

Scientific American

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Our New Volume.

The next year will be unusually attractive and interesting to the readers of the Scientific American. The great Exhibition to be held in New York, in 1853, will enable us to illustrate an extraordinary number of new machines, and as a standard work for binding at the year's end, the present, being the commencement of a new volume, forms a good opportunity for engineers, mechanics, millwrights, farmers, manufacturers, and all lovers of science and art, to become subscribers.

The New Safety Steamboat Law.

The new law passed by the late Congress for the better protection of life and property in vessels propelled in whole or part by steam, is very comprehensive, and if its provisions be faithfully carried out, travelling by steamboat will be exceedingly safe. But here is where the difficulty lies; we may make as many laws and penal statutes as would build a pile high as Mount Blanc, and yet they may all be no better for the protection of life and limb than "the baseless fabric of a vision." The safeguards for the protection of life on board of vessels propelled by steam are not good laws merely, but good laws faithfully executed. Here we have a good law, but will it be faithfully executed? that is the important question. The responsibility of its execution will rest with the inspectors of the various districts; they have supreme authority—almost boundless—to carry out its requirements and enforce its demands.

No register, license, nor enrollment, shall be granted to any steamboat, unless it first shall give satisfactory evidence that all the provisions of this law have been complied with, and those who are to see to it, that the provisions of this law must be complied with, are the inspectors. In every district there is to be a supervising inspector, and along with him, there are to be a sociated the collector, or other chief officer of customs, and the judge of the district court of the United States, who, for the district in each of the following collection of districts, namely, New Orleans and St. Louis, on the Mississippi river; Louisville, Cincinnati, Wheeling, and Pittsburgh, on the Ohio river; Buffalo and Cleveland, on Lake Erie; Detroit, upon Detroit river; Nashville, upon the Cumberland river; Chicago, on Lake Michigan; Oswego, on Lake Ontario; Burlington, in Vermont; Galveston, in Texas; and Mobile, in Alabama; Savannah, in Georgia; Charleston, in South Carolina; Norfolk, in Virginia; Baltimore, in Maryland; Philadelphia in Pennsylvania; New York, in New York; New London in Connecticut; Providence, in Rhode Island; Boston, in Massachusetts; Portland, in Maine; and San Francisco, in California, shall designate two inspectors of good character and suitable qualifications to perform the services required of them by this act, within the respective districts for which they shall be appointed—one of whom, from his practical knowledge of ship-building, and the uses of steam in navigation, shall be fully competent to make a reliable estimate of the strength, sea-worthiness, and other qualities of the hulls of steamers and their equipment, deemed essential to safety of life, when such vessels are employed in the carriage of passengers, to be called the Inspector of Hulls; the other of whom, from his knowledge and experience of the duties of an engineer employed in navigating vessels by steam, and also in the use of boilers, and the machinery and appurtenances therewith connected, shall be able to form a reliable opinion of the quality of the material, the strength, form, workmanship, and suitability of such boilers and machinery to be employed in the carriage of passengers, without hazard to life from imperfections in the material, workmanship, or arrangement of any part of such apparatus for steaming, to be called the Inspector of Boilers; and these two persons, thus designated, if approved by the Secretary of the Treasury, shall be from the time of designation, inspec-

tors, empowered and required to perform all the duties required by the law. Every steamboat is required to have the spaces surrounding the boilers safe from ignition; the boilers are to be tested by hydraulic pressure, at least once per annum; each boat must have some kind of life-preserver for each passenger; metallic life-boats must also be provided.—Vessels, according to their tonnage, must have from one to three force pumps on deck for the extinguishment of fires, and there must be a good supply of buckets. Every engineer must be examined by the inspectors and get a certificate of qualification before he can be employed to take charge of an engine,—and the safeguards for carrying only a certain amount of steam, and to have good gauges, are full and complete, but, at the same time, as we have said in substance before, this law will be a mere incubus upon the statute book if good inspectors are not appointed. Those inspectors should be men of good qualifications respecting skill and knowledge, and high above all, stern integrity—the energy and iron will to do their duty.

