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AMERICAN INDUSTRIES.—No. 67.

ASBESTOS

That American mechanics, inventors, and business men are pre-eminently practical is acknowledged the world over. They are always pronounced utilitarians - making the first count in their valuation of almost every new article answer to the questions: What is it worth to us to-day? How much can we save by its use? Will it meet our necessities better than what we have heretofore used? It is important that these and similar queries be answered in a plain and straightforward way, in regard to every new product whose manufacture is destined to take a permanent place in our industries. But what reply would such inquiries have elicited twenty years ago, supposing them to have been then made, as to the usefulness of asbestos, or anything made therefrom? The probability is that comparatively few people at that time even knew that there was such an article. A few students, however, might have furnished some very curious reports about it—how the ancients used to wrap the bodies of their dead in asbestos cloth to keep their ashes separate from those of the funeral pile; how Charlemagne had a tablecloth made thereof, and astonished his guests by throwing it into the fire after dinner, whereby it was cleaned without burning; how an Italian chevalier had a complete dress of asbestos, with which he made successful experiments in testing its protective qualities for firemen's uses; how numerous tricks in fire handling have been performed by its aid, etc.; but with all this there had been developed nothing of any considerable practical value, and the possibilities of future usefulness in this fine fibered, fire and acid proof mineral were, apparently, no better than they had been when the pyramids were built.

Asbestos (from a Greek word meaning inconsumable) is a variety of the hornblende group of minerals, and the chemical composition of the whole family is chiefly silica, magnesia, alumina, and ferrous oxide; but the qualities vary widely. In color it is usually from white to gray and green —sometimes yellow, when impregnated with iron—with fine, crystalline, flexible fibers of a silky luster, and feels somewhat oily to the touch, although in its native state it is as little suggestive of the uses for which it may be made available as the rough iron ore is of a chronometer. A few years ago it was supposed to be very rare, but since there has been a demand for it in considerable quantities new sources of supply have been opened up, and it is now found in many parts of Europe and America, the best quality coming from this country. The inquiry for asbestos for manufacturing purposes had, we believe, its commencement with the foundation of the industry which we illustrate in this paper with engravings of the manufacturing establishment of the H. W. Johns Manufacturing Company, which has grown out of the business established by Mr. Johns in 1858.

It was not until 1868 that Mr. Johns made known to the world his discovery of the practical value of this remarkable mineral, and the nature of his patented inventions. That he has labored intelligently in this comparatively new field is proven by a gratifying success and a world-wide reputation, for his asbestos products are in use wherever materials for structural and mechanical purposes are employed. Every year additional improvements and processes have been made by Mr. Johns, and, as the various branches of the industry became better known, it is not strange that he has had many imitators in his line of manufacture.

The main departments of the factory will be readily distinguished at a glance from our artist's representation. The

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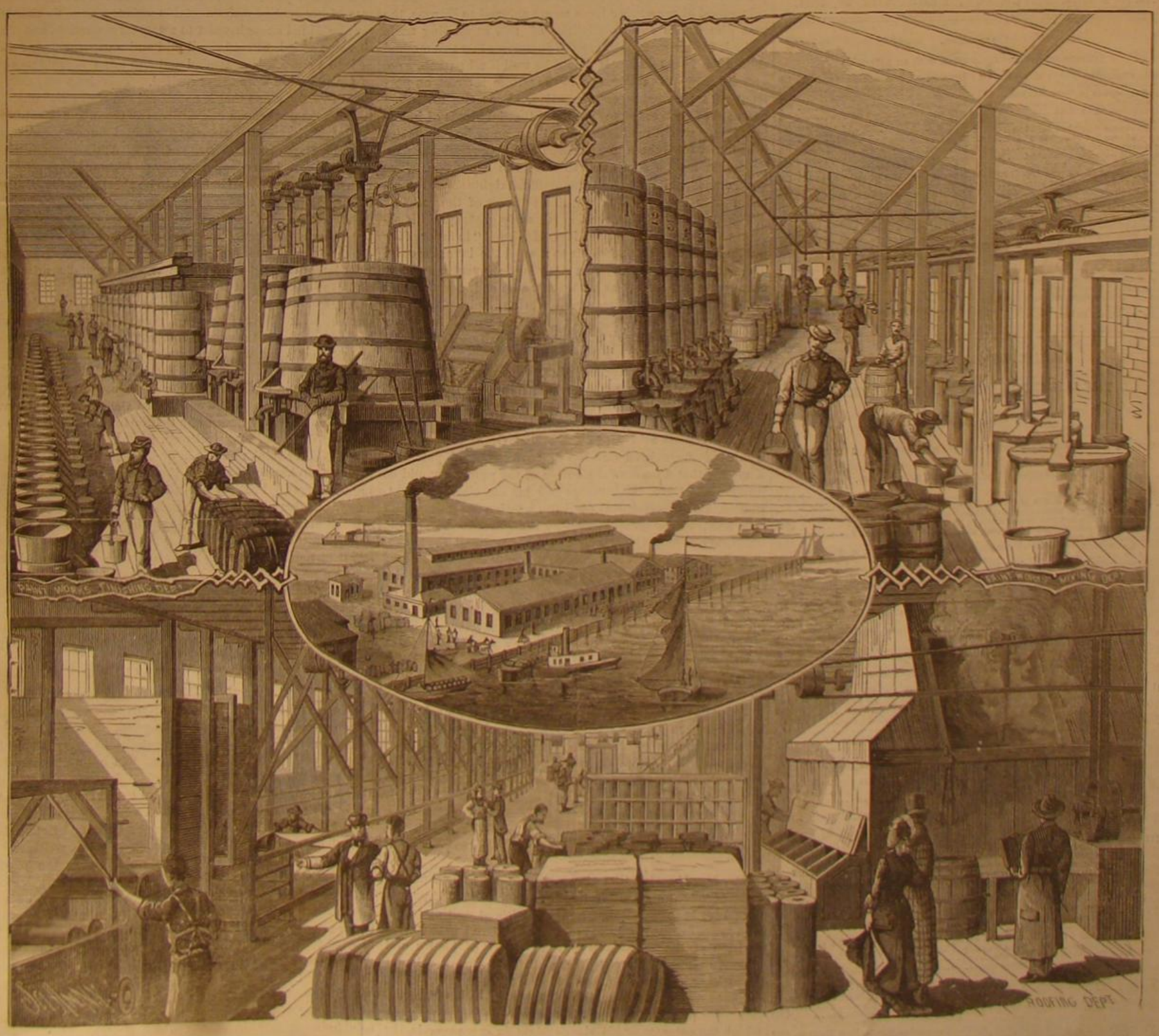

ASBESTOS WORKS OF THE H W JOHNS MANUFACTURING COMPANY.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

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THE ENCOURAGEMENT OF INVENTIONS—WITH A RESERVATION.

A curious phase of opinion crops out constantly in newspaper comments on patents and the rights of inventors. Even journals of metropolitan dignity and influence give frequent evidence of it, and thus unwittingly encourage the attacks upon the patent system of parties interested in the infringement of patent rights. The opinion referred to is hard to formulate, but it seems to be, in brief, that inventors ought always to be encouraged—provided they do not invent too much or do their work too well. In all secondary and relatively unimportant matters the inventor's rights should be strictly respected and rigorously guarded; but when the inventor produces some article or process of exceptional value, something that the public cannot afford to do without, after they have learned to use it, then it should promptly be taken away from him. Having control of something that everybody wants, the patentee becomes an "odious monopolist." His service to the public in producing so great a convenience is forgotten or grudgingly admitted. The direct or indirect advantage of the invention to the public may be a thousand dollars to every hundred dollars received by the inventor for its use; the thousand is accepted as a natural right and no account is made of it, while the inventor's hundred is eyed askance as so much paid for an intangible idea. It was such a simple thing! Scores of people must have thought of it if he had not; why, then, should people pay for what they might have had for nothing if they had only had the mind to think of it? No comparison is made between their condition before the invention was made and after it was adopted, but only between their condition with the invention and paying for it, and their condition having the invention and not paying for it. The visible thing is the inventor's profit, and that is grudged him.

