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

the position of Examiner in the Patent Office, how useless must it be, unless it includes some mode of measuring the judgment and perceptive faculties of the applicant, as well as other qualities too subtle and fundamental to be weighed in the scales of a school text book! The Patent Office itself can furnish examples of abundant scientific and literary acquirement, and brilliant examination record, combined with a chronic and incurable inability to act sensibly and wisely as examiners. ‡

NARROW GAGES FOR RAILWAYS.

There are two classes of considerations which form the basis of opinion with reference to narrow gages for railways. The first includes commercial, the second, engineering, data relating to railways of this character already built and in operation.

Commercially considered, that kind of railway is the best which pays the best dividends. Those railways pay, or, in the hands of honest directors, will pay, the best dividends, in which the first cost, and the annual expenses of running and repairing, are least in proportion to the carrying done upon them. Narrowing the gages of many roads, built, building, and projected, would not reduce their carrying capacity below what they may reasonably expect their traffic to ultimately become, while it would reduce, more or less, the first cost of everything used, and lessen current expenses. This has been amply proved by experiment. There are, however, some roads that are now running nearly up to their capacity. Such roads cannot economically narrow their gages. Commercially, then, these roads are favorably regarded as affording a solution of how cheap yet sufficiently efficient railways may be built and operated with profit to their owners.

In an engineering point of view, all necessary to consider is—can these roads be practically and economically constructed and operated? Experience has answered "yes" in a most emphatic manner to this inquiry. It is therefore evident that the day of narrow gages has dawned.

The experiments with narrow gages have been principally confined to various parts of Europe and to India. Quite a number have been operated with a saving in first cost of thirty per cent, and a saving in running expenses of twenty-five per cent over that of the ordinary wide gage roads doing the same business.

One of the principal savings is in reduction of the wide disproportion of paying to non-paying weight existing on wide gage roads, estimated by Mr. Fairlie as being only one to seven in freight trains, and one to twenty-one in passenger trains running on wide gage roads.

The celebrated Festiniog railway, with two feet gage, carries three times as much in proportion to the weight of its cars as the best wide gages.

The public has the right to say something on this matter. The reduction of gages on passenger roads would greatly reduce the comfort of railway travel in its modern perfection. A violent protest against such reduction, on roads depending in great measure on passenger traffic, might be expected, while in parts of the country where cheap railways or none must be put up with, narrow gages would be hailed as affording faciilties for travel and freight traffic, of which they would be long deprived if they had to wait till four and one half feet gages would pay.

REMARKABLE FLOOD.—Papers from the Cape of Good Hope give accounts of a remarkable and sudden flood which has occurred at Victoria West. It is supposed to have been caused by the bursting of a water spout. In the space of two hours thirty houses were washed away and one hundred lives lost. The flood seems to have commenced at the farm of a Mr. Hugo, some distance from the town. His house, homestead, and stock were all swept away, his wife and all his children but one infant (which he managed to save by swimming with it in his arms), were drowned. He describes the scene as appalling beyond measure. First he and his wife heard a sound "like iron falling from the sky;" they looked out, and saw a huge black mass of cloud sweeping along the earth toward them; they caught up the children and rushed from the house, but it was too late, and everything was swept away in the torrent, save Hugo and his infant; even their escape was little short of miraculous.

COAL ON THE ISTHMUS OF PANAMA.—An unexpected and most important discovery of coal beds on the Isthmus of Panama, made three or four years ago, has recently been brought practically to public attention by a trial of the coal at Aspinwall. The result leaves no doubt whatever that the mineral is of excellent quality, superior to the Cumberland coal, and quite equal to the best Newcastle.

The coal beds lie on the River Indio, about thirty-five miles from Aspinwall.

AMERICAN POMOLOGICAL SOCIETY.—The thirteenth session of this institution will be held at Richmond, Va., on September 6, 7, and 8, of this year. It will be in conjunction with the exhibition of the Virginia Pomological and Horticultural Society. A long list of premiums, for the best fruits and wines of different classes is announced.