We do not publish the whole law, as it is very long and contains no less than 44 sections. The inspectors are to be provided by the Secretary of the Treasury with a suitable number of uniform instruments to test the strength of boilers, there will therefore be no excuse for any inspector who may suffer a steamboat to run in his district with a defective boiler. We have heretofore had United States Inspectors of boilers, but they were of very little use. Steamboat companies were well acquainted with the way of removing a conscientious man who stood in their way; we hope, for the sake of humanity and the honor of our country, that the inspectors appointed under this new law will be as sacred men, performing their duties in a sacred manner.

Scientific and Mechanical Institutes.

We have received a communication from a highly respected subscriber and correspondent, in New Orleans, about such an Institution as the "Ecole Centrale," at Paris, where young men are educated in the theory and practice of engineering, manufacturing, and general machinery; he says, if he cannot get his sons instructed at home, in their own land, as he desires them to be, he must send them to France. He requests us to call the attention of our people to this subject. He has no desire to send them to a workshop or foundry, to learn an apprenticeship, as they would not be under the same general admonition and instruction as if under tutors.

It would be a good thing for our country if some complete school of this kind were instituted; at present there is not one, so far as our information extends. The School or Institute should have all kinds of tools and various machines, and students should be instructed how to use the tools—how to make various machines, and thoroughly instructed in the whole theory, while they are learning the practical part. The Lawrence Scientific School, we believe, was intended to embrace such kinds of instruction, but we are not aware of such views having ever been carried out. A new Chair of Civil Engineering, under Prof. Norton, has been established at Yale College; this is a judicious and wise movement in the Yaleites, it shows they are awake to the improvements of the age.

"The Peoples' College,"—that institution which our mechanics are endeavoring to get established under the patronage of the State, is intended to embrace the very system of instruction about which our correspondent has written. We hope the subject will be taken up with a hearty good will by our next Legislature.

A Claimant for the American Reaper.

The Edinburgh Review states that the Rev. Patrick Bell, a Scottish Presbyterian minister of Carmyllie, in Farsfashire, constructed a reaping machine with wheels and scissor blades, in 1825, and that his brother, a farmer, improved it, and cut down his crops with it for a number of years. He got a prize of £50 from the National Society, a number of years ago, and in 1834, several of them were in operation in Scotland. A number of such machines it asserts, were taken to or made in America by emigrants, who saw Mr. Bell's and the one of McCormick and Hussey

were but re-productions; and while they were astonishing the people of England, at the Great Exhibition, the old machine of Mr. Bell was quietly cutting down its yearly harvest in the case of Gourie, in Scotland. We cannot contradict these statements, except so far as it relates to the borrowing of the ideas of Mr. Bell, by Americans. Let us have names and dates for these statements; it is said that some of Mr. Bell's machines were sent to America twenty years ago; if this is true, the names of those who brought them here, or to whom they were sent, can surely be given. Let them be produced, and this will settle the question. It seems culpably strange that there should be a good reaping machine working away in Scotland, and yet the people of England know nothing about it,—nay, that the first knowledge of such machines being in existence, was derived from the sweepingly successful experiments of machines brought from America to the Great Exhibition. The American exhibitors of these machines certainly knew nothing about Mr. Bell's.

Spontaneous Combustion.

Prof. Graham, of London, the able chemist, made a Report to the Lords of the Board of Trade, on the subject of the Burning of the Amazon, which has recently been published in a number of our foreign exchanges. He speaks of the dangerous practice of mixing the various engineers' stores in one room, near the boilers of steamships. Tow or cotton waste, saturated with oil, by exposing much surface to the air, often oxidates rapidly, and heats spontaneously. He has known of olive oil, spilled among saw-dust, doing this; also greasy rags; cloth covered with varnish, &c. Fires in coach-works, oil stores, engine-rooms, &c., have been caused by such means. Ground charcoal and lamp-black, if any oil obtains access to them, should never be admitted as ships' stores. Oil cans, and those containing turpentine, should never be stowed in a warm place, as the liquid expands one volume in thirty, by a rise of 60° in temperature. A moderate heat increases the tendency of coals to spontaneous combustion; coals have taken fire in more than one instance, by being heaped against a heated wall. The covering of wood with iron to protect it from fire, is a dangerous practice, for the iron is a good conductor of heat, and the wood below is heated nearly as much as if it were not covered. Wood, by repeated re-heating, is brought to an extraordinary degree of combustibility, and is liable to spontaneous ignition. Wood has frequently ignited by long contact with iron pipes, which conveyed hot water for heating purposes. Coals should always be taken aboard of a steamboat in a dry state, and as an obnoxious vapor always rises before coals ignite spontaneously, they should at once be turned over when this vapor is noticed. The oil of turpentine gives off a vapor sufficiently dense, when heated to 110°, which, if mixed with air, will explode by contact with the flame of a candle. Newly painted or tarred wood is liable to be ignited very quickly, when exposed to a degree of heat of 212° for some time, and then approached with a lighted lamp. Great care should be exercised by those loading ships, in respect to stores which are liable to ignite spontaneously.

