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Contents:

(Illustrated articles are marked with an asterisk.)

Answers to correspondents	373	Juice vs. cider	372
Atmospheric wave, the November	369	Long life, the man of	372
Blower and its uses, the Sturte-	373	Man, the origin of	371
vant	373	Marine caselles	371
*Boiler explosions, steam	373	*Motion, transmission of	371
Boiler inspection and insurance	373	Natural history, curiosities of	373
Company, the Hartford	377	Nitro-glycerin, the force of	377
Brain work	370	Notes and queries	373
Business and personal	375	*Oven, improved hot blast	375
Charred papers, preserving	373	*Paper cans, how to make	370
*Combined tool	370	Patent decisions, recent	377
Diamond bubble, the California	368	Patente	373
Drawing as an educator	375	Patente, how to make money by	376
Electricity, Professor Morton on	369	Patente, official list of	379
Erie canal navigation	373	Patente, official publication of the	379
Fire, a London	373	Patente, recent American and	368
Fire engines, self-propelling	372	foreign	378
*Freeproof construction, new	371	*Sailing against the wind	375
*Freezing water in bottles	372	Scientific school at Princeton	372
Grab, the proposed half million	368	*Seed planter, improved	370
Gravel, death of Horace	369	*Shedding, revival of American	368
*Gun, for the Russian Govern-	367	Ship's compass, improved	369
ment, large	367	*Vienna exposition, the buildings	374, 376
*Head block for saw mills	371	of the	374, 376
Ice-harvesting invention, new	370		
Inventions wanted	372		

THE PROPOSED HALF MILLION GRAB.

As Congress has now assembled, and in view of the extraordinary influence which will be brought to bear upon that body to obtain a large appropriation in order to cover the expenses of American Commissioners and exhibitors to the Vienna Exposition, we deem it advisable to present a recapitulation of the various objections which we have urged against such proceeding, and also a brief review of the facts regarding the Austrian patent laws and similar enactments of other European countries, the condition of which forms the basis of our opposition. The reader will therefore find in the following a succinct *resumé* of the various arguments which we have from time to time advanced, and from which, in connection with the published and opposite views of the United States Commissioner, General Van Buren, an intelligent idea of the controversy may be obtained.

According to the rulings of the Austrian patent law, patents in that country must be worked within one year of their date of issue; working before application for a patent, or between the dates of application and issue, is not a compliance with the law. Not only the device but all its parts must be made in Austria and sworn to be in exact conformity with the drawings and specifications filed. There is no provision whereby a suit may be terminated. The infringer, after the case is completed and he finds himself beaten, has only to assert that the inventor has not properly proved his working. The suit is then re-opened, and the same ground gone over, and this can be done as often as the infringer chooses, during the whole life of the patent. If an inventor allows two years to pass after working his patent the first year, without manufacturing it again, his letters become void. As regards the practical working of the above regulations, we have presented sundry communications from American inventors in Austria tending to show that Americans have never succeeded in getting a favorable decision in that country, and detailing individual experience, proving that so far from the government supporting the injured party, it actually seeks means to aid the infringer in his piracy.

Not only are the Austrian laws thus oppressive, but the regulations of adjacent European countries are equally unjust. We note in English journals repeated complaints of the unlawful seizure of patented articles displayed in the Paris Exposition of 1867, and we find it stated that inventions supposed to be protected by a special certificate, in that Exhibition, have been patented by Continental people. That the facts of the case are fully appreciated in England is proved both by the warnings of the press and the appropriation by Parliament of but £6,000 (\$30,000) to assist English representation. The practice under the Prussian law—the Austrian practice is little better—is strongly condemned in evidence given by Mr. Henry Bessemer, the great English steel manufacturer, before a Parliamentary committee. He states that, after disposing of the use of his process to Krupp, the German founder, the latter, according to law, applied to the Prussian Patent Office for a patent on the same. The authorities first declared the invention to be not new, then temporized for a long period and finally denied the application on the ground that a description of the process was published in the English Blue Book, which volume circulated in Prussia. Mr. Bessemer adds "that is universally the way in Prussia, unless it is some paltry thing, merely to keep up the appearance of granting patents, they give an occasional patent in that way, but they receive always the drawings, the fees and the description from the English patentee, which is published there for the benefit of the Prussians. . . Having obtained all the information from an English patentee, they make it public in their country, and then say it is not new." Other cases are on record where patents on inventions have been refused, and after the denial the government

has quietly proceeded to manufacture the articles. Especially is this true of military goods.