LAST OF THE NOVELTY IRON WORKS.—These once large and prosperous works are about to be closed out at receiver's sale. In their prosperous days they accumulated a great deal of first class expensive machinery. That which has not been previously sold will be offered at auction on the 6th July. See advertisement for particulars.

ALL the members of the royal family of Prussia are required to learn some trade; the present Emperor of Germany chose printing, and, it is said, spent three years at the case.

NEW BOOKS AND PUBLICATIONS.

AMERICAN CYCLOPÆDIA AND REGISTER OF IMPORTANT EVENTS FOR 1870. Embracing Political, Civil, Military, and Social Affairs; Public Documents; Biography, Statistics, Commerce, Finance, Literature, Science, Agriculture, and Mechanical Industry. Vol. X. New York: D. Appleton & Co., 549 and 551 Broadway. 1871.

This work is too well known to the reading public to require any remarks as to its general scope and character. The present volume does not give evidence of very wise discrimination in the selection of matter. At least, on such topics as we are in the habit of discussing, and with which we are most familiar, we find some very important things not referred to; while minor matters are afforded space. For instance, we find nothing regarding the Suez Canal, the Mont Cenis tunnel, the bridge at St. Louis, the operations at Hell Gate, the Hoosac tunnel, etc., while several comparatively unimportant engineering works are mentioned at greater or less length. In looking at other departments, we have some basis for a similar criticism. A work of this kind ought to be edited with ability and care, and while we do not wish to depreciate the value of this volume, we certainly think it might have been improved. The article on the Franco-Prussian war is a comprehensive and well condensed account of that remarkable conflict. The article, "Chemistry," is also a well edited one. The same may be said of "Astronomical Progress."

THE EYE IN HEALTH AND DISEASE: Being a series of short articles on the Anatomy and Physiology of the Human Eye, and its Surgical and Medical Treatment. By B. Joy Jeffries, Lecturer on Optical Phenomena and the Eye, at Harvard University. Boston: Alexander Moore, Lee & Shepard. New York: Lee, Shepard & Dillingham.

There is, perhaps, no organ in the human body more systematically and ignorantly abused than the eye. The book herewith announced aims to correct this abuse by the dissemination of reliable information relative to its physiology and functions. While written in so popular a style that the unprofessional may read it understandingly, it will be found a book capable of adorning a professional library. Our readers will be able to judge of its merits from some extracts we shall make from it, and also from extracts we have already published from the *Atlantic Monthly*.

LOCOMOTIVE ENGINEERING AND THE MECHANISM OF RAILWAYS. A Treatise on the Principles and Construction of the Locomotive Engine, Railway Carriages, and Railway Plant. With Examples selected from the International Exhibition of 1862. Illustrated with sixty large Engravings and numerous Woodcuts. By Zerah Colburn, Esq., Civil Engineer. Parts 18, 19, and 20. New York: John Wiley & Son, 15 Astor place.

These numbers complete this magnificent work, which, as a whole, is superior to anything before published upon the subject of locomotive engineering. The work has been so frequently noticed in our columns that we need not again enumerate its merits. It is a work that ought to find a place in the library of every engineer.

TROW'S NEW YORK CITY DIRECTORY. Compiled by H. Wilson. For the Year ending May 1, 1872. New York: John F. Trow, Publisher, 52 Greene street.

This standard annual appears this year in new type, and adds to its other merits, a new colored map of the city, including the whole island, marking all the changes in street openings and in the two water fronts. It is a very large volume, and has evidently been prepared with the greatest care. It contains 200,953 names, and the labor required to canvass the names and residences of so large a number, and arrange them alphabetically, is a task that is not easily appreciated by the inexperienced.

SIGN WRITING AND GLASS EMBOSSING. A Complete Practical Illustrated Manual of the Art. By James Callingham. To which are added numerous Alphabets. Philadelphia: Henry Carey Baird, 406 Walnut street. Price, $1·50, by mail, free of postage.