Observatories.

It is proposed to erect an observatory at the Highlands, near this city. We hope the project will be carried out, and that in respect to this plan it will not be said of our city, owing to its gasconading about the Washington Monument a few years ago, "New York is mighty upon everything that makes money, but contemptible in everything else." An association was formed in Brooklyn, two or three years ago, to erect an observatory there, but alas, where is the observatory and where the society now? The subject of an observatory for New York has been talked of so often, that we feel excessively cautious in saying anything at all about the proposed new one. We should have an observatory here, the city is rich enough to maintain the best in the world, but will it do it? that is the question. We hope it will.

The largest achromatic telescope in the world has recently been erected in a new ob-

servatory near Leamington, England. It was constructed by a Mr. Craig, an Episcopalian clergyman. The tube is of a cigar shape, is 76 feet long, and is 13 feet in diameter. Mr. Craig will soon turn it on the planet Venus to settle the question whether she has a satellite or not. The Moon seen through it presents a most magnificent appearance, clear and colorless, with her rocks and mountain craters looming up in terrific grandeur.

Safety of Railroads versus Steamboats.

The conclusion cannot be shut out from the mind of any man, that steamboat travelling, in comparison with railroads, is triply dangerous, and wherever the railroad can be chosen in place of the steamboat, it is recklessly criminal not to choose such a means of conveyance. We defy any person to refute the statement, "that more lives have been lost on steamboats, in these United States, during the past three months, than have been lost on all the railroads in our country since the first rail was laid, and that is more than twenty years ago. Many people here profoundly calculated on the certain safety of our North River boats; "they were all low pressure," they said (a mistake, however, many supposing that all condensing engines have low pressure boilers), "consequently there was nothing to fear," but by the burning of one steamboat, and the explosion of the boiler of another, no less than one hundred and ten of our fellow creatures have lost their lives between the cities of New York and Albany in three weeks. The late accident was that of the steamboat Reindeer, which burst a plate of her boiler, by which thirty persons came to an untimely end. There was no carelessness nor defective construction in any part of the boat, so far as human eye could judge; of this we are fully convinced by the testimony of witnesses. The cause of the accident was a bad plate of boiler iron—it had a flaw in its heart. The boiler was made of what is called the best Pennsylvania iron; who was the maker of the iron, we cannot tell, but this we do know, that it is the second explosion from the same cause—a bad boiler plate—which has taken place on New York steamboats this summer. Let us have the names of the makers by all means, so that the public may be made aware of those who make bad work for the endangering of precious lives. In view of the great destruction of life, by steamboat travelling, and even taking into consideration the new Law recently passed by Congress, for the better protection of life, we cannot but advise all who can, to choose the railroad as the safest means of travel, in preference to the steamboat. Of course there have been and will be railroad accidents, but surely, if the pastis of any use at all—if we can place any reliance on past events for future guidance—the railroad is assuredly by far the safest medium of modern travel.

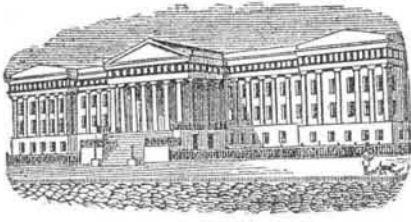
Patent Law of the United States Applied to Englishmen.

A correspondent of the London Mechanics' Magazine, signing himself "Justice," calls attention to our present Patent Laws, and the large fees which the subjects of Queen Victoria have to pay for an American patent. All foreigners—Frenchmen, Germans, &c.—are charged \$300, Englishmen and all other British subjects are charged \$500. This fee was charged to correspond with the patent fees of specific foreign countries. "Justice" hopes that our charge for Britishers will now be reduced, as the English patent fee has been lowered. We advocate its reduction to \$300, so as to make all foreigners stand on the same level, but, at the same time, we do not advocate this measure because England has reduced her fees,—they are yet too high.