Under the existing patent law of Austria, a valid patent cannot be had if the invention is exhibited in Austria prior to the application for a patent. By a recent modification, the Director of the Exposition is empowered to except from the operation of the above clause such inventions as may be exhibited at the Exposition, and to grant a certificate to that effect in such cases as he chooses.

It is hardly necessary to say that, as a protective patent measure, this certificate is worthless. There is, therefore, plainly no ground for the assertions of the United States Commissioner that it is a patent or in any way operates as such. The most that it does is to fix a time during which an invention may be exhibited in Austria before being patented, and it then leaves the inventor to the tender mercies of the old and unaltered law. We therefore strongly deprecate any appropriation of the public funds in support of this great show business until Austria modifies its laws and consents to grant to our inventors the same enjoyment of their inventions in Austria as the subjects of that empire enjoy in the United States. In this country the Austrian inventor may obtain a patent even if his invention has been exhibited and manufactured for two years prior to his application for a patent; and our courts will defend and protect him from infringement, the same as if he were one of our own citizens.

From the consideration of this branch of the subject, we desire to direct attention to subordinate though cogent reasons why legislative assistance should be denied. We consider that an inventor or manufacturer in sending his goods for exhibition to Vienna does so in accordance with the views expressed by President Barnard in a late oration: that it will be a grand advertisement and ensure him a large profit. Unless it is to his direct advantage to make such a display, no inducement in the shape of partial assistance will cause him to expend the necessary time and trouble. Surely, then, it is manifestly unjust to devote the national money to the ends of private gain. For the relief of needy inventors having meritorious products to exhibit and being without funds to forward their desires, just exception might be made and discriminating enactments, private or otherwise, passed. But to manufacturers of our own products and of long known and tried devices, who incur no danger of infringement, pecuniary assistance should be denied, and they ought to be ashamed to ask it. Such refusal will not militate against a fair display of American products, as the same are largely manufactured abroad and will in any event be contributed by foreign exhibitors.

We have yet to refer to the especial labor of the United States Commissioner. This gentleman some time since voluntarily accepted the office, well knowing, as he himself states, the duties pertaining thereto, and that it was merely honorary, no salary being attached. After working "zealously" alone for several months, he has suddenly, under what authority we know not, appointed an advisory committee of thirty, who in turn appoint a series of assistants, making the total number of officials one hundred and forty-three. Forgetting his voluntary acceptance and also that of his subordinates, the Commissioner now concludes that he and they will labor no longer at his or their private expense, and consequently devotes his entire energies in securing, or, to use a common phrase, the lobbying through Congress, an appropriation of five hundred thousand dollars from which he and his deputies are to be compensated.

To say that the personal ends of these gentry do not underlie their patriotic endeavors would be absurdity; the fact is evident, and indeed is admitted by some, though, at the same time, defended by specious arguments of scientific reports, etc. It is well known that living expenses in Vienna are extremely high, and therefore half a million dollars would barely cover a year's expenditure for the number of officials above mentioned, leaving either a very small sum or nothing for the benefit of the exhibitors. We hold that this body of office holders are totally unnecessary, and that for Congress to lavish public money upon them would be both unjust and impolitic. We have ample diplomatic representation in Austria, with paid employees to look after our interests. We need no one at home to point out to our citizens where their best interests do or do not lie. Our business men are sufficiently shrewd and amply capable of managing their own affairs without any assistance from General Van Buren or his staff.

