power of any conductor is only the power of its smallest part. Perfect safety demands that the capacity should be maintained at its maximum throughout the system.

Leaving to individual judgment the best method of fulfilling these conditions, we may say that they are seldom complied with, and that they are found lacking in every instance where damage is occasioned by the lightning stroke. Such a system as we have described entails so much expense, that remote though possible contingencies are accepted rather than to incur the outlay. If connection of a rod with the earth be broken it is useless, and in many cases is indirectly a source of danger.

Rods do not attract lightning from the clouds; they only dispose of it when it comes within the sphere of their influence.

MASSACHUSETTS SHOEMAKERS ON THE TAXES.

A protest has been issued, signed by a large number of the leading shoe manufacturers of Massachusetts, including Lynn, Boston, Haverhill, Marblehead, Worcester, and Beverley, against the tariff and other taxes upon leather and shoe findings.

The protestants state that of late years there has been an increase of twenty-five per cent in the productive power of a given amount of capital and labor, due to the good effects of improved machinery and processes; but this gain is completely nullified by the taxes, so that they are unable to furnish boots and shoes any cheaper than formerly.

They further allege that, while the revenue, received by the government from all the taxes on leather and products used in their business, amounts to only three millions five hundred thousand dollars, the actual tax imposed upon the manufacturers of boots and shoes is eighteen millions of dollars per annum.

"The legislation of our own country has driven our products from the markets of Canada, Mexico, the West Indies, and South America, which we had enjoyed for more than a century. It has transferred the manufacture of our products to a great degree to Canada, where it enjoys greater advantages, and is subject to fewer impediments, in the prosecution of business. Thus, our country has, to this extent, lost the benefits of this industry, and given her wealth to others, though a system of tariff taxation, professedly framed to foster and encourage American industry, but which expels it from America and increases the wealth of other nations.

"In addition to the direct influences of the tariff upon our production, the system of protective duties indirectly imposes grievous burdens upon it by increasing the cost of our buildings, engines, machinery, tools, and supplies, as well as railroad transportation. It raises the prices of house rent, fuel, food, clothing, and all supplies, so as to render extravagant wages a necessity to our workmen. This apparent increase of wages, however, yields no substantial benefit to our workmen, because it is all consumed in the enhanced cost of living.

"We believe that an entire removal of all protective duties would greatly advance our industry, as we should then have the markets of the world in which to sell our products, thus largely increasing the labor employed and the profits of manufacturing. We, moreover, believe that the enhanced wealth and comfort of our own people, consequent upon a change of system, would be evidenced in an increased consumption of our goods. A reduction in the duties levied upon the articles used in our manufacturing, is demanded by the interests of all capitalists and laborers engaged in the boot and shoe industry.

It is but just and reasonable that the views of representative men in the business should be carefully considered by the next Congress, and proper relief granted. In the value of its product, and the number of hands employed, the boot and shoe interest is larger than any other single industry in the country.

COLOSSAL BRONZE BUST OF WASHINGTON IRVING.

It will be gratifying to many of our readers to know that a bust is to be erected to the memory of the great author, in Prospect Park, Brooklyn, and still more, to learn that the work has all been done in this country. Heretofore, nearly all the bronze work erected in the United States has been done in Germany or France. The founderies which we have established within the past few years, render it no longer necessary for our sculptors to send their works abroad; we have skilled artisans equal to any in the world in nearly every department of mechanics.

This colossal bust of Irving was modeled by the well known sculptor, J. Wilson Mac Donald, 161 Fifth Avenue. It is the head and shoulders only, and is many times larger than life. The pedestal, which is of granite, and the head render the whole work fourteen feet high. It is pronounced by the friends and relatives of the great story writer to be an admirable likeness. The bust was cast at the foundry of Maurice J. Power, in East 25th street, in this city, and reflects great credit upon his establishment. The metal is very rich, and the finish quite artistic.

The work is to be unveiled in Prospect Park, the day we go to press, June 24th, with appropriate ceremonies. Henry Ward Beecher is to deliver the oration, and the sculptor is to unveil the bust.

The bronze is erected at the expense of Hon. Demas Barnes, one of Brooklyn's most prominent citizens.

THE writer of the "Card," signed "Fides," in another column, page 14, is known to us to be a responsible person, and the gentleman for whom the situation is wanted has been long and favorably known at this office.

SCIENTIFIC INTELLIGENCE.

WATERPROOF GLUE.