We do England the justice, however, to say that she makes no distinction between her own and American citizens—all men stand on the very same level before her patent laws. We hope our next Congress will reduce our patent fees, for the subjects of Britain, to \$300.

Information Wanted.

Any person knowing the residence of Lauren M. Peck, formerly of Philadelphia, will confer a favor by addressing a note to this office.



Reported Officially for the Scientific American

### LIST OF PATENT CLAIMS

Issued from the United States Patent Office.  
FOR THE WEEK ENDING SEPTEMBER 7, 1852.

**SMOOTHING IRONS**—By F. C. Adams, of Aberdeen, Ohio: I claim, first, the basket grate, formed by the bars, as mentioned.

Second, I claim the concave form in the top of the smoothing portion of the iron, all for the purpose set forth.

**MACHINES FOR MAKING CARRIAGE WHEELS**—By C. H. Guard, of Brownville, N. Y.: I claim the manner of feeding up the boring spindle slowly, and bringing it back speedily, whilst the driving spindle is turned constantly in one direction, and with the same velocity, viz., by connecting the driving spindle to the boring spindle, by means of the collared bar, and by a cog wheel on the former gearing into a pinion on the latter, and by screw threads, formed upon the said spindles, which can be alternately operated upon by the segmental nut, which is placed between them, and actuated by the lever, substantially as set forth.

**REFRIGERATORS OF WORT**—By Adolph Hammer, of Philadelphia, Pa.: I claim the series of deep narrow open chamber, when made with vertical partitions, so as to form passages at the bottom thereof, for imparting to the wort a direction downward and upward, through the said chambers, in combination with shallow chambers, with which the aforesaid chambers successively communicate, and the enclosed  $\lambda$ , through which flows, in a direction opposite to that of the wort, a current of cold water, in the manner and for the purpose set forth.

**APPARATUS FOR FEEDING CHICKENS**—By Simeon W. Albee, of Walpole, N. H.: I claim attaching and arranging the doors to the case, in such a manner that said doors will open inwardly instead of outwardly, when the fowls tread upon the steps, the doors being attached to the case and arranged as described, or in any equivalent way.

**RAILROAD SIGNALS**—By Aurin Bugbee, of Charlton, Mass.: I claim the combination of a single bell, a spring, two cords, and two or more tripping arms or levers, as applied to a railway and supporting frame, at a road crossing of such railway, and so that the contraction of one of the two ropes, by change of temperature, or otherwise, may be counterbalanced by that of the other, and not draw the bell laterally out of place, as it would be likely to, were but one rope or wire used.

And I claim the combination of the weighted or heavy flag, or signal board, with its suspension chains or cords, the windlass barrel, the overbalance weight or weights, and suspension cords or chains, the leading cord passing over the pulley, the tripping lever, the spring catch, and its cord, and the tripping lever or arm, all being arranged and made to operate together, substantially as specified.

**PRESERVING INDIAN RUBBER**—By Frederick Bonner, of Vera Cruz, Mexico: The nature of my discovery, is by applying the before mentioned quantity of Campeachy salt, or muriate of soda, to the rubber, in its sap state, and that by so doing, to prevent putrefaction and fermentation of the juice, to which, more especially, I confine the claim of my invention.

**GRAIN HARVESTERS**—By Daniel Fitzgerald, of the County of New York N. Y.: I claim, first, the arrangement and combination of two cylinders, with each other, for the purpose of cutting and bringing the cut grain into the middle between them, and delivering the same to the crib, as described.

Second, the construction of the cam cutter, and cam fingers, so constructed as to be drawn in for the purpose of allowing the cylinders to throw the cut grain into the crib, as described.

Third, the use of a sloat or channel, to regulate the movement of the fingers, as described.

Fourth, the arrangement and construction of a crib made to receive from the two cylinders and hold the cut grain upright, so that it can be readily taken out for binding, in the manner described.

**SALT**—By Jas. P. Haskin of Syracuse, N. Y.: I claim the use of a screen, false bottom, or floor, in the vapor pan, containing saline waters, or brine, for manufacturing salt, to separate impurities or bitterings, from the salt, substantially as described, or any other mode substantially the same.