A pretty illustration of this thankless logic is furnished in the editorial comments of the *Herald* on Judge Nixon's recent decision sustaining the right of the Bate Refrigerating Company to the processes covered by their patent.

The *Herald* says: "Our patent laws sometimes lead to practical absurdities. If there be but one safe and economical method of preserving fresh meats shipped to Europe, the vast dimensions and possibilities of this expanding trade make it for the general interest of commerce that this method should be free to all. It would be well if all patents were granted subject to revocation in the public interest on payment of a reasonable compensation. Processes are often patented of such extreme simplicity that hundreds of ingenious minds would readily discover them, and when the patent injuriously obstructs a great branch of foreign trade the public should not be compelled to await its expiration. The government which creates these artificial rights should grant them with an explicit reservation in favor of the public."

The absurdity of this position is simply grotesque. It assumes that the patent system is not designed "in favor of the public;" but that its purpose is to reward the inventor only. The truth is the patent system regards the inventor and his encouragement simply as a means to an end, and that end is the advancement of the useful arts and sciences for the public benefit. The proposed reservation would simply defeat the end aimed at by attaching a penalty to successful invention.

The alleged obstructiveness of the more perfect inventions when patented is equally absurd. Admit, for the sake of argument, the assumption that there is but one safe and economical method of shipping fresh meat to Europe. Without the inducements held out by the Patent Office that method would not have been developed, perfected, and patented. Knowing that a successful solution of the problem would be profitable to them, the inventor and his associates thought, studied, and experimented until the solution was gained, and then accepted the terms offered by the government for the temporary monopoly of their system. Without the invention there could be, it is assumed, no profitable shipment of fresh meat to Europe. With it such shipment is possible. So far there has been an extension, not an obstruction of trade. Other men are at liberty to perfect, if they can, the previously existing methods or to devise new methods. They plead that they cannot; therefore, they say, our inventor must let them use his method for nothing, or for a price which they think is reasonable. If he will not consent he is an obstructor of trade!

To revoke the "obstructive" patent because its value has led other men to covet the privilege it covers would be a breach of contract on the part of the public that would react disastrously in the discouragement of further invention. To confiscate the property indirectly by compelling the owner to surrender it at a price not fixed or agreed to by himself would be equally impolitic and scarcely less unjust. We doubt whether there was ever an invention which the inventor would not part with for a "reasonable compensation."

The *Herald* asserts that when an invention has been proved to be of great public utility the "government should possess the power to open it to universal use without waiting seventeen years for the expiration of a patent," and calls this a revision of the patent laws "in the interest of justice and common sense." If a patentee, realizing the great value of advertising in the *Herald*, should insist that the government ought to compel the *Herald* to advertise his patented invention "for the public benefit" for nothing, or at a price which the patentee or his friends might fix as reasonable, the *Herald* would probably speak disrespectfully of his intelligence.

IS GLUCOSE UNWHOLESOME?

The manufacture of glucose and starch sugar having increased with surprising rapidity recently we are frequently asked whether its use will injure the health. Some claim that it will, others assert the contrary. Reliable experiments by competent persons are rare, and every fact which throws any light upon the subject is welcome and will have its effect. We are, therefore, willing to give place to certain statements made by Dr. J. Nessler, of Baden, in regard to his own experience with starch sugar. In Germany the starch is made from potatoes, and of course German glucose may possess some properties unlike ours, which is made from cornstarch. The specimen used by Dr. Nessler in his experiments may or may not have been a fair average of the glucose made in that country, but his statements will suggest to courageous parties at home the propriety of putting American glucose to the same tests or similar ones.

This kind of sugar has been used for nearly fifty years, says Dr. Nessler, for improving sour wine, in making beer, and in confectionery. Since starch is not injurious to the health, and the sulphuric acid is almost completely removed, it was assumed that no hurtful substance could be formed by the action of dilute acid on starch. Up to a very recent period no one harbored a suspicion that starch sugar could exert any injurious effect. This kind of sugar is cheaper and is better fitted, for other reasons too, for making cheap drinks than cane or beet sugar. It had, therefore, been recommended officially and privately, even by Dr. Nessler himself, under the conviction that the use of brandy could best be checked by the manufacture of good and cheap drinks.

Not long since A. Schmitz, who drank natural wine one day and wine containing glucose the next day, tried the experiment of injecting the unfermentable substance contained in starch sugar into the veins of a dog. He noticed that starch sugar had, or might have, a stupefying or narcotic effect.

Incited by these statements of Schmitz, Dr. Nessler began some experiments with the unfermentable constituents of such sugar. He obtained from Alsace a 20 per cent solution of a sugar which was free from arsenic and in which there was 26 per cent of unfermentable substances. To the solution he added enough yeast to set up fermentation, and when this was added, filtered the liquid and evaporated one liter of it to a sirup. The alcohol and any other volatile product of fermentation were thus expelled. This sirup was now diluted to 100 c.c., so that it contained ten times as much of the various unchanged constituents as the original solution. At 7 A.M. he took 50 c.c. (nearly 2 fluid ounces), representing 100 grammes of sugar, and at 10 A.M. as much more. Its taste was bitter and repulsive. Toward noon he felt rather badly, but not sufficiently to be able to ascribe with certainty any hurtful action to the extract which he had taken. At 2 P.M. he took as much of the residue as represented 100 grammes of sugar, but this time it had not been evaporated so far as the first time, but only to two-fifths. An hour later a violent perspiration broke out, and a little later a violent headache set in which lasted until late in the night.

A few days later Dr. Barth, assistant at the experimental station, took the unfermented portion from 90 grammes (over 3 ounces) of the starch-sugar at 10 A.M. The fermented and filtered liquid was again evaporated to three-fifths. A cold perspiration soon showed itself, attended with a tightness of the chest. At noon he had no appetite, and threw up the soup which he had eaten. In the afternoon he was seized with a violent headache that lasted until evening, and the next day he did not feel well.

Dr. Nessler thinks there can be no doubt left a substance injurious to health remains in the liquors made by fermenting this sugar. Possibly not all starch-sugar has the same effect, but there is always a bitter substance or extract left after fermenting and evaporating, which turns the plane of polarization to the right. It is probable that all are more or less injurious according as it contains more or less of this substance.

Whether this substance is formed during the fermentation or was already there, and whether its injurious effects are not destroyed or neutralized by the alcohol in which it is usually dissolved, are questions which he does not attempt to answer.

WRITING INK.

There are few chemical preparations the use of which has become so general as that of writing ink. And yet it is rare to find an ink that fulfills all the conditions required of it. This is explainable upon the ground that ink recipes are not constructed according to any chemical formula, but that we are compelled to rely upon empirical experiments and make use of the results gathered by practical experience. A good black ink must flow easily from the pen, and must yield either immediately or in a short time a deep black writing. It must not corrode metallic pens nor destroy the paper. Further than this, a good ink should contain no considerable sediment when kept in airtight bottles. In ordinary ink bottles a sediment will always form, and the more it is exposed to the atmosphere the faster it will form. An ink that is to be used for important documents must not be washed out with water or absolute alcohol so as to be permanently illegible.

Ink may consist of either a clear solution of any dyestuff, or, as in the case of common black ink, a finely divided, insoluble precipitate suspended in water. The chief materials used for making this ink are gall-nuts, green vitriol, and gum, which are employed in the most varied proportions. The

gallnuts are crushed to a coarse powder and boiled in water, or better, digested for several hours at a temperature near the boiling point, and the gum and green vitriol added to the filtered decoction in solution.