Like all the works published by Mr. Baird, this is an eminently practical one, giving the plainest instructions and directions in regard to the art which forms the subject of the treatise. Judging from the sad want of anything like artistic design in the average sign writing we daily meet with, the work should find a large demand in this country.

TRANS-MISSOURI STOCK RAISING; the Pasture Lands of North America, Winter Grazing, etc. By Dr. H. Latham, late Surgeon N. P. R.R. Omaha, Neb., *Daily Herald* Steam Printing House.

This is a pamphlet, describing the vast region lying between the Arkansas on the south, British Possessions on the north, the one hundredth meridian on the east, and the summit of the Rocky Mountains on the west, where cattle and sheep graze out the entire year, without other food or shelter than is naturally afforded.

AMERICAN NEWSPAPER DIRECTORY. Containing Accurate Lists of all the Newspapers and Periodicals Published in the United States and Territories, and in the Dominion of Canada and British Colonies of North America. Together with a Description of the Towns and Cities in which they are Published. New York: Geo. P. Rowell & Co., Publishers and Newspaper Advertising Agents, 41 Park Row.

Those who have much advertising to do will find this book a valuable and reliable guide.

THE PARENT'S GUIDE; or Human Development, through Inherited Tendencies. By Mrs. Hester Pendleton. Second Edition. Revised and Enlarged. New York: S. R. Wells, Publisher, 389 Broadway.

This book is written with a good motive, and will do good. It tells many plain truths. Doubtless it contains some errors that the physiologist would point out, but the chief purpose of the book will not be defeated by them.

TILL THE DOCTOR COMES AND HOW TO HELP HIM. By Geo. H. Hope, M.D. From the Fifth London Edition. By a New York Physician. A Complete Manual of Directions in Cases of Accidents, indispensable to every Household. New York: G. P. Putnam & Sons.

A very readable, as well as useful, little book, one that will keep people from useless tinkering, and guide them correctly, till medical aid can be called.

THOUGHTS FOR THE YOUNG MEN, AND THE YOUNG WOMEN OF AMERICA; or, a few Practical Words of Advice to those Born in Poverty and destined to be Reared in Orphanage. By L. U. Reavis, St. Louis, Mo. New York: S. R. Wells, 389 Broadway.

A good timely, thoughtful, and morally healthy book. Any young man or woman will be the better for reading it.

HISTORY OF SPRINGFIELD, ILL. Its Attractions as a Home and Advantages for Business, Manufacturing, etc. Published under the auspices of the Springfield Board of Trade. By J. C. Power, Springfield, Ill. State Journal Print.

The facts this report contains, shows the home of the late President Lincoln to be the center of large manufacturing establishments, which probably accounts for our large subscription list from that place.

ECLECTIC MAGAZINE. W. H. Bidwell, Editor, Proprietor, and Publisher, 108 Fulton street, New York.

The July number is at hand. It is unlike any of the other monthlies published in this country. Its contents are made up mostly of selections from other home and foreign periodicals, thus forming a cyclopædia of varied literature of the best kind.

ATLANTIC MONTHLY. James R. Osgood & Co., Publishers, Boston, Mass.

The July number is just out, and its list of contents is varied, and indicative of its sustaining its past popularity.

AMERICAN EDUCATIONAL MONTHLY. J. W. Schermerhorn & Co., Publishers, 14 Bond street, New York.

A magazine of popular instruction and literature; a magazine of special interest to teachers. $2·00 per annum.

VENTILATION OF THE CAPITOL.

Hon. T. A. Jenckes will please accept our thanks for a copy of the Report of the Joint Select Committee on the above subject.

WE are in receipt of the Second Annual Report of the Bureau of Statistics of Labor of Massachusetts; embracing the account of its operations and inquiries from March 1, 1870, to March 1, 1871. Boston: Wright & Potter, State Printers. It is an important and valuable document.

No. 5 of the *Workshop*, published by E. Steiger, 22 and 24 Frankfort street New York, is one of the best of this excellent repertory of design we have seen. Besides the usual collection of rich designs, it contains an excellent article, "Heliography as a branch of Art Industry," which alone is worth the price of the number.

