THE AMENDMENT OF THE PATENT LAW.

BY THE SECRETARY OF THE WESTERN RAILROAD ASSOCIATION.

AN article in the November number of this magazine (p. 99) under the title "Our Patent-System and what we Owe to it," having special reference to the amendments of the patent law now pending in Congress, set forth objections to the patent-system which have been heretofore erroneously attributed to the friends of those amendments; stated one or two of the objections to the present law which they have themselves suggested; utterly (though it is fair to presume unintentionally) misrepresented the work of the Western Railroad Association, and the purposes of its members in the premises; indulged in many able encomiums upon inventions and their results; proceeded upon the supposition that all progress in science and the useful arts was due indirectly to the patent or property right conferred by the government, that is, that all invention was due primarily to the incentives of the patent law; treated rather collaterally of the right of property which an inventor has in his invention and of "the labor-saving machinery question"; and devoted the most of its space to opposing a desire to repeal the *whole* patent-system with which the article wrongfully charged the promoters of the proposed amendments to the present law.

As a demonstration of the sound policy of having *a* patent-system, and as opposing those individuals who would like to see the whole patent-system demolished, the arguments of the writer referred to were ably put and determinative, though in the opinion of the present writer they were, in view of the questions really at issue before the public, ill-timed and uncalled for, and, in view of the accompanying misstatements of facts, very misleading.

No one who now commands in this connection any degree of public attention in this country, and none of the accredited friends of the proposed amendments either desires the repeal of the patent law, or entertains any considerable number of the objections thereto set forth in the article.

Mr. Richardson unfortunately exposes great ignorance alike of the character of the provisions pending before Congress and of the character and ability of the members of Congress, when he says, "Very few are aware how seriously the integrity of the system was assailed in Congress last winter, or how nearly the assault came to success owing to the ignorance of many members from the West and South with regard to its nature, purpose and influence."

The writer hereof fairly and correctly stated the convictions and desires of the friends of the proposed amendments to the law when before the Senate Committee in the first consideration (November 17, 1877) of the pending bill, he said: "I desire the committee to take my most solemn and earnest assurance that there is nothing in my personal ambition and convictions, in my professional or business connections, or in the purposes of those I represent, which would knowingly militate against the efficient and honest administration of a wise and equitable patent-system."

The object of this paper is to correct many of the misstatements of facts in the article alluded to, and to give the public a true and authoritative statement of these matters; to exhibit the plans and purposes of the association referred to; to explain the movement, the success of which will result in a somewhat radical amendment of the patent law; and, as space shall permit, to offer some general suggestions in point.

It would be silly to reproduce here many of the foolish and absurd objections to the patent-system and the present laws to which, it is believed, dignity is for the first time given by our author. The article contained however, in addition to the above quotation, the following misleading statements: "The opponents of the patent-system assert that it is no part of the duty of the state to advance the arts; * * * that patents do not encourage inventors either to make or to publish their inventions." Of course this is arrant nonsense. It may be entertained by a few people, for there are many who have no competent understanding of the principles of the patent law. But to charge the promotors of the movement for amending the law with such sentiments is a flagrant example of ignorance and injustice.

In the same connection we read: "Many large users of patented inventions—railway

companies, for example—find it unprofitable to do without, and very burdensome to pay for, the inventions they need." This contains a grain of truth, yet is in spirit contrary to the manifest interest and to the actions of all large users of inventions—railway companies included, and is strangely inconsistent with their uniform practice of encouraging inventions. The President of the Chicago and Alton Railroad Company, in a sworn statement to the Illinois Commissioners (their report 1874, p. 30), says that the amount of patent royalties paid by his company is *at least* seventy-five thousand dollars *per annum*. It is in one sense burdensome to pay any such sum even for a railroad company; yet this cannot be truthfully contradicted that all large users of patents are willing at all times to pay *reasonable* royalties for valuable improvements.