The following example will serve as ink for ordinary use: 12 parts galls, 5 parts green vitriol, 5 parts gum senegal, and 120 parts water.

An exceedingly fine ink is said to be produced by the following recipe: 11 parts galls, 2 parts green vitriol, one-seventh part indigo solution, and 33 parts of water. Here the relatively larger quantity makes the gum unnecessary, while the indigo solution makes the brilliant black seem still deeper. Writing executed with this ink may, it is true, be removed by means of dilute acids, but it may be rendered visible again by chemical means.

There is also an ink in the market in which the galls are replaced by logwood, but the writing is less black and can be totally destroyed by treatment with acids and cannot be restored by other means.

The so-called alizarin inks flow easily from the pen, but they mostly suffer from the fact that the writing appears at first only of a faint greenish, bluish, or reddish color, although it gets darker afterward.

The most permanent writing is done with India ink, because the black coloring matter of this ink consists of finely divided carbon, which is unaffected by chemical reagents. Its high price seldom permits of its use.

For ordinary use only such ink is recommended as consists either of pure galls and iron, or of some mixture in which these are the chief ingredients.

A small quantity of salicylic acid, one-half gramme to the liter, will prevent it from moulding even when kept in open ink bottles. This is far preferable to the bad smelling carbolic acid, or the very poisonous bichloride of mercury, so frequently used both in ink and mucilage to prevent souring, fermentation, or mould.

PROPOSED DIGEST OF PATENTS.

In his recent annual report the Commissioner of Patents, Mr. Marble, calls the attention of Congress to the necessity of having a digest made for the use of the office and the public, of the inventions patented in this and foreign countries. The preparation of such a work, he says, would cost a large sum of money, but he thinks the government would soon be reimbursed by its sale. The advantage to the public, especially to inventors and manufacturers, would be incalculable, and for these reasons he earnestly recommends Congress to take action looking to an early commencement of the work.

To prepare such a digest would, indeed, be an immense work, but there is no doubt of its value as an assistance to inventors in determining the probable novelty of their inventions, provided the books were kept up to date and made readily accessible to the public. To Patent Office examiners the work would be of especial convenience in helping them to reject new applications for patents.

A beginning of the proposed work might be made with the American Patents; and when that digest is complete then take up the foreign patents, as the latter would necessarily contain many repetitions of the devices found in the American patent lists.

But before anything is done in respect to this proposed compilation we would suggest that the Commissioner of Patents take steps to provide for the convenient access of the public to the printed patents that now exist in the Patent Office. This would seem to be a comparatively simple matter; but somehow or other it is hedged about with insuperable difficulties. It is a curious fact that although the U. S. patents are printed in convenient form, and are public records, kept in a public building especially designed for the access and information of the people, still it is next to impossible for an individual to go to the Patent Office and refer to any complete part of the printed patents. For example, an inventor having made an improvement in flat irons, calls at the Patent Office and requests the privilege of looking over the various flat iron patents, with a view to applying for a patent if his supposed invention is new. He is shown sundry portfolios or volumes, purporting to contain all the previous inventions, finds nothing like his device, files his application, and is rejected. He then ascertains that some of the drawings or some of the patents, including the one resembling his device, had been temporarily removed, on some excuse or other, from the portfolio when he examined it, and that the set was not complete; so his examination was fallacious. He further finds that there is no uniform system followed at the Patent Office whereby the public may enjoy convenient and certain access to all of the printed patents in any particular class or branch. We suggest that before the new digest proposed by the Commissioner be commenced, the printed patents should be thoroughly classified, and several complete sets thereof maintained in convenient places for public reference.

We are inclined to believe that the Commissioner of Patents already has authority to establish such a system. Its efficient realization would be of great value to manufacturers, inventors, and all who are concerned in patent affairs.

THE SUN SPOT MAXIMUM.

We are now approaching the period when frequent and large sun spots may be expected. In 1870–71 this was the case, and the evidence is quite conclusive that they return with tolerable regularity at intervals of about ten or eleven years. As I write (January 28) there is in the sun's southern hemisphere, near the western border, a dark and conspicuous spot surrounded by a distinct penumbra. The umbra by itself is about 20 seconds in diameter, or in linear units about 9,000 miles, larger than the earth would appear at the same distance. There is also in the northern hemisphere a pretty group of four spots; and there are several others scattered about the surface of the sun. This is not very unusual. Spots have been recorded over 100,000 miles in diameter and visible to the naked eye, and as many as a hundred are sometimes noticed at one time. Frequently, however, the surface is entirely barren. The large spot mentioned above may almost be seen through a piece of smoked glass, and a spyglass of quite low power will render it easily visible. It is now moving off the disk; but in about twelve days it will probably return on the eastern edge; probably, but not certainly, for these large spots sometimes last for months and sometimes are dissipated in half an hour.

Care must be taken not to look at the sun through a telescope without the intervention of a piece of smoked glass over the eye end of the telescope. Loss of sight may result from neglect of this precaution. The best way to view the surface of the sun is to point the tube through a hole in the window shutter or other screen, and allow the image to fall on a piece of white paper, the eyepiece being first drawn out and the paper moved toward and away from it till the true focus is found. This gives a miniature but correct map of his surface, which can be seen by a number at a time without any risk or difficulty. If some of the readers of the SCIENTIFIC AMERICAN would keep a regular record of this kind, mapping and describing the phenomena observed systematically and accurately, they would find themselves much interested, and the records might have a scientific value. It is said of Schwabe, to whom we are indebted for more of our knowledge of the sun spot and associated phenomena than to any one else, that "twelve years he spent to satisfy himself; six more years to satisfy, and still thirteen more to convince mankind. For thirty years never has the sun exhibited his disk above the horizon of Dessau without being confronted by Schwabe's imperturbable telescope, and that appears to have happened, on an average, about 300 days in a year." This persistent work of observation, even sometimes with very limited means, has given us the reliable basis of theory; and there is nothing to hinder many an American observer continuing the record and keeping watch for the phenomena now to be explained, which seems to be associated with these sun spots.

These observations of Schwabe's, continued till 1868, and those of Wolf since, show very conclusively the ten year period above referred to. This being unquestionably determined, all kinds of eleven year cycles have been supposed to be discovered on the presumption that whatever affects the sun affects also all terrestrial activities. Herschel endeavored to show that the price of wheat changed with the sun spot period, being lower at times of maximum. But notwithstanding the authority of his great name, his success is very doubtful. Equally fruitless is the attempt to find an eleven year cycle coincident with sun spot maxima in the great financial panics and eras of commercial failures, which some Englishmen of good reputation have been recently indulging in. But there is one relation in which the observations are so complete that we may believe it to be established —the relation between photospheric activity on the sun and electrical activity on the earth. Through a long course of years it has been shown that the periods of magnetic variation coincide with the period of sun spots; not rigidly, but sufficiently close to prevent the probability of a chance connection. In at least one case, when observers have been looking at the sun through telescopes, and have recorded the exact instant of solar activity, the magnetic needles over the earth were violently affected, rigidly pointing out a new meridian. Auroras were noted, even in southern latitudes. Telegraphic lines refused to work, and shocks were given to the operators.

It is not difficult to explain a connection between earth currents of electricity, auroral display, and magnetic disturbance, but how these are caused by sun spot prevalency, or how a common cause produces all, is a problem which has not been satisfactorily solved. In the meantime it is well to heap up the records; to keep a close watch on the sun and note the size and character of his dark and bright spots; to look out also for auroras and record their appearance and duration; and for those who have opportunity to observe any especial disturbances in telegraphic currents and any odd freaks of the magnetic needle.

