class, that of pioneers in the domain of nature. It is such men that Archimedes must have desired when he refused to teach his disciples the art of constructing his powerful ballistic engines, exhorting them to give their attention to the principles involved in their construction; and that Telford, the founder of the Institution of Civil Engineers, must have had in his mind's eye, when he defined civil engineering as 'the art of directing the great sources of power in nature.'"

The principal subjects discussed at the meetings of the Association are becoming more and more general in their scope, and many of them of international character; such as the systematic collection of magnetic, astronomical, meteorological, and geodetic observations; the formation of a universal code for signaling at sea, and for distinguishing lighthouses, and especially the settlement of scientific nomenclature and units of measurement, regarding all of which an international accord is a matter of the utmost practical importance.

The subjects which Dr. Siemens discussed at greatest length were those of which he has done so much to further the development—both practically and scientifically—namely, electrical measures and measurements, the transmission of energy, the application of electricity to horticulture, electric railways, electric lighting, and so on.

A full report of this instructive and suggestive address will be found in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.

A Massive Safe Deposit Vault.

The safe deposit vault for the Nassau Bank, corner of Beekman and Nassau streets, is said to be the largest steel vault ever constructed. It is made of welded chrome steel, iron, and Franklinite, and is, to all appearances, thoroughly fire and burglar proof. Entrance to the vault is effected through the bank proper. A staircase of marble and iron leads down into a well lighted and ventilated basement, about 12 feet high. The floor is paved with tile mosaics and marble. The vault, which is 35 feet long, 22 feet wide, and 9 feet high, is built clear of the walls of the building, and rests upon a thick foundation of concrete and granite. The sides, bottom, and top of the structure are very thick, and comprise inner and outer walls of welded iron, chrome steel, and Franklinite, between which is a solid layer of fireproof cement, 9 inches thick. There are two massive iron doors at each end of the vault, and the outer ones are the largest single doors ever made for this purpose. The doors are built of the same material used in the construction of the vault. The inner doors are about 6 inches thick and the outer are of the same thickness, but larger and hung on central hinges. Their locks are double dial time locks of the very best make. It will require two persons to get into the vault, for one will have the combination of the inner doors and the other the combination of the outer doors. Outside of the heavy steel doors are electric burglar alarm doors, which cannot be tampered with without sounding a loud alarm. There are now nearly 1,400 safes in the vault, but that number is to be increased to 4,000. These safes are 24 inches deep, of various sizes, and are made of half-inch chrome steel. The door of each is provided with a double key lock, and some of them have combination locks. No customer can unlock his own without the help of the attendant, who has a key with which he sets each lock. Neither the customer nor the attendant can get in singly. The vault is lighted by the electric light.

The Fur Seal at Sea.

On the voyage to Sydney two fur seals were seen about the ship. They were of a smaller species than that occurring at Kerguelen's Land. They swam alongside with remarkable ease and rapidity, having in the water just the appearance of porpoises.

The hind limbs were stretched out straight behind as the animals swam, and the motion mostly maintained by rapid strokes of the fore limbs. The tail, however, *i. e.*, the fin-like expanse formed by the closely applied and outstretched flat hind flippers, was used with an undulating movement, just as is the tail fin in porpoises.

The seals swam with ease and rapidity from the stern to the bows of the vessel, though it was going $4\frac{1}{2}$ knots at the time, thus going 9 knots at least. In fact, they swam with all the ease of a porpoise, and as once or twice they threw their heads and backs out of the water in a forward leap I should certainly have mistaken them for these animals had I not seen them almost at rest several times, and with their heads well out of water.

I never before realized the close connection between the seals and whales, and how easily a whale might be developed out of a seal. The fur seal is one which, on land, still bends its hind limbs forward, as do land mammals.

The seals without external ears, like the sea elephants, carry them habitually stretched out behind, as this one does in swimming.

Little modification would be necessary in order to turn the otherwise useless hind limbs of the earless seals into the whale's broad tail fin, which probably represents the remains of the seal's webbed hind flippers.