Our author further says, "In justice to our inventors and manufacturers it must be said that opposition to the patent-system very rarely comes from them. That ungrateful work is almost entirely monopolized by the railway companies, or rather by a few of them." *Per contra*, inventors, manufacturers or railway companies neither make opposition nor desire to have opposition made to the patent-system. What they each and all desire is simply just and carefully considered amendments to some pernicious provisions of the present law; and the movement now near its successful end to secure the same by Congress was in fact commenced, and for months conducted alone by the inventors and manufacturers of agricultural implements.

In the same connection we read: "Not satisfied with boldly invading inventors' rights, they have the assurance to appeal to Congress for an amendment of the patent law which *shall put inventors completely under their thumbs.* Foremost in this effort has been the Western Railroad Association, the temper of which is *fairly* illustrated by the cool avowal of one of its prominent members that 'whenever our attention is called to a patent of value we use it, and in a few cases we are made to pay by plucky inventors, but in the aggregrate we pay much less than if we took licenses at first.'" (The italics are mine.)

This statement is utterly, unqualifiedly, and absolutely false in every particular. That a writer of the acknowledged ability and integrity of Mr. Richardson should be led into such a statement is, perhaps, the fault of the manufacturers and railroad officials, in that they have not thought it necessary to refute the slanders which have appeared in the public prints now for a considerable time. A fair sample of these slanders is the one quoted by Mr. Richardson as above. That statement was charged upon the "prominent member," etc., by name, by Mr. A. H. Walker, the representative of the Tanner Brake speculation, in his speech before the House committee. That official gives the present writer an unqualified denial that he ever entertained or gave utterance to any such "avowal," and Mr. Walker admits to the present writer that he never saw the official or a written word from him, but made the statement on hearsay information.

There is, doubtless, a strong public sentiment against the "whole patent-system," which has excusably grown out of the administration of some unjust provisions of the present law. Some of those who have suffered by such provisions petition Congress for amendments thereto. Those who are taking advantage thereof characteristically respond with willful misrepresentations of the purposes and propositions of the petitioners, and by easy means fill the press and the air with such false statements. They go for a time uncontradicted, and are believed by members of the bench, bar, and press, and by others. The petitioners, however, are confident of the justice of their propositions, and that, as enacted law, these amendments will not only prove their own justice, but will absorb and destroy the public sentiment above referred to, and thus do to the patent-system a very great service, instead of injury, as charged. Notwithstanding this, an association for any purpose of more than eighty railroad companies, operating more than thirty-three thousand miles of road, is a matter of public interest, and, under these circumstances, its objects should, perhaps, be fully explained; and like all other proper institutions of any public concern, it will profit by the explanation.

The questions arising under the patent law every time an improvement is presented for introduction or a claim is presented for past use, are *sui generis* and of great difficulty, with which the general solicitors and other officers of railroad companies are not always competent to deal, on account of the lack of special experience and study in that direction. The Western Railroad Association was re-organized in 1874, prior to

which time its members had paid millions of dollars for claims which had no real foundation, either in law or in fact, and had been in the habit of paying reasonable royalties for improvements without any reference as to whether they infringed other patents. The members perceived the importance of having the patent relations of any new improvement thoroughly investigated, when, after years of use of a device upon which patent a royalty had once been paid, one, two, three, and, in some instances, four or five other claims were presented for the infringement by the same device of other patents than those under which the device had been introduced.

Out of about fifty million dollars of litigated claims which the Association, through its officers and attorneys, is now defending, hardly one dollar is based upon any device upon which the defendants have not paid at least one patent royalty.

The objects of the association are twofold: namely, first, to examine the patent relations of any device desired to be used, that the full liability of the member may be settled at once and in advance; and, second, to pass upon any claim that may be presented for the past infringement of a patent.

One of the rules of the association—the one most earnestly insisted upon—is that no new device, whether invented on the road or presented by others, shall even be experimented with until its patent relations shall have been first, as far as possible, ascertained.