I. S.

ANOTHER NEW DISINFECTANT.

Preserving and disinfecting agents have in recent times acquired an importance and scope regarding the methods of using them that could scarcely have been suspected at a relatively recent date. Dr. Koller cites, as examples, the antiseptic treatment of wounds which has been so exceptionally successful in the science of medicine. The discovery and application of true disinfectants and antiseptics may be designated as a most important practical question. The sanitary weal of the individual, of the masses, of cities, and of countries depends upon rational disinfection. The army of contagious diseases cannot be conquered by anything more successfuly than by the weapons of disinfection.

The mutability, the changeableness, the self-sufficiency of the germs of decomposition and decay are characteristic of everything organic; but also characteristic of no men is that restless striving to lend a longer life, a quiet stability, to changeable nature. This conservative character is a feature of everything human: the shadows of the war for existence are sharply defined in this well-lighted picture, and time alone, with her flitting and varying forms, conjures up the conflict, whose final solution, however, only testifies to the old and innate conservatism.

The step up which the present has climbed in the recognition of disinfectants and antiseptics is quite a high one; but glancing back upon leaves of science, covered with glory, it is not difficult to predict that in this domain we shall still have many important advances yet to rejoice over.

At the head of the list of disinfectants which belong to modern times are carbolic and salicylic acids and thymol. A definite circle of action was found to belong to each when experience had leveled the way. Carbolic acid is in general the disinfectant of crude masses of organic substances; salicylic acid is the disinfectant of the kitchen, the cellar, and the larder, but thymol (most costly of all) is the disinfectant of the boudoir.

To the above mentioned must now be added a new one, says Andeer, viz., *resorcine*. Before we enter into a discussion of how it acts it is advisable to consider more closely its nature.

Resorcine was discovered about fifteen years ago by Barth and Hlasiwetz. At that time it was obtained as a product of the decomposition of certain gum resins like gum ammoniac, galbanum, assafœtida, etc., by fusing them with caustic potash; also by the dry distillation of Brazil wood. It derives its name from *resina*, resin, and orcin, a substance which it resembles, and which occurs ready formed in all lichens used for making litmus and archil, and is also obtained by the dry distillation of acids and ethereal bodies obtained from these lichens.

Sommer afterward called attention to the fact that umbelliferone, obtained from the umbellifera resins, when fused with alkalies gave the same substance. This umbelliferone crystallizes in colorless, odorless, and tasteless prisms, which are very soluble in boiling water, alcohol, and ether, and fluoresce strongly. It can be made from the resin which occurs as a drug in the market, or from the resin obtained by extracting angelica root, or levisticus, or imperatoria, with alcohol, and evaporating the alcoholic extract.

Resorcine belongs to the numerous compounds of benzole derivatives, especially to the dihydrox-benzoles or diphenols. A cheap method of making resorcine from benzole derivatives has been invented, and the dyes derived from it have justly attracted very extended attention.

Among the methods for making resorcine, the following are worthy of mention, because they furnish it at a reasonable price:

The chlorobenzol-sulpho-acid is made by dissolving chlorobenzole in fuming sulphuric acid. Its sodium salt when fused with caustic soda forms resorcine.

On warming a solution of phenol in sulphuric acid the metaphenolsulphonic acid is formed, and its sodium salt fused with caustic alkali also yields resorcine.

The third and best method, it seems, for making resorcine is from the dibenzolsulphonic acid, which is made by benzole vapors into warm sulphuric acid. A large quantity of resorcine is formed by fusing its sodium salt with caustic soda.

The relation that exists between resorcine and phenol (carbolic acid) as to their constitution led Andeer to ask whether their action might not be similar. In fact further experiments proved that resorcine has the property of stopping decay. Chemically pure resorcine, which withstands the light, when in a one per cent solution stops the development of fungi and mould. This has been proven not only by artificial experiments in the laboratory, but also chemically on the appearance of the symptoms of disease.

What seems deserving of special remark is that absolutely pure resorcine, in every degree of concentration, coagulates albumen and precipitates it from solution. On this account the author considers it an excellent caustic to remove unhealthy tissue. In crystals it cauterizes as powerfully as lunar caustic, but, he assures us, without pain, nor does it form metallic albuminates, which are insoluble or difficult of solution, causing a scar. In a comparatively short time, say three or four days, the skin regains its natural appearance.

In homeopathic doses the pure resorcine will preserve ink and colors which would otherwise mould very quickly, and not injure the color.

A one per cent solution will not prevent fermentation, but only retard it in favorable cases. To stop it completely requires a comparatively strong solution of 1¼ to 2 per cent.

Andeer adds that resorcine is soluble in all liquids except chloroform and sulphide of carbon, and unites readily with animal fats and oils, especially in the presence of alkalies, and helps to emulsify them. Hence it is an antiseptic, caustic, to a certain extent a styptic, and an emulsifying agent. It has one advantage over the other disinfectants derived from benzole, that it can be used in every form prescribed by the pharmacopœia.

It seems that we are to be enriched by a new disinfectant which shall take a position in the future of unlimited usefulness. Resorcine will be the disinfectant, and in a certain sense the antisept'c of the physician, the druggist, and the laboratory.

MR. WATSON, in his *Mechanical News*, says that the best packing he ever used for faced joints, either steam or water, is common drawing paper soaked in oil. After a short time the heat of steam converts it into a substance like parchment, so that it is practically indestructible. It has the advantage of stripping readily from surfaces when it is desired to break a joint.

ASBESTOS.

[*Continued from page* 127.]

location is a most convenient one in Brooklyn, at a point on New York Bay where there are admirable dock facilities for receiving and shipping goods.

Asbestos materials are woven, felted, or matted fabrics, and sheets of various fineness and thickness, used for filtering acids, for non-conducting and fireproof coverings, linings, and for many other purposes. Mill boards of one-sixteenth to one-half inch or more in thickness are used for packing gaskets around steam, fire, oils, and acids; also for fireboxes, coverings for locomotive boilers, etc. Sheathings, in sheets and rolls, make fireproof linings under weather-boards of wooden buildings, and in fire and boiler rooms. Steam packings, in the form of rope, wick, loose fiber, etc., are for use in stuffing boxes around valve stems and other moving parts of steam engines, acid and oil pumps. Cements and coatings in great variety are employed for repairing gas and other retorts, and for use around furnaces, acid works, etc.; roof cement for covering and repairing roofs, and jointing cement for steam and other joints; while the concrete coating is used for rendering beams, posts, girders, and other woodwork fireproof. The following facts are given under the authority of Mr. Johns: A stick of wood thus coated and thrown into their furnace, for experiment, was taken out in its original form after this exposure, the asbestos coating, however, then covering only charcoal. Fireproof paints are used for interior woodwork. The largest drygoods firm in New York had their stores and warehouses thus painted, the total woodwork covered amounting to four and a half acres. Besides the above are asbestos paper, thread, and numerous other articles, widely varying in their character and adaptations, which form an interesting portion of the business of the establishment, but they are less important to a large class of persons than H. W. Johns' asbestos roofing, liquid paints, and boiler coverings.

The department for the manufacture of asbestos roofing, and the machinery employed therein, which forms the subject of one of our engraved views, represents a branch of business to which Mr. Johns first devoted his attention, having commenced it in 1858. The machine which is shown in this department is the result of a long series of experiments by Mr. Johns, and by its use the whole operation of manufacturing roofing from the raw materials is completed. Some two miles of this fabric, about 40 inches wide, is turned out daily by this machine. It is furnished in rolls containing about 200 square feet each, and the covering of a roof is quickly accomplished. The Johns patent asbestos roofing differs from other composition roofing, and is claimed to be about equal to tin, while it costs only about half as much. Its structure will be readily understood from the small engraving. The actual thickness is about one-tenth of an inch. It consists of a manila lining, upon which is a layer of waterproof composition, then a strong canvas, another layer of waterproof composition, and a surface layer of asbestos-coated felt. This composition is claimed to be acidproof as well as

Roofing.

waterproof. It is also said to be equally adapted for use in all climates, and for flat or steep roofs. An occasional application, at slight expense, of the asbestos roof coating, keeps a roof in good order, and the white fireproof coating with which the surface is finished makes a light roof, which is not only air and water tight, but an effective non-conductor of heat, and one that will protect the roof against fire from adjoining buildings.