**SULPHURIC ACID**—Carl Hinrichs of New York N. Y.: I claim concentrating sulphuric acid in leaden vessels, to the strength of 66 degs. Baume, and at a temperature below the boiling point of the acid.

I also claim the long conducting and escape pipe, in combination with the agitating apparatus for condensing the deleterious gases, and preserving a pure and wholesome air in the neighborhood of the establishment.

[The first claim is a singular one.]

**COMPOSITION OF ENAMELS**—By J. G. Dunn & Alfred F. Howes, of Lawrenceburgh, Ind.: We claim the enamel described, and its application to brick and iron.

**APPARATUS FOR HEATING FEED WATER OF LOCOMOTIVES, ETC.**—By I. P. Magoon, of St. Johnsbury, Vt.: I claim to combine the vessel with the deflector, the heater, and the chimney pipe, substantially as described, whereby such deflector shall not only form the bottom of the said vessel, but that the smoke and exhaust steam may be made to heat said vessel, by impinging against the deflector, as specified.

I also claim the improvement of throwing the steam directly into the heater or vessel, and there partially or wholly condensing it, before it is passed into the tank of the tender, not meaning to claim the throwing of it into the tender, from the blast pipe and through a single pipe connecting the blast pipe and tender, but the combining the tender and the blast pipe, and the heater or vessel, by pipes, substantially as represented, whereby the advantages stated, as well as others, are obtained.

**WHIFFLETREE HOOK**—By E. A. Palmer & A. J. Simmons, of Clayville, N. Y.: We claim the head, turning upon the shaft, to close the hook, the sliding catch to prevent its opening, and the spring within the head acting upon them, the whole combined and operating substantially as specified.

**AIR TIGHT MAIL BAGS**—By Chas. A. Robbins, of

Iowa City, Iowa, and Harvey Allen, of Allen Grove, Wis.: We are aware that linged clasps or clasps, have been used for drawing together and keeping closed, the mouth of the bag, such, therefore, merely of themselves we do not claim; but we claim forming the jaws of the clasp with a tongue and groove on their inner faces, for crimping in the elastic material of the bag, and causing it to act as packing, in effectually making air and water-tight the mouth of the bag, as set forth.

**BLOW-PIPE FOR DENTISTS, &c.**—By J. Thompson, of North Bridgewater, Mass.: I claim, first, the combination in one instrument of the flame of gas, or a lamp, with a blow-pipe, so that both operating together, may be held in one hand, and the flame applied on any spot, in any direction, and for any length of time, at the will of the operator.

Second, the arrangement of the thumb-piece, or its equivalent, in combination with the flame of gas, or a lamp and a blow-pipe, so that while the instrument is held in one hand, a movement of the thumb will adjust the blow-pipe to the flame in such a way as to produce any desired variation in the flame, as set forth.

I do not intend by this claim, as I have intimated, to restrain myself to the mode of construction described, but to reserve the right to vary the same as I may deem expedient, while I attain the same ends by means substantially the same.

**PREPARING STONE IN IMITATION OF MARBLE**—By Hiram Tucker, of Cambridgeport, Mass.: I claim the improvement in preparing the surface of the slate, or absorbent stone, or mineral matter, for better receiving and retaining colors, and for its quicker and better induration, than by the ordinary process of baking oil or japan on it: the same consisting in applying a drying oil, or vehicle, to it as set forth, in combination with baking it and charring it, or with burning it thereon, essentially as specified, the charring or burning the oil, being the principle of my invention or discovery, under the circumstances as stated.

And I also claim the improvement in applying the veining and ground colors to such indurated surface, or other surface, the same consisting in applying the graining colors first, and drying them on, in combination with subsequently covering the whole surface, together with such veining colors with one or more coats of black or other colored japaning, and after the same has been dried, grinding down japaning from the veining colors, and leaving it between them, so as to form a ground as stated.

**LAMP TOPS, RIVETS, &c.**—By L. C. White, of Meriden, Conn.: I claim the method of making lamp tops, stoppers and other similar articles, from a disc or plate of metal, by bending it, and forming it, substantially as described, so that the rim is formed of two thickness of metal, and the centre and flange, of one thickness, as described.