We afterward, in the Straits of Magellan, became familiar with the motions of fur seals in the water, and frequently saw them there in shoals, progressing through the water by a series of leaps exactly like porpoises or rock-hopper penquins.—*Challenger Notes—Mosely.*

A New View of the Earth's Evolution.

The assumption that the earth was at one time in a fluid condition, as held by Laplace and by many astronomers and geologists, was disputed with a suggestive array of evidence by Dr. Houghton, of Dublin, before the Science Association at Montreal.

Following are some of his reasons for doubting the fluidity of the earth or any other planet at any stage of its evolution:

1. The possibility of the equilibrium of the rings of Saturn, on the supposition that they are either solid or liquid, has been more than doubted, and the most probable hypothesis concerning them is that they consist of swarms of discrete meteoric stones, discrete meaning that they are separate from each other in space.

2. It is difficult to understand the low specific gravity of Jupiter and the other planets on the supposition that they are either solid or liquid, for we know of no substance light enough to form them. If the outer planets consist of discrete meteoric stones moving around a solid or liquid nucleus, the difficulty respecting the specific gravity would disappear.

3. The recent researches connecting the periodic showers of shooting stars with comets tend in the direction of showing that comets in cooling break up into discrete solid particles, and that probably the solar nebula cooled in like manner into separate fiery tears, which soon modified by radiation into the cold of space.

Mr. Huggins's recent comparisons of the spectroscopic appearances of comets and incandescent portions of meteoric stone shows the presence in both of hydrogen and nitrogen compounds, confirming the conclusions drawn from the identity of the path of comets and meteoric shooting stars.

From all these and other considerations it is allowable to suppose that the earth and moon, when they separated from the solar nebula, did so in the form of solid meteoric stones, each of them having the temperature of interstellar space—that is, something not much warmer than 460° Fahrenheit below the freezing point of water.

Enameling Cast Iron Pipes and Castings.

A recently invented process is as follows. There are various receipts for the enamel, depending on the purpose for which it is applied. One for water pipes is as follows: twenty-eight parts by weight of silica, eleven calcined carbonate of soda, and six carbonate of lime. Another is: thirty-four silica, eleven carbonate of soda, twelve chalk, and eleven dried pipe clay, to which boracic acid or lead oxide can be added when a more vitreous enamel is required. The core forming the inner surface of the pipe—and if desirable, the mould too—is coated with blacklead, smoothed, and the enamel as a powder, paste, or pigment, applied to the thickness required. The molten iron causes the enamel to soften and firmly adhere to the iron. If it is not necessary that the enamel should not be smooth, the blacklead is omitted.

The enameled pipes are much appreciated in Bohemia; the Municipal Council of Egar have passed a resolution to use no other kind. The enameled pipes are now being manufactured in several works in Germany and Austria.

Fishing for Rats.

A novel mode of catching rats is thus described in the *American Angler*. The writer says that a person having the patience of most fishermen can have much sport in hooking the vermin.

The warehouse adjoining his place of business is infested by these "file-tails," and our friend may be seen in the early spring, and late fall, on an occasional evening just after dusk, seated at the back window of his counting room (overlooking the yard of the warehouse), with an ordinary rod in hand, strong linen line, and a spring hook, commonly called a "sockdologer," baited with a lump of fresh beef, patiently waiting for a bite. It does not tarry long nor does it consume itself in nibbles, but with a hungry snap the bait is seized and the hooks of the sockdologer impales the rat, when the excitement commences.

A lusty rat is no mean antagonist at the end of a pliant pole and ten feet of line, and his plunges, twistings, and straight-away dashes are more perplexing to the angler, than the leaps, surges, and sulkings of the gamy trout or bass. The rat is generally landed, after seasonable sport, and killed by a blow from a bludgeon.

In this connection we may state that thousands of small hooks are bought by sugar refiners for ratting purposes. The hooks are baited with small pieces of beef on each, and then distributed about the building. The rats swallow beef and hook—the first is digested, the latter is not—death of course results. The remedy is said to be infallible.