Asbestos roofing has been in use for many years, and it has met with the approval of manufacturers and railroad officers for roofs of railroad buildings, bridges, warehouses, and for factories, etc., for which purposes it is especially adapted.

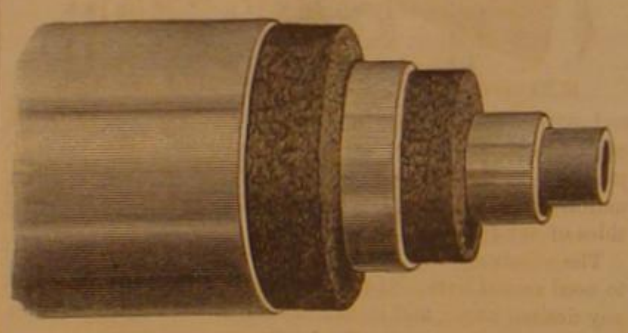
The utilization of asbestos in the manufacture of paints attracted the attention and became the subject of experiment with Mr. Johns at an early period in his investigations, and it forms a valuable ingredient in the fireproof paints referred to in the foregoing list of asbestos materials. This company also manufacture on an extensive scale a superior grade of pure linseed oil paints, in liquid form, for general structural purposes, which are designated by the peculiar trade-mark which is shown at the head of this article. Our artist has made two representations of departments where the manufacture of these paints is carried on, which give but an incomplete idea of the magnitude of this branch of the business. The manner of grinding and mixing is different from that followed in other establishments, and, although paints form only one of several classes of goods made by this company, their production in this class alone is claimed to be larger than that of any other manufacturers in this line in this country.

The purest linseed oil and colors enter into the composition of these paints, and they contain no water, alkalies, benzine, or other deleterious or useless adulterations or dilutions. They are furnished only in liquid form, ready for use, in all the standard shades, and of qualities

ASBESTOS GRINDING.

suited for out-door work or interior decoration. They work freely under the brush in cold as well as warm weather. They are not intended to compete in price with any of the low grade paints sold in the market, but the company claim that by their superior durability, they are less expensive than anything else offered in this line.

The way in which these liquid paints are ground and mixed is said to cause a more intimate combination of the



Pipe Covering.

ingredients than can be effected by the ordinary processes with oil and turpentine, and therefore greater richness and permanency of color and beauty of finish are attained. For roof painting the company have a special preparation which, either alone or in combination with their asbestos cement, they particularly recommend for rough usage and in exposed situations, and also for the preservation and repair of old leaky tin and other roofs. The roof paints are made in a variety of shades, and are durable preservative coatings for iron work exposed to the weather or in contact with the earth or salt water.

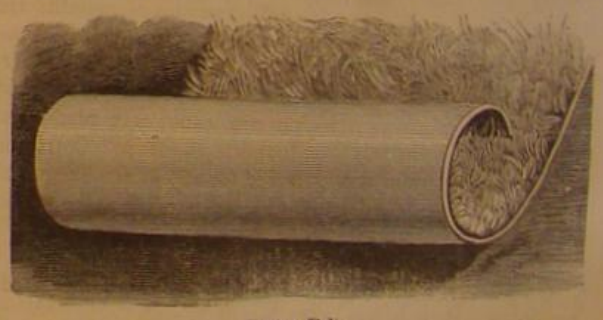
The use of asbestos, alone and in connection with other materials, for covering steam and hot-air pipes, boilers, etc., thus preventing the radiation of heat and economizing fuel, has formed one of its most popular and valuable applications. There are many different combinations and ways of applying it, and the company have patents on many feasible and valuable processes, extending back to its original adaptation to such uses, and covering also recent improvements. For pipe coverings they especially recommend their asbestos lining felt, a representation of which is given in our engraving. It consists of a pure asbestos sheathing, to one side of which is attached "flocked" asbestos. It is furnished in sheets and rolls, and forms an insulating cushion or non-conducting lining, over which is placed a layer of hair felt and then one of non-porous fireproof sheathing, while, if still further protection is required, another layer of hair felt surrounded by non-porous fireproof sheathing is added. The protection which this manner of covering affords, and the manner of its application, will be readily understood from the illustrations.

For boiler coverings, or where large surfaces giving out great heat are to be protected, the company recommend their asbestos cement felting, which partakes of the nature of a felt and a cement. It is composed of asbestos and a cementing compound, applied as a mortar, and forms a light porous covering, possessing superior non-conducting properties. It is claimed that there is no danger of its cracking from the expansion or contraction of the surfaces to which it is applied, the flexibility and strength of fiber of the asbestos keeping it always in its place, and it can be applied to heated as well as cold surfaces. In this connection we would state that the invention covering the application of this important function or use of asbestos, that is, the employment of its fibers as the indestructible binding or tying material in felts, cements, coatings, etc., in lieu of other fibers, such as hair and the like, as formerly used, was patented through the SCIENTIFIC AMERICAN office in 1868.

In the representation showing necessarily only a portion of the department for the preparation of crude asbestos for

Wadding.

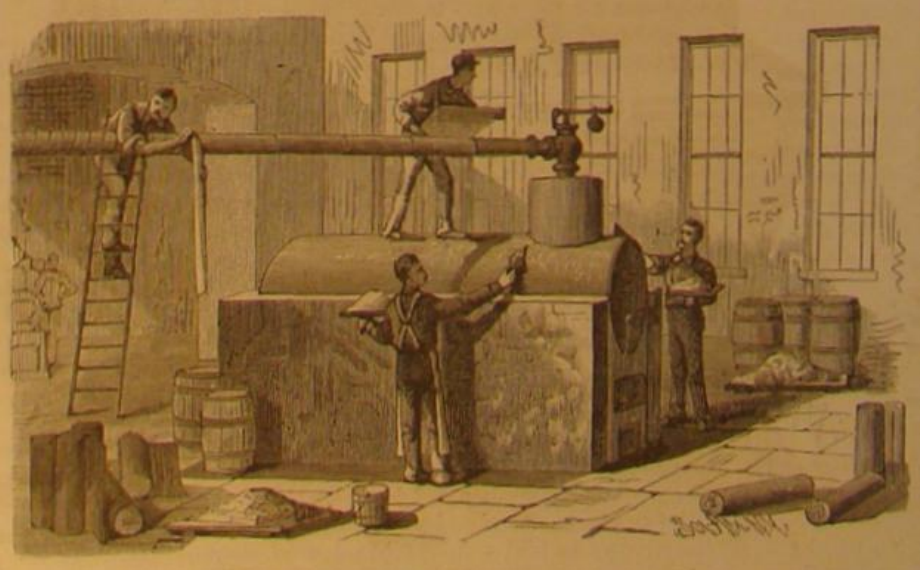
its manufacture into the various articles made at this establishment, are several machines designed especially for the purpose by Mr. Johns. The different kinds of asbestos, of which there is always an extensive variety on hand, require varying treatment, not only as to the goods to be made, but from the quality of the crude material, and it has only been by years of experience that the processes of manufacture have been perfected. Asbestos, of which we give an illustration of a fine sample from this country, comes in irregular solid blocks, generally not larger than stove coal, but



Lining Felt.

by a gentle attrition, without breaking the fiber, a piece as large as an egg may be made to fill a half-bushel measure of what looks not unlike the finest wool. Upon the length, strength, flexibility, and fineness of the fiber depends the value of the different varieties.