In conclusion, and on the grounds above related, we strongly urge upon Congress the denial of all applications for this appropriation. If a considerable sum is necessary, let General Van Buren, his assistants, and others who are interested in the Exposition, subscribe to the extent of their abilities, and thus further their own profit with their own funds. The country cannot and should not lavish half a million dollars, which might be far more advantageously applied to the reduction of our national debt, to the support of our own Exposition, the Centennial of 1876, and to hundreds of other purposes, than to any enterprise to which there are such strong objections, and which, at the best, bids fair to be of so little national benefit as the Vienna Exposition.

REVIVAL OF AMERICAN SHIPBUILDING.

Two new and splendid steamships, for the Pacific Mail Steamship Company, have lately been launched at Wilmington, Del. They are the *Colon* and the *Acapulco*, both of same size. Three others, for the same company, are also being built at Chester, Pa. The following are the general dimensions of the *Acapulco*: Length, 300 feet; beam, 40 feet; depth of hold, 30 feet 6 inches. She is a four-decker of 2,324 tons measurement, with a carrying capacity of upward

of 4,500 tons. Her model is handsome, and combines speed, stability, and large stowage capacity. She is to be brig-rigged, like the other vessels of the line. Her interior will be supplied with all modern improvements. The machinery is first class, of the compound type, with cylinders 51 and 88 inches in diameter, and with 42 inches of stroke; she has four boilers, 9 feet 9 inches in length and 13 feet in diameter, connected to one smoke stack; each boiler is made of 13-16 inch boiler iron, double riveted, and capable of carrying a working pressure of 70 pounds of steam. The line shafting is 13½ inches in diameter, the propeller being 16 feet 3 inches, with a varying pitch of 22 to 26 feet.

We alluded the other day to the remarkable stupidity exhibited by certain prominent shipping merchants, in requesting the American Institute, of this city, to examine and report whether the compound marine engines, now so extensively used, were really meritorious; as if the success and economy of this form of machinery, now employed on all the finest foreign vessels trading to this port, had not settled the question. Among the signers was the Vice President of the Pacific Mail Steamship Company. The engineers of that corporation seem to understand the subject, whether the Vice President does or not, for they are putting in the compound engines; and their new fleet of steamers will doubtless be enabled to make the same speed on half the coal burned in their present vessels, besides carrying more cargo. It would not be a bad idea for shipping merchants, who pay for the building of steamers, to become readers of the *SCIENTIFIC AMERICAN*, and thus keep themselves posted in the mechanical and scientific progress of the day.

THE CALIFORNIA DIAMOND BUBBLE.

For several weeks past the papers have been filled with accounts of the discovery of diamonds, rubies, sapphires, and other precious stones, in Arizona and other parts of the Western wildernesses. The wonderful region, where the gems were to be found almost as thick as blackberries, was alleged to be quite circumscribed, and very inaccessible. The fortunate discoverers brought to San Francisco a large number of specimens, which excited the astonishment and interest of everybody. It was then announced that they had arranged, by purchase and preemption, to secure the whole of the valuable area, which embraced these untold treasures. The aim of the proprietors, as they now allege, was to make arrangements for the supply of a large amount of funds, so that a body of workers might be sent to the grounds and subsisted for a length of time sufficient to collect all the jewels that were accessible. To effect this, they determined to form a joint stock company. A corporation, styled the San Francisco and New York Commercial and Mining Company, was accordingly organized, a large amount of the stock sold, and the money transferred to the pockets of the original projectors. The purchasers of the stock, in order to ascertain the approximate value of their astonishing possessions, decided to institute a careful survey of the diamond regions and, for this purpose, a scientific party, headed by the well known geologists, Clarence King, D. D. Colton, Mr. Bost, and Mr. Frey. These gentlemen, after a toilsome march, reached the alleged diamond regions, and found, surely enough, diamonds and rubies on the surface of the ground and in the crevices of the rocks. But, strange to say, in every instance of a "find," it was evident that the gems had been deposited there by the hand of man, and that none existed where, if their occurrence had been genuine, the inevitable laws of Nature would have placed them. The explorers were forced to the conclusion that the ground in certain places had been salted, or scattered over with the gems for the purpose of deceiving honest or unskilled searchers, and they denounced the whole thing as a swindle of the most barefaced description.