It is necessary that railroad companies should make settlements for the use of patents in advance, for three reasons; first, the prices that under the law are charged after the infringement (independent of plenary damages and of costs) are such that the use of the improvement would not only be of no advantage to the infringer, but prove to be of great loss and disadvantage; second, if settlements are made with the owners of patents, with little regard to the rules of law and simply upon commercial principles, a settlement before the infringement can be made more satisfactorily than one after the claim has accrued. Third, it is an unfortunate fact that some in authority consider railroad property as not at all sacred, and not even analogous to private property in its rights, but simply a public crib to be plundered by any who can safely do so under the form of law; and that in controversies a corporation, and especially a railroad corporation, wages an unequal warfare, having to contend with strong opposing prejudices. This is especially true of patent litigation against railroad companies.

The railroad companies have suffered severely on account of these general and special prejudices which always work against them, and even now, with the most efficient means possible for examining these claims, are forced to give the claimants the benefit of every possible doubt, and to pay thousands and thousands annually to escape the grasp of the law.

It is a matter of congratulation both to patentees and to railroads, that in five years when an improvement has been by this association recommended to be used upon settlement under this, that, or the other patent or patents, so far as the writer can learn the recommendation has, with one single exception, been acted upon in every instance, and in no single instance has a claim been subsequently presented for such use. Only four new subject matters have been in those years put into litigation, and the cause of action in them arose prior to the reorganization of the association.

When a claim for past infringement is referred by a member, it is thoroughly examined, its weak points ascertained and if without foundation settlement is refused; and in every instance save one (in which prudential reasons prevented) the *main reasons* for the refusal have been given frankly to the claimant. These reasons have been so conclusive that out of the hundreds of claims that have been so refused, not one claimant has yet found any one to commence suit under his claim. When the claim is a doubtful one or clear, compromises or settlements are effected accordingly. The writer hereof paid for one such claim about forty-five thousand dollars.

Lack of space excludes further details. In concluding this part of our paper we appeal with the greatest confidence to each and every practitioner before our association (excepting only the representatives of the Tanner Brake patent) to sustain fully the assertion of one of our Federal judges to the effect that the association is of as great benefit to the owners of valid patents as to the railroad companies.

Concerning the specific provisions of the bill, which will probably be enacted by the present Congress, the most thorough examination by every one competent therefor is earnestly desired. A review of them in this connection must be but cursory.

I. A large number of suits were commenced in 1876, the cause of action in which accrued about 1855. A reasonable statute of limitations is desired.

II. A decree has been entered against the Chicago and North Western Railway Company for the infringement of a patent (the principle of which is alleged to have been infringed by the use of another subsequently patented device upon which a royalty had already been paid), which decree fixes, if fully sustained, the liability of that company therefor at *about twelve hundred thousand dollars*. The rule of recovery in equity patent litigation as now understood is confessedly absurd and unjust. The rule substituted is that the commercial value of the invention is to be determined by a reasonable number of applicable business transactions under the patent, plenary damages and expenses of suit to be added at the discretion of the Court.

III. The provisions of the law allowing re-issues of patents on account of accidents or mistakes in the original issue are much broadened and a reasonable limitation of time within which such re-issue may be had is added, in order partially to prevent re-issuing patents, so as to cover subsequent inventions; and the retroactive character, in two respects, of re-issues is taken away.

IV. A provision for taking testimony *in perpetuam*, most carefully guarded, is introduced. The provisions of the general law in this regard are not applicable in patent cases.

V. Proceedings to annul invalid patents are provided for.

VI. A very large proportion of the patents now alive are useless as practical devices, and are useful only as the basis of infringement suits. Two fees, one at the end of four years of $50, and the other at the end of nine years of $100, are provided for, non-payment working a forfeiture in order to get rid of the many patents whose lives are not worth these amounts.

VII. The writer paid over $40,000 for patent licenses destroyed in the Chicago fire, the existence of which was admitted but the contents of which could not be proved, because the law, although allowing all other patent grants to be recorded in the Patent Office, did not admit licenses. The bill corrects this.