Prior to 1868 Mr. Johns had been for several years prosecuting experiments looking to the industrial utilization of asbestos. For a long time he found it extremely difficult to obtain such samples as were needed in making his experimental trials, and he was, for a period, accustomed to search the country for it, after the manner of an amateur geologist. He succeeded in finding some asbestos beds in the vicinity of New York; but when he had completed all the other preparations by which he would be able to put forth a manufactured article, it was a matter of grave doubt with him whether it would be possible to secure a permanent supply of the raw material. He, therefore, at the commencement of this enterprise sent out descriptive advertisements, in reply to which samples began to come in from various quarters, many of them not being asbestos at all, and others of little or no value; but in this way the supply has ever since been steadily increasing, so that in a little over thirteen years he has built up an entirely new industry of large magnitude, one which has proved of great value to the public, and for which there yet appears to be



BOILER AND PIPE COVERINGS.

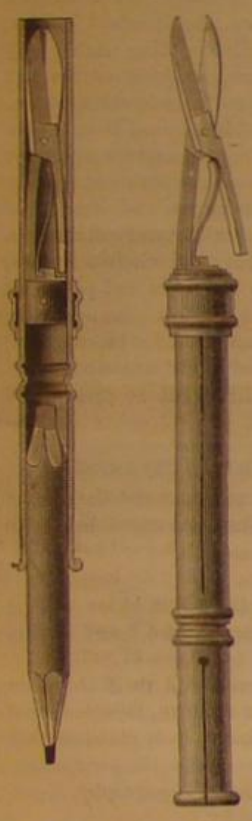
a wide field for future growth. It is worthy of mention that the largest contract ever made for paints, *i. e.*, that for painting the Metropolitan Elevated Railroad of this city, was awarded to this company, and their liquid white has been exclusively used for several years upon the United States Capitol at Washington.

Asbestos.

The New York office of the company is at No. 87 Maiden Lane, where illustrated catalogues, descriptive of their inventions, can be obtained, and their goods are sold by dealers in all the principal cities and towns in this country and abroad. The London house of Messrs. Witty & Wyatt, No. 9 Fenchurch street, E. C., have the sale of these goods in Great Britain and the English colonies.

PENCIL HOLDER AND SCISSORS.

A handy combination of pencil holder and scissors is shown in the annexed engraving. The pencil holder may be of any of the usual forms. The one illustrated is what is known as a pencil-point protector, having a shoulder in the middle to limit the extent to which the pencil can be inserted. The tube beyond the shoulder is fitted to receive a small pair of scissors, which are attached to a block connected with an external sliding sleeve, by means of which they are projected from or drawn into the tube.



Benson's Combined Pencil Holder and Scissors.

This invention was lately patented by Mr. H. C. Benson, of New York city.

Action of Vegetable Acids on Tin.

Professor Charles E. Munroe, of Annapolis, states that the ordinary fruit acids, such as those contained in apples, tomatoes, rhubarb, lemons, etc., all acted upon tin. Some cider which he examined, and which had been stored in a tin fountain, contained 117 milligrammes of metallic tin to the liter in solution. One case was given where persons eating fruit preserved in tin cans were made violently sick, and tin only was found in the fruit. Corrosion of tin pipes by water was referred to, and it was suggested that the corrosion was due to the vegetable acids in the water.

NEW ICE CRUSHER.

We give an engraving of an improved ice crusher made by Thomas Mills & Bro., 1301 North Eighth street, Philadelphia, Pa., which is the result of a long experience both in the practical use and in the manufacture of machines of this class. The machine shown in the engraving is designed to be driven by power, but this firm also make crushers to be driven by hand.

The essential features of this machine are clearly represented. The movable and fixed spiked jaws converge, so that as a piece of ice becomes reduced in size by the crushing action of the jaws it continually falls until it is finally reduced to small pieces which come within the capacity of the speculated rollers at the bottom, which can be adjusted to crush the ice to any degree of fineness. Below the rollers there is a follower which pushes the crushed ice out toward the rear of the machine.

The largest of these machines will receive an ice cake weighing 100 lb., and will crush 10 to 12 tons per hour. The smallest machine takes a cake weighing 10 lb., and there are several intermediate sizes.

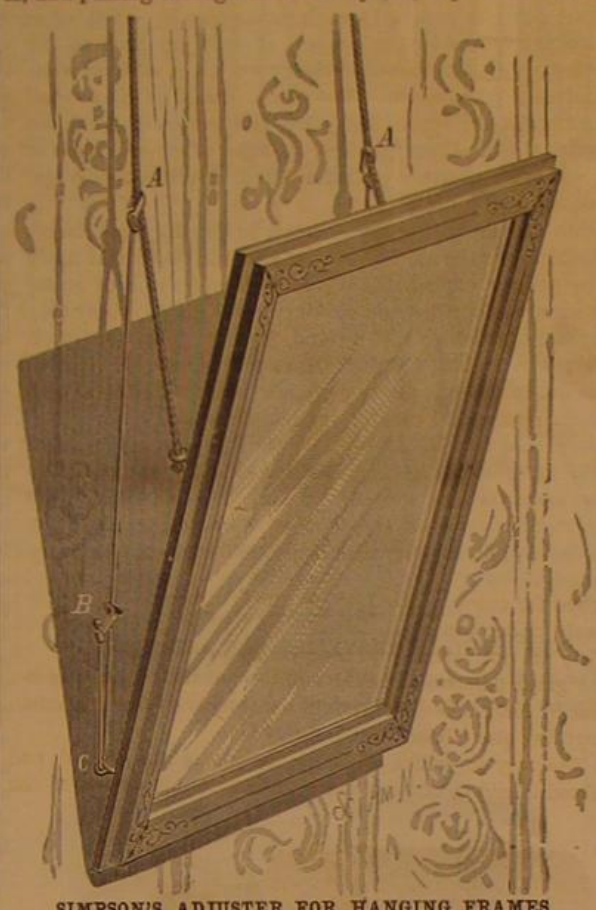
The advantage of this machine is that the ice can be rapidly crushed to a uniform size, insuring the degree of compactness most desirable for packing purposes.

These machines are in use by hotels, ice cream factories, fish packers, and private families, and are acknowledged to be efficient and satisfactory.

NEW ADJUSTER FOR MIRROR AND PICTURE FRAMES.

It requires no little skill to hang a series of pictures at a uniform angle, and it is often difficult to attach the cord to a mirror so that it will have the desired inclination without bracing or propping of some sort. To avoid these difficulties Mr. Charles A. Simpson, of Saxonville, Mass., has invented a very simple and inexpensive attachment for frame hangings, which is readily applied and holds the frame at any desired angle.

The frame is hung with cords in the usual way, but the screw eyes are so located that it may hang a little straighter than the desired angle. Near the lower corners, on either side of the frame, is placed a screw eye, C. A cord, D, attached to the picture cord by means of a common hook, A, and passing through the screw eye, C, is provided at the



SIMPSON'S ADJUSTER FOR HANGING FRAMES.

end with a flat hook, B, which clamps the cord by being canted by means of the weight of the frame. The hook, B, may be moved up or down on the cord, D, to alter the inclination of the frame. The adjustment is the same for both sides of the frame.

The advantages of this simple invention are too apparent to need recital here. It enables one to adjust his frames at any desired angle, and it insures their remaining in position.

Test of a Safety Elevator.