When the report of the surveyors reached San Francisco, the trustees of the corporation met and adopted a resolution to the effect that the fraud be at once and fully exposed, in order that the public might be protected; also that no more stock be issued or transferred, and that the corporation be dissolved as soon as practicable.

Thus ends the romance of the Arizona diamonds. It is to be hoped that the originators of this daring outrage upon innocent purchasers of the stock may be brought to justice.

OFFICIAL PUBLICATION OF THE AMERICAN PATENTS—A NEW AND IMPORTANT WORK.

No better evidence of the energy and ability which the present Commissioner of Patents, General M. D. Leggett, has brought to the discharge of his onerous duties, and no more satisfactory proof of the rapid improvements which are being effected in the department under his charge, can, we think, be asked than that afforded by the recently published volume which forms the first of a series hereafter to be issued by the Patent Office, entitled "Specifications and Drawings of Patents." It consists of a large quarto of 668 pages of letter press and 226 pages of plates, containing not the mere claims, but the entire specifications and reduced *fac similes* of the drawings of all patents issued for nearly one month. It is intended to publish this work monthly, so that the record of devices patented, instead of being obtainable only in the Patent Office, will be broadly disseminated throughout the country and made generally accessible.

The importance of this undertaking, both as an encouragement to the useful arts and as a valuable aid to the inventor, can hardly be over estimated. An immense amount of time is constantly wasted by people seeking to develop what to them are new ideas, which are in the end perfected only to be rejected, after official examination, as old and covered by previous patents, while the luckless inventor discovers too late that he might have saved all his toil and expense, had he posted himself in what others had done before

him. With the aid of the present work, which—for a small yearly sum, no more than sufficient to cover the actual cost—may be added to every one's library, the most accurate information may be obtained, not only regarding the latest improvements and discoveries, but also all that has hitherto been accomplished in any special branch of industry or mechanism. So that within a few years the accumulated volumes will form the most elaborate encyclopædia of the useful arts ever published.

Each monthly edition will contain at the least estimate one thousand patents, while the aggregate of the latter, published in the twelve volumes, will reach nearly fourteen thousand per annum. If we compare the above large total with that corresponding in other countries, we find that the sum of all the patents granted in the United States in a single year exceeds the entire number issued by many nations during the past century or since the establishment of their patent offices. This fact alone shows that the work will be of still wider value as furnishing, not only to Americans but to the world, a complete record of the majority of all the useful inventions produced.

Great Britain approaches us most nearly in the number of novel ideas yearly devised by its inhabitants and placed under the protection of its patent laws. The statistics of this nation show that 3,000 patents are annually granted, but little over one fifth of the average taken out in the United States. The English specifications and drawings have, however, been regularly published for a considerable period back, so that we are enabled to draw the contrast between the British and American modes of transmitting this valuable information to the public.

The specifications of the English patents are issued in volumes measuring $7\frac{1}{2} \times 10 \times 2\frac{1}{2}$ inches, each weighing some 4½ pounds. Each year's publication occupies about fifty books of specifications alone, the drawings being bound separately in fifty additional volumes— $16 \times 22 \times 3$ inches in dimensions, and weighing about fifteen pounds each. The aggregate dead weight of a year's issue reaches 975 pounds or nearly half a ton of printed matter, all of which, it seems, is required for the description of 3,000 patents in a manner not a whit clearer or fuller than our compact yet elaborate volumes. On the above English plan of publication, it would require about five hundred volumes a year, weighing in the aggregate over two hundred tons, to produce the same number of patents as are yearly issued by this country, and which Commissioner Leggett expects to print in thirteen comparatively small volumes. As to the comparative expense of the two systems, no comment is necessary. As a matter of course the English publications might as well remain unprinted, for they are virtually out of almost every one's reach.