Many of the provisions of the bill are purely in the interest of additional facilities to the inventor, and all the provisions not enumerated above are unquestionably as much in the interest of patent owners as of infringers. It is a significant fact that while each one of the twenty-five sections of the bill was bitterly opposed when first suggested (they have since been modified and improved in form), the able representatives of a pool of patent owners, organized for the purpose of opposing this bill, have since acceded to the justice and propriety of each of these provisions, with some verbal alterations agreed upon since the bill was reported.

Space remains briefly to notice but two of the general matters in the article so often herein referred to. In discussing the right of property in the intellectual production of the inventor, our author says: "The inventor's monopoly infringes no man's rights; it diminishes in no wise the world's store of common possessions; it simply recognizes the patentee's exclusive right to control something which he has discovered or created—something which the world had not before him, and might never have had, except for him." This has a shadow of truth in it, and for one out of say twenty thousand patents, is literally true. Yet, as applied to the generality of inventions, these statements are almost unmixed errors. The host of minor improvements would be made if the inventor did not receive the arbitrary protection of the constitution and the law, and would be common possessions. The fallacy of all such statements is apparent in the fact that in every line of invention the important, as well as the unimportant improvements are very frequently made by different separated persons at about the same time. The art demands the improvement and the supply is simply a question of the ingenuity of the artisans. It is only so far as the patent law fosters and develops the natural ingenuity of the people to supply the wants of our growing civilization, that it has any foundation in right, reason or public policy; and the patent law is not based upon any natural or ethical right on the part of the citizen to the selfish exclusive enjoyment of the products of his brain.

A patent *does* create rights which the inventor otherwise would not have. It is *primâ facie* evidence that its owner has an exclusive property right to all that is claimed therein, and it shifts on to the public a heavy burden of proof to destroy beyond a reasonable doubt the claim upon which the government has put its broad seal.

It is a matter of difficulty to treat with

the respect which their source demands the strictures of Mr. Richardson upon large uses of patented appliances, as, for example, farmers, manufacturers, and railroad companies. His ignorance of the facts should be the excuse for his intemperate language. Given the facts that you cannot lift up your foot and put it down again, or buy the simplest tools the market affords for tilling an acre of ground, or for making the simplest articles of consumption, or drive a nail into a railroad car, without coming against patents and patents; that at least eighty per cent. of all the patents issued are of value to the patentee only as they are used by others; and that more than ninety percentum of the infringements of patents for which claims have been made have been innocent by reason of ignorance on the part of the infringer:—yet you find that when, after such ignorant use the claim is made, if the alleged infringer has the ability and the disposition to investigate the claim, and under advice of counsel refuses to entertain it, he is classed as a "chicken thief" or a "pickpocket."

The writer gives this public and authoritative statement that the facts in the above case are mild in comparison to those which have characterized each and every one of the claims which have been refused by the members of the Western Railroad Association. It is deeply to be regretted that the people at large, by reason of the great variety in avocations and trades, are not enabled by associations and otherwise to give these claims a just investigation, but are obliged so frequently to be subjected to the blackmailing of "patent sharks," who present frivolous and invalid claims.

TOPICS OF THE TIME.

Religion in These Days.

MAN'S place in nature has never been so sharply and profoundly questioned as it has been during the past ten years. The answer which science presumes to give, when it presumes to give any, is not one which pleases or in any way satisfies itself. "Dust thou art and unto dust shalt thou return." Matter and force have manifested themselves in man, in form and phenomena, and the matter and force which have made man shall at last all be refunded into the common stock, to be used over and over and over again, in other forms and phenomena. There is a body, but there is no such thing as mind, independent of body. The dualism of constitution in which we have believed, and which lies at the basis of all our religion and philosophy, is a delusion. Out of all the enormous expenditure of ingenuity, or of what appears to be, or seems like, ingenuity, nothing is saved. The great field of star-mist out of which our solar system was made has been hardened into planets, set in motion and filled with life, to go on for untold ages, and then to come to an end—possibly to become a field of star-mist again; and nothing is to be saved out of the common fund of matter and force that can go on in an independent, immortal life. Man is simply a higher form of animal. God as a personality does not exist. Immortality is a dream, and the Christian religion, of course, is a delusion.