#### DESIGNS.

**MEDALLION OF GENERAL SCOTT**—By Peter Stephenson, of Boston, Mass.

**MEDALLION OF FRANKLIN PIERCE**—By Peter Stephenson, of Boston, Mass.

**COAL STOVE**—By Wm. L. Sanderson, of Troy, N. Y., (assignor to Reuben R. Finch, Sr., & R. R. Finch, Jr., of Peekskill, N. Y.)

#### Amendment to the Patent Laws.

The following is the only amendment made to our Patent Laws during the late session of Congress:—

**AN ACT** in addition to an act to promote the progress of the useful arts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That appeals provided for in the eleventh section of the act entitled an act in addition to an act to promote the progress of the useful arts, approved March 3rd, 1839, may also be made to either of the assistant judges of the circuit court of the District of Columbia; and all the powers, duties, and responsibilities imposed by the aforesaid act, and conferred upon the chief judge, are hereby imposed and conferred upon each of the said assistant judges.

**SEC. 2.** And be it further enacted, That in case appeal shall be made to the said chief judge, or to either of the said assistant judges, the Commissioner of Patents shall pay to such chief judge, or assistant judge, the sum of \$25 required to be paid by the appellant into the Patent Office by the eleventh section of the said act on said appeal.

**SEC. 3.** And be it further enacted, That section thirteen of the aforesaid act, approved March the third, 1839, is hereby repealed.

Approved August 30, 1852.

#### Comets.

What are those eccentric wanderers among the starry hosts of heaven? this is a question which philosophy has not yet been able to answer. The friend of Kepler believed them to be the residences of damned spirits, and many other notions nearly as singular have been entertained by various nations and persons. At one time they struck terror into the hearts of all nations, now they are hailed as returning wanderers from unknown journeyings away through the infinitude of space.

The comet comes from regions of unknown remoteness, and rushes, with continually increasing speed, towards the sun. When it has reached within a certain distance of this object, it sways round with fearful impetus, beginning reluctantly to settle out into open space again, and moving with less and less velocity as it goes, until its misty form is once more withdrawn by distance from hu-

man sight. When the comet of 1843 swept round the sun in this way, it was so near to the shining surface of the solar orb, that it must have been rushing for the time through a temperature forty seven thousand times higher than any which the torrid region of the earth ever feels. Such as would have been twenty four times more than enough to melt rock crystal. The comet passed this fiery ordeal as the lightning's flash might have done. In two short hours, it had shifted its place from one side to the other of the solar sphere. In sixty little minutes, it had moved from a region in which the heat was forty thousand times greater than the fiercest burning of the earth's torrid zone, into another, in which the temperature was four times less.

The tail of that comet was 170 million miles in length, and one thing very singular about their movement is, that comets always turn their tails prudentially out of harm's way as they whisk through the neighborhood of the solar blaze. Imagine the case of a rigid straight stick, held by one end in the hand, and brandished round through a half-circle.— If the stick were 170 million miles long, the extent of the sweep would be not less than 3,740 million miles! Through such a stupendous curve did the comet of 1843 whirl its tail in two little hours as it rounded the solar orb. Sir John Herschel very beautifully suggests, that the comet's tail, during this wonderful perihelion passage, resembled a negative shadow cast beyond the comet rather than a substantial body. But this suggestion can only be received as an ingenious and expressive hint.

The comet's tail is always thrown out away from the sun, just as the shadow of an opaque body in the same position would be. But this is not all that can be said of it. It is not only cast away from the sun; it is really cast by the sun—shadow like, although not of the nature of shadow. It only appears when the comet gets near to the sun's effulgence, and is lost altogether when that body gets far from the great source of mundane light and heat. It is raised from the comet's body, by the powers of sunshine, as mist is from damp ground. When Halley's Comet of 1682 approached the fierce ordeal of its perihelion position, the exhalation of its tail was distinctly perceived. First, little jets of light streamed out towards the sun, as if bursting forth elastically under the influence of the scorching blaze; very soon these streams were stopped, and turned backwards by the impulse of some new force, and as they flowed in this new direction, became the diverging streaks of the tail. Not only a vapor-forming power but also a vapor-drifting power, is brought into play in the process of tail formation; and this latter must be some occult agent of considerable interest in a scientific point of view, as well as of considerable importance in a dynamic one, for it is a principle evidently antagonistic to the great prevailing attribute of gravitation, so universally present in matter. The comet's tail is the only substance known that is repelled instead of being attracted by the sun.