We can confidently predict a world-wide circulation for our new work. It will prove a trusty guide to the inventor and a useful and convenient means of reference for the Patent Office Examiners, as well as a valuable repository of knowledge for all interested in or desirous of obtaining information regarding our industrial progress. As an addition to our mechanical and scientific literature, it enures greatly to the credit of Commissioner Leggett, to whom its inception is due, while, as a monument of the national inventive genius, it is a production of which the country may justly be proud.

IMPROVED SHIP'S COMPASS.

The Earl of Caithness, at present visiting New York city, has recently exhibited to us a new form of gravitating ship's compass, invented by himself. Seamen are well aware that during heavy weather the rolling and pitching of a vessel cause the compass to oscillate, and that the consequent side movement of the points often renders proper steering a matter of difficulty, and at times results in throwing the ship far off her course. Lord Caithness' invention overcomes this difficulty by abolishing the gimballs in which the compass box is supported in the binnacle, and substituting therefor a ball and socket joint.

The arrangement of this device is simply a ball of metal fastened directly under and to the center of the bottom of the compass box, resting on a ring formed in the top of a hollow conical support, which is firmly attached to the binnacle. Just within the ring is a small metal point, and in the ball is a slot, fitting over it, so that sidewise rotary motion of the parts is prevented, and the compass, when adjusted to the ship, is held in proper position.

Attached to the ball, and counterbalancing the box and its contents, is a vertical rod, on which slides a weight. Within the binnacle, this pendulum has free play, and, by its gravity remaining always vertical, will necessarily retain the instrument in a horizontal position, no matter how deeply the ship may roll or pitch.

The variety of compass employed, whether liquid or ordinary card, is of course immaterial. In port, when it is desired to hold the compass steady, it is only necessary to slip the weight on the vibratory rod an inch or so down, so as to embrace the end and also the top of a small fixed upright at the bottom of the binnacle, securing it in place by a set screw.

His Lordship's invention is one of practical utility, and is both inexpensive and a decided simplification and improvement on devices now in use. We have before us many testimonials received from the British Admiralty, and officers of the navy and merchant service, giving records of its performances, all of which unite in its commendation. We note that in one instance a compass remained free from oscillation when the vessel was rolling to an angle of 30° and at times 35°. As Lord Caithness is desirous of introducing his device in the United States, we take pleasure in thus presenting an invention, evidently meritorious, efficient, and well worthy the careful attention of all seamen.

THE NOVEMBER ATMOSPHERIC WAVE.

Recent reports from the Signal Service Bureau indicated the discovery that the great meteorological phenomenon, known in Western Europe and the British Isles as the November atmospheric wave, has appeared on this continent. That this aerial billow has been hitherto believed to exist only within circumscribed limits, is shown by the following, written by Sir John Herschel in 1863, in which he speaks of "that great periodical phenomenon whose recurrence is beginning to be recognized as one of the features of our European weather table—a vast and considerably well defined disturbance, peculiar, it would seem, to this portion of the globe." The views of the distinguished astronomer are, however, now clearly shown to be erroneous. On November 12 last, says the report, a similar atmospheric wave began to break over the shores of Oregon and British Columbia, as shown by the weather telegrams. By the evening of the 13th, it had spread over nearly all the Pacific States and Territories, Utah and Nevada, and at midnight was pouring through the passes of the Rocky Mountains. On Thursday, the 14th, it descended upon Colorado, Nebraska, Kansas, and the Indian Territory. On Friday morning, it extended in unbroken magnitude and magnificence from Oregon and Washington Territory eastward through the great trough or depression of the Rocky Mountain back bone in Idaho and Montana, and stretched thence to the Lower Missouri and Lower Mississippi Valleys and over the western shores of the Mexican Gulf. Through this discovery the approach of winter may be accurately predicted, as it advances from the Pacific coast eastward in the great current of westerly winds. By showing that the warm air from the Pacific Ocean laden with vapor breaks over the icy summits of the Rocky Mountains, it explains the cause of the vast falls of snow which so effectually blocked the Central and Union Pacific Railroads last year. The air robbed of its vapor, and besides deflected upwards, is, it is believed, further chilled, and large quantities of latent heat are liberated. The warmer strata being then borne eastward explains the existence of the mild winter belt lying northeast of the mountains of Idaho and Montana and extending to the Athabasca and Saskatchewan rivers.