Ordinary glue can be rendered insoluble in water by adding to the water, with which it is mixed when required for use, a small quantity of bichromate of potash, and exposing the articles to which it is applied to the light. Chromic acid has the property of rendering glue and gelatin insoluble, and, as the operation of heating the glue pot is usually conducted in the light, no special exposure of the articles to which it is attached need be made. It is probable that paper could be rendered impervious to water by pasting the sheets with this prepared glue. The bichromate is said to render rubber particularly hard and unattackable by hot water. The chromated gelatin ought also to be tried on parchment paper, wood, leather, and cloth fabrics. The proportion of bichromate to be taken must be ascertained by experiment; for most purposes one fiftieth of the amount of glue employed will be found to suffice—that is, one pound of dry bichromate of potash to fifty pounds of dry glue.

Many applications of waterproof glue will readily suggest themselves to our readers. The Albert photographic process is founded upon this property of gelatin, and billiard balls, buttons, and ornaments are now largely made of the chromated glue.

HOP REFUSE FOR PAPER.

A large paper manufacturer near Marseilles, France, has sent agents to the various hop merchants of the Continent to purchase the waste of hop vines for the purpose of mixing it with other stock as a substitute for wood and straw. The fiber is said to be strong, and well adapted for paper. The process by which the raw material is worked up is kept as a trade secret, but it cannot materially vary from the treatment to which wood and straw are now subjected. As hop raising has now become an important branch of agriculture in Northern New York and Canada, it would be well to take note of the French example and save the refuse for the paper manufacturer. Paper can only be made from waste with profit, and such material as wood, straw, seaweed, grass, cornstalks, hop vines, and the like, naturally fall into the the same mill with the rags so long used for this purpose. Cheap paper is associated with cheap books, and the latter with higher civilization and intelligence; therefore we hail with pleasure the introduction of any new material for its manufacture.

[Special Correspondence of the Scientific American.]

THE KELLY PATENT EXTENSION CASE.---ADDRESS OF HON. S. S. FISHER.---COMPETITIVE EXAMINATIONS.---FEMALE APPLICANTS FOR CLERKSHIPS IN THE PATENT OFFICE.

Washington, D. C., June 20, 1871.

The application of William Kelly for an extension of his patent for an "Improvement in the Manufacture of Iron," the same expiring by limitation on the 23d inst., has excited great interest, from the magnitude of the manufacturing establishments in which the process is used, and the capital represented by the parties applying for and those opposing the extension.

The case was argued before Commissioner Leggett on the 15th instant, Mr. George Harding appearing for applicant, and Mr, Franklin E. Felton for the opposition. Among the sixty-four remonstrants are the names of the most prominent financial and business men of the country—*e.g.*, J. E. Thompson, President of the Pennsylvania Railroad, Jay Gould, President of the Erie Railroad, Thomas A. Scott, President of the Union Pacific Railroad, H. J. Lombaert, President of the American Steamship Company, John W. Brooks, President of the Burlington and Missouri River Railroad, Nathaniel Thayer, of Boston, Jay Cooke, Samuel Sloan, James F. Joy, President of the Michigan Central Railroad, and Samuel M. Felton, President of the Pennsylvania Steel Co. On the same day with the hearing, the Commissioner decided in favor of the extension, the Examiner, Professor B. S. Hedrick, having also reported favorably.

Mr. Kelly's invention consists in "decarbonizing molten crude cast iron by running it into a vessel separate from that in which it is melted, and blowing through it blasts of air so as to burn out the excess of carbon." For the benefit of some of your readers, it may be well to state in a general way, without entering on more scientific and accurate details, that cast iron is the first product of smelting the ore, and that this contains about four per cent of carbon; by reducing this proportion of carbon to 1 or 1·5 per cent the product is steel; and by still further reduction, so as approximately to to remove all the carbon, we have pure or malleable iron. Steel may therefore be made by either eliminating the carbon from crude iron, or by adding carbon to malleable or bar iron, and both modes involve some form of chemical action. Among the different processes for reducing the amount of carbon is the so-called pneumatic, which, in a broad sense, is simply injecting, into and through the body of the molten iron, currents of air, the oxygen of which unites with the carbon and escapes. To whose inventive mind this valuable thought first occurred it is not easy to decide, and it was probably original with more than one individual. In Europe, Mr. Henry Bessemer, of England, appears to have been the first who successfully applied the pneumatic process, and his original patent was issued, both in England and this country, in 1856. The claim reads as follows: "The conversion of molten crude iron, or of remelted pig or finery iron, into steel or into malleable iron, without the use of fuel for reheating or continuing to heat the crude molten metal—such conversion being effected by forcing into and among the particles of a mass of molten iron, currents of air or gaseous matter, centaining or capable of evolving sufficient oxygen to keep up the combustion of the carbon till the conversion is accomplished."