These conclusions seem to be the best that science can give us. Science believes nothing that it cannot prove. There may be a personal God, who takes cognizance of the personal affairs of men, but science cannot prove it; therefore a belief in a personal God is "unscientific." There may be such a thing as the human soul—a spirit that has a life, or the possibilities of a life, independent of the body; but it cannot be proved. Indeed, it seems to be proved that all the phenomena of what we call mind are attributable to changes that take place among the molecules of the brain. Therefore, a belief in the human soul is unscientific. Of course, if there is no human soul, there is nothing to save, and if there be nothing to save, Christ was, consciously or unconsciously, an impostor; and the hopes and expectations of all Christendom are vain. And this is the highest conclusion to which science seems to be able to lead us. Can anything be imagined to be more lame and impotent? We should think that every laboratory and every scientific school, and every library and study of a man of science, would seem like a tomb!

That this attitude of prominent men of science toward the great questions that relate to God, immortality, the nature of the human soul and the Christian religion, has sadly shaken the faith of a great multitude, there is no doubt. Society is honeycombed with infidelity. Men stagger in their pulpits with their burden of difficulties and doubts. The theological seminaries have become shaky places, and faith has taken its flight from an uncounted number of souls, leaving them in a darkness and sadness that no words can describe. All this is true. It is so true that tears may well mingle in one's ink as he writes it; but, after all, we have everything left that we have ever possessed. Nothing is proved against our faith. Science has never proved that there is no personal God, no soul, no

which he has carried out his design of the "Medallic History of the United States of America, 1776–1876."* The first of the two sumptuous folio volumes consists of text descriptive of the eighty-six public medals which have been issued during the century; the second contains 170 etchings, the size of the originals, by the well-known artist Jules Jacquemart. The paper was made in France especially for the work, and the impressions from the etchings were made there. The elegant letter-press is by Francis Hart & Co., the printers of SCRIBNER'S MONTHLY and ST. NICHOLAS.

The history of American medals is by no means a connected history of the country, as Congress has shown little system or sense of proportion in their issue. Lieutenant Colonel de Fleury, "a French gentleman in the Continental Army," receives a medal for gallant conduct at Stony Point, while La Fayette, although he gets a sword, is not awarded a medal; and only two public medals commemorate the civil war, one being given to U. S. Grant, then a major-general, for victories, and another to Cornelius Vanderbilt, in acknowledgment of his gift of a steamship.

The medals themselves vary greatly in merit. Some are real works of art. The latest are decidedly the worst, and the height of vulgarity in design is reached in the Cyrus W. Field medal and the reverse of the medal to Peabody—the lettering of the latter looking as if it had emanated from a third-rate job-printing office. All conscientious work of the kind done here by Mr. Loubat and his "collaborateurs" (as "L'Art" calls the artist, the printer and the paper-maker of the "Medallic History") is sure to have good results indirectly as well as directly. These volumes will call attention to the art of design for both medals and coins, and will no doubt hasten the day when the metal currency of the United States will represent its culture, and not its "chromo civilization."

"L'Art."

IN the latest volume of "L'Art" (J. W. Bouton, 706 Broadway) the editors have been still drawing largely upon the treasures of the International Exhibition for illustration. The first pages are devoted to the historical exposition of ancient art in the Trocadéro. Next we find an illustrated account of the last Royal Academy of London (including examples of Boughton, Hennessy and others), and next a full-page lithographic reproduction of "Le Troupeau de Moutons," by J. F. Millet,—monumental in its simplicity and touched with that large and natural pathos which only the greatest and most virile poets can convey in words. Some drawings of Delacroix follow this. The number contains, among other things, pictures from the Grosvenor Gallery, an etching by Achille Gilbert, from one of Franz Hals's finest portraits, and some reproductions of Velasquez—two masters whose influence is so great upon the rising generation of painters.