Whether or not this vast motion in the atmosphere has any connection beyond that of coincidence of time with the November meteoric belt, through which we have recently passed, is an open question. It undoubtedly has had some influence in the severe storms recently experienced. The telegraph informs us that, on the night of the 12th of November, the polar bands of cloud, said by Humboldt to pre-empted tempests, appeared; while on the same evening a prediction of the Signal Bureau was verified by the rising of a heavy storm which visited the lakes with great severity and swept over the whole face of the country. The more immediate effects of the present wave are said to be drier and more wintry weather.

The Signal Bureau deserves the greatest credit for the valuable addition to scientific information elicited by its researches, and we trust that the Government will appropriate ample funds to promote the prosecution of such important labors.

DEATH OF HORACE GREELEY.

This distinguished editor, so widely known in connection with the *New York Tribune*, died on November 30, at the age of 61 years, at Chappaqua, N. Y. His demise has deprived the world of industry, progress, and science, of one of its staunchest and most zealous friends. The son of a New Hampshire farmer, he was apprenticed to a newspaper printer in Vermont, and came to New York in 1831, with very little money, and no friends. He obtained work as an ordinary type setter in a printing office, and soon showed his intelligence and ability. In partnership with a friend, he undertook the printing of a one cent daily paper, which soon failed; and Mr. Greeley then found another partner, with whom he started the *New Yorker*, a journal which had for seven years and a half a high reputation for its literary and critical ability. Mr. Greeley was subsequently the editor of *The Jeffersonian*, and then of the *Log Cabin*; but his great work was the establishment of the *New York Tribune*, the first number of which was issued in April, 1841. In this work he was ably assisted by Thomas McElrath, his partner, without whose business abilities it is not likely that the *Tribune* would ever have attained its present success.

Although Mr. Greeley's talents were chiefly literary and controversial, he had a most enlightened sympathy for all the branches of science and the progressive spirit of the age in which he lived. He was notably the friend of the industrious, the ingenious, and the intelligent among the people; and his journal owes much of its popularity to this trait in the character of its principal editor. His influence as a journalist has been acknowledged by all parties, and although much of his life had been passed in weathering political storms, he has left few personal enemies behind him. He was the recent candidate for the Presidency, of the Democratic party, and to over exertions made during the late campaign is due, it is believed, the illness which has so fatally resulted. Horace Greeley was a remarkable man, and his name will occupy an eminent place in the annals of American history.

J. E. T. has tried a recipe published in our paper for a cement composed of glue and rubber in spirits of niter, and says the thing wont work. The rubber dissolves but the glue remains solid. In dissolving and combining many substances, it is oftentimes necessary to observe a certain order. In the present case, if our correspondent will dissolve the glue in a little water and then add it to the solution of rubber in spirits of niter, we think he will succeed.

[Reported for the Scientific American.]

ELECTRICITY AT THE STEVENS INSTITUTE.—NOVEL RESEARCHES BY PROFESSOR MORTON CONCERNING THE INDUCED CURRENT.

The first of a course of public lectures on electricity was recently delivered by Professor Morton, at the Stevens Institute of Technology, Hoboken, N. J., before a large and intelligent audience.

The lecturer introduced his subject with a few simple, but suggestive, experiments, showing the attraction and repulsion of pith balls and gold leaf very plainly, by throwing their magnified image on the screen. He mentioned that although glass was the substance generally used as an insulator, it was not by any means perfect for the purpose, and pointed to a series of Leyden jars which were entirely useless as a reservoir of electricity, owing to the poor insulating power of the glass.