Queries.

[*We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.*]

1.—CRUDE TARTAR.—Having some crude tartar, I would like to know the best way to clarify it.—McA.

2.—BALLOON VARNISH.—What is the best varnish for a silk balloon? How obtained or prepared and applied?—H. W.

3.—STENCILLING.—I want a solution, say of rubber, for instance, that can be stencilled on hard metal and will not rub off easily, but will present a hard surface when dry, and dry quickly, yet can be got off easily, say by soaking in water or an alkali for a short time. I suppose it will have to be rather thick and not *runny*, for stencilling.—P. H.

4.—BOILER PIT.—I have a boiler pit, six feet deep, sides and bottom of which are brick, laid in cement. In rainy season it lets in water badly. Can I plaster or paint it with anything to make it water proof, and thus save the labor of pumping?—E. H. H.

5.—CONE PULLEYS.—I want a rule for constructing cone pulleys, so that one length of belt will fit each pair on the cones.—H. G. L. & A. W.

6.—PLEASURE BOAT.—I want a rule for shaping or drafting a pattern for the knees of a small pleasure boat.—C. D. M.

7.—BEVEL GEARING.—What is the best mode to gear and ungear a bevel pinion on top of a shaft turning a horizontal drum shaft, and having a drum below the pinion, the driven shaft being perpendicular? I wish to alternate and run first one and then the other. Can it be done without stopping the shaft? and how?—W. McW.

8.—CHESTNUT AND HEMLOCK TIMBER.—In this village, on a contract for chestnut scantling of good quality, for stringers or bed timbers for sidewalks, at double the price of sound hemlock, the trustees accepted and used worm-eaten timber, which has given dissatisfaction and rise to the question of the comparative durability of such timber with young, thrifty timber or with sound hemlock. It is obvious that a correct solution to the question is of much importance to multitudes who have occasion to use timber for posts, stakes, stringers, ties, etc. Will those in possession of facts obtained from observation or practical and experimental tests, please answer?—A. H.

9.—COPYING INK.—How can copying ink be made which will leave a copy of writing on copying paper, without dampening the paper, the use of press, or blurring the original, but by simply passing the hand over the copying paper, beneath which the writing shall have been placed?

10.—BENZOLE.—Will some of your numerous readers be kind enough to inform me how I can separate benzole from the light oil of distilled coal tar?—E. F. E.

11.—FILLING FOR ICE BOX.—Is saw dust a good thing to fill in a small ice box with? or would it be better to leave the space entirely empty?—S. F. M.

12.—SHELLAC VARNISH.—Does it improve shellac varnish to put resin into it?—W. F. W.

13.—PINE TAR.—Will some of your readers give me the analysis of pine tar, and tell me what effect the steam or smoke arising from it will have upon the lungs, or on catarrh in the head?—L. F.

11.—KEEPING FLIES FROM HORSES.—How can this be done without nets?—F. N. P.

15.—IMPRESSION PAPER.—Please inform me how to make black impression paper, such as telegraphers use in making several copies of a message or report at one writing. I have made several lots of it by smearing thin, tough paper with lampblack mixed with butter or lard oil. It answers tolerably well for four or five impressions at one time, but it does not keep moist very long, and the color is not as black as that used by telegraphers.—J. D. E.

16.—ELECTRIC LIGHT.—I am a photographer, and feel a desire to learn more of this subject; I therefore make bold to request your answers to the following questions: 1. How large a number of cells of Grove's battery would be required to produce a light equal to the oxyhydrogen lime light? 2. Are the carbon points common charcoal? 3. Are the points connected directly with the two poles of the battery, or must the current first pass through a helix or some other arrangement? 4. Is there any special difficulty, aside from the automatic adjustment of the points, in arranging them so as to produce a good light with a sufficiently strong battery? 5. Is there an electric lamp in the market? If so, where can it be obtained?—W. R. B.