The American department is represented by reproductions of the following works: Elihu Vedder's "Cumean Sibyl" and "The Young Marsyas"; Winslow Homer's "Sunday Morning in Virginia"; J. G. Brown's "The Passing Show"; Clementina Tompkins's "Rosa la Fileuse"; J. McL. Hamilton's "Cerise"; F. A. Bridgman's "Funeral of a Mummy on the Nile"; Wyatt Eaton's "Reverie," and "Harvesters at Rest"; W. G. Bunce's "Approach of Venice"; Arthur Quartley's "Morning Effect in New York Harbor"; Edgar M. Ward's "The Sabot Maker"; T. Hovenden's "A Breton Interior"; Walter Shirlaw's "Sheep-shearing in the Bavarian Highlands"; George Inness's "View near Medfield, Massachusetts," and H. R. Bloomer's "Old Bridge at Grez." The ignorance of American painters,—those represented in the exhibition and those not represented,—shown by the writer of the accompanying letter-press is not counterbalanced by any special insight. A much more careful critic than is Mr. Charles Tardieu, might mistake for originality the mere imitation of something with which the critic is not familiar, but the over-estimation of a really commonplace work is not so unfortunate as the under-estimation of work that is unusual, not on account of its subject, but of its artistic strength.

* For sale by J. W. Bouton, New York.

COMMUNICATIONS.

Conscience and the Patent Law.

WASHINGTON, D. C., Dec. 30, 1878.

SIR: The article of Mr. J. H. Raymond on "The Amendment of the Patent Law" in the January number of your magazine, has very lately come to my knowledge. In order that your readers may be enabled to put a just estimate upon its assertions, I request that you will present them with a few words from Mr. Raymond, spoken before the Senate Committee on Patents, to be found in a document printed by order of the Senate, a copy of which I send you. On page 111, Mr. Raymond says:

"Within the last six months I applied for a patent in the Patent Office for a peculiar device, and reference was given to a patent for the same device in an attachment of thills to a wagon, constructed in exactly the same manner, without any qualification, producing exactly the same results—this being one in a railroad-switch. I said to my friend, 'You ought not to have any patent, but I think I can get you one; I will try.' I prepared a brief, and sent it to the examiner. The examiner then sent me another reference of the use of the same thing, producing the same results, in exactly the same manner, in a sulky for a race-course."

Senator Chaffee: "Still they issued another patent?"

Mr. Raymond: "They issued another patent in another class. The examiner in one class probably did not happen to see this prior patent for a sulky for a race-course in another class. I cannot explain how it happens, but I am stating a fact that happened within the last three months. The second time being referred to this identical thing producing identically the

same results in another connection, I wrote another brief and sent it to the examiner. I will not give the argument that I used before him. There was no sense or reason in it in the world."

Senator Chaffee: "Then you were not very scrupulous?"

Mr. Raymond: "No, I am bound not to be, in securing and protecting all the rights the law may give my client. But I will pay my respects to that idea in a moment."

Senator Chaffee: "Is that the case with all the rest of the patent lawyers?"