Vacuum tubes were passed among the audience, each tube having sealed within it a smaller tube, with bulbs blown along each inch of its length; in the space between the smooth outside and the bulb inside tube, was placed an ounce of mercury; on suddenly inverting the instrument, the mercury, in its descent, would strike against the bulbs of the inner tube, producing friction, and consequently electricity, of which the effect could be seen as a violet or purple colored light following the mercury.

The subject of electrical induction was next introduced, with a simple instrument called the electrophorus, and a Holtz machine; then followed a series of experiments with induction coils. A Giessler tube was caused to revolve rapidly by means of a small magnetic engine. When the induced current was transmitted through the revolving tube, it produced the effect of a handsome piece of fireworks. A wire, with strips of paper fastened at one end, was connected with the inner coating of a Leyden jar. On charging the jar with the long sparks of induced electricity from the induction coil, the strips of paper would be repelled and stand out from each other, but on discharging the jar they would instantly drop. A chime of bells was rung on the same principle, and would continue to ring for twenty minutes with one charging of the jar.

Professor Morton mentioned that he believed he was the first to discover that the induced or secondary current of the Ruhmkorff coil was capable of producing attraction and repulsion, similarly to frictional electricity.

An electrical orrery was set in motion by the induced current escaping from points, and reacting on the air; a lighted candle, held near one of the points, was almost blown out.

The speaker closed the lecture with some brilliant experiments with the large coil of the Institute. Wood was torn up, and gunpowder was only scattered with one electric flash, which lasted the six billionth of a second, but ignited by another of longer duration, about the six or eight hundredth of a second. The last experiment, that of causing the induced electricity to penetrate blocks of glass, was received with well deserved applause; the assistants brought in two heavy columns of glass, each having a metal rod running through its middle; thick varnish was poured on the top face of one column, and the block of glass to be penetrated placed on the varnish. More varnish was then poured on the block, and the other column placed on top. The principle was simply to bring two very well insulated electrodes together, with the block of glass between them; the object of the varnish was to render the path through the glass the easiest course for the electricity. The terminal wires of the secondary coil were connected with the rods in the columns of glass. It was very interesting to observe the effect of the strange force struggling through the glass; the electricity would penetrate perhaps an eighth of an inch, and then, as if the resistance were too great, it would dart back and run around the outside of the block, turning the corners and scattering the layers of varnish; then again the current would make a new attack, penetrate deeper and deeper, until at last the bright streams of light passing entirely through the glass announced the electrical success.

The Professor exhibited a block of glass three inches thick (penetrated in this manner), by throwing the light through it and on the screen; two plainly marked cleavage lines showed the electric path through three inches of solid glass.

L. D. D.

THE CHRISTIAN LEADER.

The *Christian Leader*, the organ of that body of religionists known as the Universalists, has just made its appearance in a new and improved form, to wit, the large quarto shape. Its readers are now presented with twenty pages of matter, handsomely printed. The new publisher is Mr. M. K. Pelletreau, and his name alone is a sufficient guarantee for the elegance of the typography. Office No. 8 Church street, New York; subscription \$2.50 per annum, chromo included. The new editor is E. H. Chapin, D. D., who, as everybody knows, is not only an able and popular writer but he is also a most eloquent speaker. Under this new editorship and management, the *Leader* will undoubtedly take the place in the ranks of religious journalism which its name so appropriately implies. The editor in his address says: "In our day, the human mind is much engaged with problems that involve the highest interests of our being. It may be an age of religious doubt and dislocation, it is not an age of religious indifference. These things appear, not because men are apathetic, but because they are in earnest. Trained by the scientific culture of the times to face the facts of nature, they demand facts and not assertions in every department of human faith and teaching."

In education, science is invaluable as the sole means of training and invigorating the intellect.