The comet's tail seems, in reality, to be a thin oblong case of vapor, formed out of the cometic substance by the increasing intensity of the sunshine, and enclosing the denser portion of that substance at one end. As the comet nears the sun, much of its substance is vaporized, but as it goes off again into remoteness, the vapor is once more condensed. The tail may then be seen to flow back towards the head, out of which it was originally derived.

The comet's tail is believed by most astronomers of the day, to be the body converted into vapor by solar influence, and as we know that steam is perfectly colorless and transparent, when unmixed with air, a comet may be composed of a subtle steam vapor. The faintest stars have been seen shining through the densest parts of comets without the slightest loss of light, although they would have been effectually concealed by a trifling mist extending a few feet from the earth's surface.

The belief in the comet's surpassing thinness and lightness is not a mere speculative opinion. It rests upon incontrovertible proof. In 1770 Lexwell's Comet passed with-

in six times the moon's distance of the earth, and was considerably retarded in its motion by the terrestrial attraction. If its mass had been of equal amount with the earth's mass, its attraction would have been so held back in its orbital progress in consequence, that the year would have been lengthened to the extent of three hours. The year was not, however, lengthened on that occasion by so much as the least perceptible fraction of a second; hence it can be shown, that the comet must have been composed of some substance many thousand times lighter than the terrestrial substance. Newton was of opinion that a few ounces of matter would be sufficient for the construction of the largest comets' tail.

Comets are supported in the void by the combined effects of motion and attraction.— Their own impetus strives to carry them one way, while the sun's attraction draws them another, and they are thus constrained to move along paths that are intermediate to the lines of the two impulses. Now, when bodies are driven in this way by two differently acting powers, they must travel along curved lines, if both the driving forces are in continued operation, for a new direction of motion is then impressed on them at each succeeding instant.

In most instances, comets move in space, about the sun in ellipses, so very lengthened, that their paths seem to be parabolas as long as the cloudy bodies are visible in the sky. Two of them, Ollier's comet and Halley's, are known to return into sight after intervals of seventy-four and seventy-six years, during which they have visited portions of space a few hundred millions of miles further than the orbit of Neptune. Six comets travel in elliptical orbits that are never so far from the sun as the planet Neptune, and return into visibility in short periods that never exceed seven or eight years. These interior comets of short periods seem to be regular members of our world system in the strictest sense. Their paths, although more eccentric, are all contained in planes that nearly correspond with the planes of the planetary orbits, and they travel in these paths in the same general direction with their planetary brethren in every case.

The comet's motion strikingly illustrate the almost absolute voidness of space. If the thin vapor experienced any resistance while moving, its free passage would be checked, although that resistance was many thousand times less than the hand feels when waded in the air. It is found, however, that Encke's comet does indicate the presence of some such resistance. It goes slower and slower with each circuit, hence the comets have been termed the feelers—nerves of the celestial universe. Encke's comet was retarded for two days in its last orbital revolution, and upon the basis of this retardation, Prof. Nichols has adopted the theory that the time will come when our system shall cease to exist as it is, and pass into some other form of being. There is a planetary ether, he says, filling the space between the spheres, so that in the course of time Encke's comet will disappear. Whether it will do so or not, the future alone can tell, the idea of the ether filling all space was entertained by Euler in other days, but the cause of the retardation may not be an ether, but some heavenly body. In 1770 Lexell's comet came within the spheres of Jupiter's attraction, and was kept within it for two years, it at last broke away like a wild steed from its charioteer, and since then it hath not again appeared.— Whither it hath gone no one can tell, and whether it will or will not return and visit our system once more is equally beyond the ken of the most profound observer of the starry heavens.

#### A Railroad in Broadway.

The controversy whether there should or should not be a railroad in Broadway, is still going on in our daily papers. The champions—"Monopoly," and "Anti-Monopoly," are perhaps among the greatest pen warriors the sun ever shone upon; there is no fears of their ever "sheathing their swords for lack of argument; they would have made excellent members of the "Long Parliament," or the last Congress.