The proprietors of the Grand Central Hotel, in this city, recently gave a public exhibition of the efficiency of a safety air cushion which had been affixed to their large passenger elevator by the inventor, Mr. F. T. Ellithorpe. The elevator was, the makers claimed, the largest and heaviest in the world. The safety cushion consisted of a stout rubber bag, so placed beneath the floor of the elevator as to expand by the upward pressure of the air confined in the elevator shaft, and gradually arrest the fall of the elevator by filling the shaft like a piston head, and retarding the escape of the air from a closed well at the bottom.

In making the test the supports of the elevator were severed, and the elevator was allowed to drop a distance of 123 feet, retarded only by the safety cushion. The inventor had faith enough in his protective device to trust his life to it, and made the hazardous trip not only without harm but without serious discomfort. The motion of the elevator was arrested with so little shock that several eggs on the floor were not cracked, nor was a goblet of water overturned. No record was made of the pressure of the air in the well or of the time covered by the fall. The motion of the elevator was very rapid until within a few feet of the bottom. The efficiency of the safety cushion was amply demonstrated.

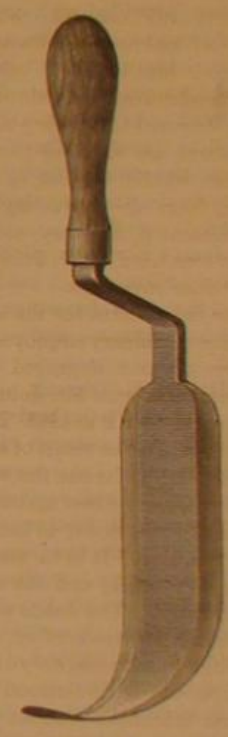
Iridium for Electric Lights.

The latest material offered for an incombustible "burner" for the electric light is iridium. Mr. Holland, gold pen maker of Cincinnati, claims to have discovered a flux by means of which he is able to fuse iridium in an ordinary draught furnace. He casts the metal in any shape desired, and in bars or ingots weighing as much as ten ounces. The metal thus fused and cast defies the file and resists all acids. The only mechanical way of cutting it is by friction with a copper wheel charged with diamond dust or fine corundum. Mr. Holland claims, further, that the cast iridium makes suitable "burners" for the electric light, and that so used the metal is durable without protection from the atmosphere.

IMPROVED HAND HOE.

The engraving shows an improved hand hoe adapted to universal use in the cutting away of grass or manipulating the soil about plants. The novelty consists in the peculiar form of the blade, which is constructed of a main body portion setting off to one side of the longitudinal axis of the handle in a parallel plane therewith, and a curved or upturned end portion, which, as well as the main portion, is sharp upon both edges.

This useful tool was recently patented by Mr. Robert L. Turner, of Olena, Ohio.



Turner's Hand Hoe.

RECENT INVENTIONS.

Mr. George W. McKenzie, of Dyersburg, Tenn., has patented an improvement in baling presses by which great pressure is exerted upon the bale, and which is easily and rapidly operated. A hinged lever, connected with the follower and provided with a clevis, pulleys, and rope for actuating the same, are the principal features of the improvement.

Mr. Thomas D. Gallagher, of Cleveland, Ohio, has patented an improvement in stock cars, which supplies readily detachable troughs for feeding and watering cattle during transportation. The trough is attached and detachably secured on the outside of the car by flanged edges working over longitudinal braces on the car.

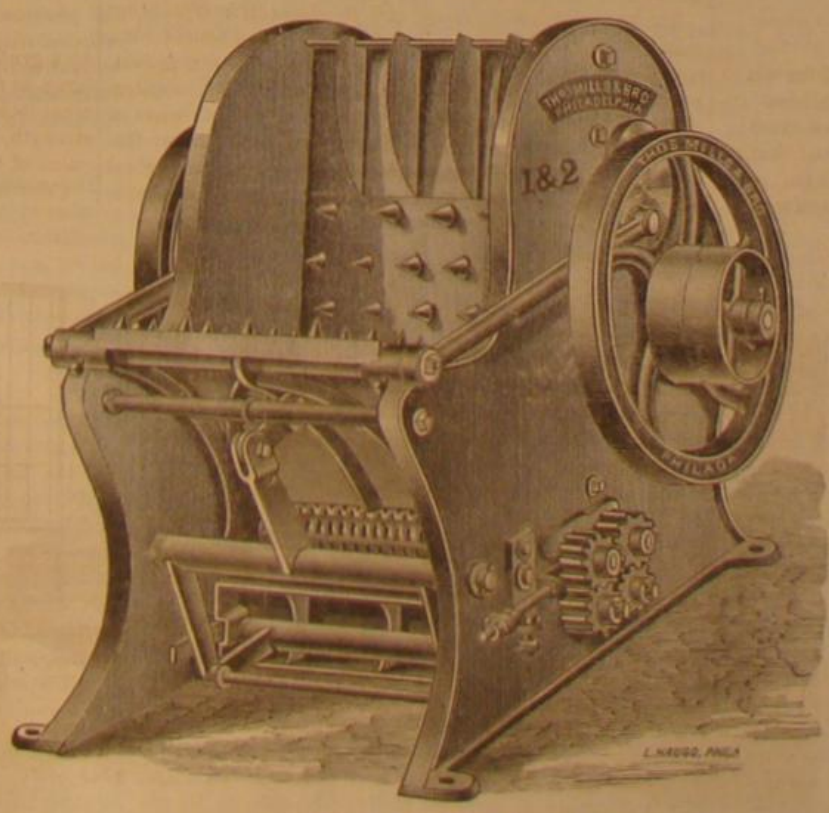
Mr. Ross Hall, of Millersburg, Ohio, has patented an improved stove of that class having exterior attached reservoirs or feeders delivering coal into the lower part of the fire pot. The arrangement is such that the combustible gases evolved by heat from the coal in the lower part of the fire pot pass up through the incandescent coal, where they are consumed and add to the heat of combustion.

Mr. Henry H. Spencer, of Mound City, Ill., has patented a rotary spading machine which imparts to the spades a compound rotary and reciprocating movement, their rotary motion being temporarily arrested while they enter the ground without checking the movement of the carriage or causing strains upon the gearing, and at a suitable moment withdraws the spades, completely frees them from the earth, and turns the latter over.

Mr. Abel Henning, of Easton, Md., has patented an improved carbureting apparatus, in which a peculiar arrangement of parts causes the pump which feeds the oil to a mixing chamber to be operated by the same power which actuates the air blower. Peculiar devices for volatilizing the oil and mixing the vapors with air are also supplied.

Mr. Samuel T. Richardson, of Cambridge, Md., has patented a lever power and dredge winder, designed more especially for oyster dredges, but applicable to analogous purposes, which not only much reduces the very hard labor of dredging in the ordinary way, but also avoids the danger to life and limb caused by oyster dredges catching on a rock.

Mr. Jacob Katzenberg, of New York city, has patented an improvement in suspenders



IMPROVED ICE CRUSHER.

whereby they may be made cheaper and yet be strong, more durable, and more ornamental, with due elasticity.

Messrs. James Semple and Wilkinson Crossley, of Broad Brook, Conn., have patented an improved apparatus for extracting dyes, which consist of an upright cylindrical vessel containing horizontal plates for supporting the dye stuffs, provided with pipes for introducing steam, boiling, drawing off the extract, and forcing the latter from the vessel, and also provided with appliances for introducing the unleached dye stuff and removing the spent stuff. Devices for regulating the process are also supplied.

Mr. Thomas Robinson, of Newtonville, Ind., has invented a potato-bug catcher, so constructed that the insects can be conveniently caught and removed from potato vines and other plants. The device consists of a box having an inclined apron and extended sides to receive the bugs, guard plates to prevent the bugs from shaking out, guard plates to intercept the flying bugs, and a socket and handle for carrying the implement.