Mr. Kelly's invention was considered by the Patent Office as similar to Bessemer's, and when his application was filed, in Nov., 1856, the parties were put in interference, Mr. Bessemer having just received his patent. The latter did not appear as contestant, and the interference was decided for Kelly. In 1854, Mr. Christian Shank filed an application for an air blast process, and in 1856 received a patent here; and in England, in 1855, Mr. Martien was granted a patent for a similar improvement in the manufacture, but it is evident from its action that the Office did not consider any of these as equivalents of Kelly's invention. And here it should be stated that Kelly in his patent disclaimed a broad application for blowing air into molten iron, but claimed only his method of doing it.

The opposition, however, contended that the above patent to Shank and also the patent to Martien fully covered Kelly's original claim, and that it should not have been allowed. The other grounds taken by those opposing the extension were that Kelly had not used due diligence in introducing his invention into general use; that the prolonged existence of the patent would be prejudicial to the public interests by reason of the onerous burdens imposed thereby on American manufacturers, and that the invention was practically useless and a failure. In proof of the last named argument, witnesses were brought forward to show that Kelly's process required the supplementary use of Robert Mushet's patent, which consists in introducing into the molten iron, at the proper moment, a triple compound of iron, manganese, and carbon. It was also argued that the British iron masters, being relieved from royalties by the expiration of the Bessemer and Mushet patents, would secure a monopoly of the American market.

Mr. Bessemer's and Mr. Shank's patent expired last year, and their applications for extension were refused, so that the Bessemer process of manufacture in this country is now covered only by the extended patent of Kelly. Five Bessemer steel works are at present in operation in this country, viz., at Troy, Harrisburgh, Johnstown, Penn., Cleveland, and Detroit, and a sixth is erecting at Chicago.

Mr. Bessemer is one of the financially successful inventors. Since the original patent of 1856, others have been granted him, and he is said to live in luxurious and princely style.

The Bessemer works in this country are all in the hands, directly or indirectly, of a company styled "The Trustees of the Pneumatic or Bessemer Process of making Iron and Steel," these parties having purchased the numerous patents of Bessemer, Mushet, and Kelly, and "consolidated their several interests for the purpose of avoiding all conflict of claims thereunder." These trustees are John F. Winslow, John A. Griswold, of Troy, N. Y., and Daniel J. Morrell, of Johnstown, Pa.

The late Commissioner of Patents, Hon. S. S. Fisher, has recently delivered an address in Cincinnati, before the Young Men's Christian Association, on his experiences as a bureau officer. It is an interesting and amusing "tale out of school," and gives one an agreeable peep behind the curtain, with a moral or two of practical moment to the country. Mr. Fisher gives a sorry picture of the working of the American mode of appointment and promotion in the civil service, and of the trials to which the heads of departments and bureaux are subjected. He strongly favors a system of competitive examinations, and a long tenure of office, and refers with satisfaction to the working of the plan which he himself adopted when Commissioner. Ample authority for the introduction of thorough pass and competitive examination was found in an Act of Congress, passed in 1853, and Mr. Cox, the Secretary of the Interior, was in favor of a reform. In referring to the retirement of Mr. Cox from the Secretaryship, Mr. Fisher says that it was unquestionably "due to the determined resistance of certain men to this work of reform."

Most of the present corps of Assistant Examiners passed one of the competitive examinations, and Mr. Fisher gives it as his opinion "that so intelligent and efficient a body of men has never before been seen in the Patent Office;" and that if a similar system were introduced into the other Departments, and rigidly adhered to, the number of employés might be reduced one third. The inaugurations of the examinations, when applied to those already holding places, caused a great flutter and commotion, and several resigned rather than face the ordeal. One man, to heapcoals of fire on the Commissioner's head, accompanied his resignation with the present of a small Bible, enclosing in it, on a slip of paper, the "Beatitudes" in Latin.

The number of female applicants for clerkships, even in the Patent Office, where only about sixty-five are employed, is greatly in excess of the males. As employées he highly recommends them. "Some of the lady clerks," he says, "had no equals among the gentlemen, and they and many of the men should have changed salaries."

Mr. Fisher's opinions on the subject of test examinations are worthy of all consideration, but it must be allowed that everything depends on the character of these examinations. To merely sift out the fools and ignoramuses by a few schoolboy questions, is a simple and eminently desirable operation; but to test the fitness of an applicant for a responsible position is quite another transaction, and the crucible is not so easily manufactured. Knowledge is needed of his character, and ability as displayed in positions already held, and other witnesses than himself must be consulted. Qualities and habits of mind and life need to be considered as of more value than scholastic attainments; but how is an examination of a few hours, as ordinarily conducted, to secure answers to such inquiries? For example, in applying a test for fitness to hold