Mr. Raymond: "Yes, sir; with every one of them, without a single exception, in my opinion. But I sent my brief on and got a patent on the railroad-switch. Now as to the suggestion of Senator Chaffee: I came, two years ago, to the conclusion that there was no logical sequence following through the patent law from the commencement, nor yet was there a great deal of conscience in it. Of course there is conscience in the practice of patent law. A man came into my office the other day who had no claim in the world in law. He had in fact and morally a claim. He had been swindled out of a monopoly of a very valuable invention which we wanted to use. I gave him a hundred dollars, simply because he did not have money enough to get out of town. In another case, a man comes in with a case against us which he ought to maintain, but which some technicality of the Patent Office gives us a right to use. I know of no other basis, and there is no other basis, than that the law said thus and so. My conscience in patent matters is the patent statute enacted by Congress, and I cannot substitute anything else. If a man has a legal claim against us (as in one instance that comes to my mind, where there was not the first shadow of a moral right), if the law gives it to him, I say, 'You have a claim'; and in the case to which I refer I paid $34,000 where, morally, the man had no claim at all. Another man comes in to whom I ought to pay $40,000 on conscientious grounds, but I say, 'The law does not give it to you, and I cannot give it to you.'"

In my observation a man who avows so complete a want of moral principle and attributes the same to all his associates, is never worthy of confidence.

If the eighty-one railroad corporations which Mr. Raymond claims (page 116) to represent have no more soul or conscience than their representative, can there be any doubt that they are ready to assault the barriers of justice, and crush with their combined power every interest they may regard as standing in their way? Respectfully yours,

GARCELON.

THE WORLD'S WORK.

New Forms of Electric Lamp.

AMONG the many new appliances for creating the electric arc between the ends of carbon rods may be observed one or two of some interest. One of these employs two carbons standing erect in hinged brackets, or holders, so arranged that when unsupported the carbons fall together and rest one against the other in the form of an inverted V. In the center, between the carbons, is an upright rod made of some refractory material like kaolin. This is supported at the base by a horizontal lever, the shorter arm of which makes the armature of an electro-magnet. When the apparatus is at rest the weight of the upright rod causes it to fall, lifting the armature from the magnet and permitting the carbon rods to touch each other. On passing a current through the lamp the magnet is excited and the armature is pulled down and thus pushing the rod upward between the carbons and thrusting them apart. This separates them sufficiently to cause the electric arc to spring up between them. The kaolin rod melts away in the heat as fast as the carbons are consumed and the light is maintained somewhat on the principle of the familiar electric candle. If the current decreases in strength the armature of the magnet is released and the rod falls, permitting the carbons to come together again and re-establish the light. Another form of lamp employs two carbons, one standing upright and the second supported by a lever leaning against it. One arm of the lever forms the armature of an electro-magnet, and in action the second carbon is alternately permitted to fall against the upright carbon and then pulled away by the action of a spring somewhat after the manner of a "chattering" electric bell. This vibration of the carbons is so rapid that, to the eye, the quivering light is practically continuous, and appears to be steady. Another form of vibrating lamp has two carbons placed one over the other in a vertical line, the lower carbon resting on a lever that forms the armature of a magnet. Still another form of lamp, and one said to be much more successful in general practice than either of these, employs four carbons, two placed in the form of the letter A and two inverted like V, the four making the figure X. The light is maintained at the junction of the four carbons. The rods are held in cups connected by cords with weights that keep them adjusted to each other and in the best position for maintaining the light. An electro-magnet is also used with this lamp. The advantages found in this lamp are steadiness in the light and ease of adjustment, as a carbon can be replaced when burned out without extinguishing the lamp.

In the search for an electric lamp of moderate power, attention has already been drawn to the fact that a strip of metal or carbon inclosed in a glass jar charged with nitrogen and brought to incandescence by an electric current will give a good electric light. Hitherto, experiments in this direction have not been wholly satisfactory. More recently this field has been investigated with better results, and a new electric lamp and an improved system of electric switches have been brought out that present some features of interest. The lamp is designed for domestic use, and gives a light varying from a faint cherry red to sun-like whiteness, and developing at its brightest a light equal to 27 candles. In shape and size it resembles the chimney of an argand burner. The lamp is divided into two parts, the electrical apparatus and a hermetically sealed cylinder charged with nitrogen. This cylinder is a heavy glass tube closed at the top, and having a thick glass base accurately fitted to the bottom, and having two openings for the electrical connections. Within the cylinder are two long