Mr. Thomas M. Ullery, of Wakefield, Kansas, has patented an improved lime kiln, which provides means for separating the burned lime from the ashes of the fuel, and for facilitating the drawing of the lime from the kiln. A horizontal shoveling plate is placed between the mouth of the kiln and the ashpit, coming short of the rear wall of the throat or opening into the bottom of the kiln, and supporting a grate inclined upward and backward from the rear of the shoveling plate to the rear or back part of the throat. In passing down the inclined grate the burned lime is separated from the ashes.

Mr. Frederick F. Bioren, of Newark, N. J., has patented an apparatus for removing snow from streets and railroads. An oil tank is provided with a series of wick tubes, and a fan blower provided with corresponding pipes that operate as blow-pipes to direct the air from the blower forcibly upon the flames issuing from the wick-tubes, thereby forming blow-pipe flames which are directed upon the snow or ice to be removed. A combustion chamber which can be vertically adjusted to protect, direct, and concentrate the flames is used, and the entire apparatus is mounted on a wheeled platform, to be drawn along the surface of the street as may be required.

Mr. James Simmons, of St. Louis, Mo., has patented an improved icebox, which has its main frame and walls so constructed that the refrigerator may be taken apart and closely packed for shipment, and put together again for use when wanted.

Mr. Robert H. Dimock, of New Haven, Conn., has patented a marine paint and process for manufacturing the same. The paint consists of linseed oil with certain preparations of copper incorporated therein to make a paint poisonous to animal and vegetable life.

Mr. Solomon B. Elithorpe, of Rochester, N. Y., has patented a lasting machine, which combines in a suitable frame a seat for holding a last, flanged levers for fitting the leather about the last, a vertically adjustable templet provided with clamps and pressing screws for holding and stretching the leather upon the last, and a gathering cord for holding the leather so stretched.

Mr. Joseph Johnson, of Lebanon, Ohio, has patented an improvement in harness, consisting in a novel construction and arrangement of devices used in connection with the back strap and collar, whereby provision is made for dispensing with traces or tugs for pulling, and with breechings for holding back.

COOKING BY STEAM.

In the popular mind steam cooking is associated with charitable soup kitchens, public poorhouses, prisons, and similar institutions, where sodden and unsavory food is turned out wholesale for uncritical palates. To apply steam for the finer work of the civilized kitchen is quite another matter; and to those who are unfamiliar with recent progress in this direction it seems little less than incredible that steam cooked food can, in range or quality, bear any comparison with that prepared by a skillful cook at an open fire. Yet it would seem to be precisely in the matter of quality in the product that steam is likely to prove most serviceable as well as most economical in the kitchen.

The one thing essential to good cooking (presupposing, of course, an intelligent cook and a proper supply of raw materials) is a supply of heat properly distributed and under perfect control as to intensity. These conditions are not easily met with direct fire heat, and when met necessitate incessant vigilance on the part of the cook to prevent such variations in the heat of the fire as may injure the quality of the food in preparation. Even with the utmost vigilance much food is overcooked either by miscalculation or to secure the proper cooking of the rest. In roasting and browning a joint, for instance, the thinner portions are very apt to be overdone or dried while the thicker parts are being sufficiently cooked.

With steam cooking, under proper conditions as to apparatus, these difficulties are entirely done away. With the same source of heat supply a dozen ovens in a row may be kept either at the same temperature steadily hour after hour, or each may be maintained at a temperature exactly suited to the work to be done in it, and varied as may be desirable, without affecting in any way the rest. This puts the work of the cook upon a strictly scientific footing, the various operations being individually and collectively under perfect control, thus ruling out entirely the large and wasteful element of uncertainty, which costs so much in spoiled food and spoiled temper under ordinary kitchen conditions.

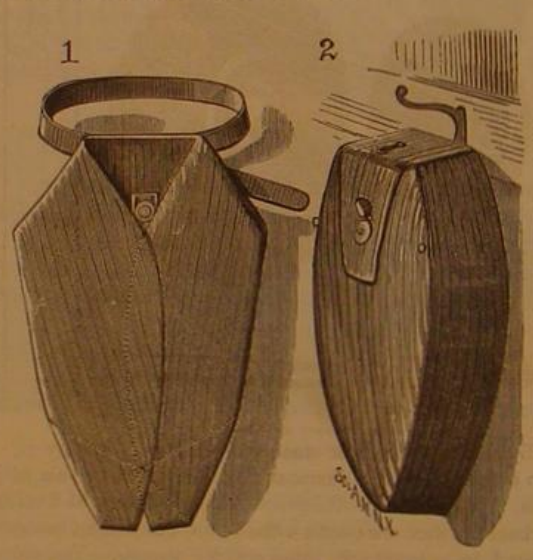
A practical illustration of these truths, as well as of the capacity of steam cooking to cover the entire range of culinary processes, is furnished daily in the extensive kitchen of the well-known restaurant of Messrs. Crook & Nash. This establishment, which ranks among the first in New York in respect to age, size, and the quality of the cooking, has lately been refitted and provided with a complete outfit of steam appliances on the patented system of Mr. John Ashcraft. No fire is used in the kitchen, the steam being taken from an adjoining building and distributed in pipes to the various sets of cooking apparatus. For baking, roasting, broiling, and other operations requiring a dry heat, the steam surrounds the cooking chamber, but does not enter it. Boiling is done either in jacketed vessels surrounded by steam, or as in cooking vegetables the steam is directly admitted to the articles, which are cooked in their own juices with no wastage of material or flavor. The meats cooked by this method are exceptionally tender and juicy, and free from the flavor of gases absorbed from the fire, the taint of scorched flesh or fat, and other unsavory qualities usually developed in irregular cooking with fire.

With the increasing use of steam in dwellings and larger establishments the employment of steam in cooking is likely to be greatly extended. Where public systems of steam heating are adopted steam cooking stoves must entirely take the place of existing ranges; and, judging from the result obtained by Messrs. Crook & Nash and others, the change from fire to steam is pretty certain to lead to better as well as more economical cooking than now prevails.

Great economy is also possible through the employment of the waste steam of factories for culinary purposes. In many cases the heat now thrown away in waste steam would amply suffice to cook the food of the workmen and their families and do it better than is possible with the ordinary cooking stove.

CONVERTIBLE TRAVELING CAP AND SCARF.

The article of apparel shown in the annexed engraving is designed especially for travelers' use, and is convertible into



CONVERTIBLE TRAVELING CAP AND SCARF.

what is known as a "flat scarf" and into a cap, answering an excellent purpose in either capacity. The top of the article is made in the form of a cap, and the flexible side portions fold in when the article is used as a scarf. A clasp is secured to the top, which is engaged by eyes attached to the sides when they are closed down upon the top. By unclasping the sides and unfolding them, a comfortable cap is formed.

This article has been patented by Mr. A. Weiler, of Crefeld, Prussia.

Substitutes for Lumber.

We are in receipt, from Mr. S. W. Hamilton, of Lawrence, Kansas, of a sample of lumber made from straw, manufactured after a process patented by himself, the particulars of which he does not explain. He informs us, however, that he can manufacture lumber like the sample sent, in any desired length, from 12 feet upward, and to 32 inches in width, at a cost competing with the better or finishing grades of pine, although he does not inform us whether this competition will apply equally to sections where lumber is comparatively cheap, as at Chicago, and at Western grain producing points, as at Kansas. We imagine, however, that the expense will vary but little at any point where straw is obtainable in large quantities.

The manufacture is, of course, confined to a grade which will compete with the better class of lumber, as there would be no object in filling the new product with knots, and shakes would scarcely be obtainable even if desired; while sap and decayed wood must be impossibilities. The sample sent to us will hold a nail as well as wood, is equally susceptible to a high painting finish, and can be polished to as high a degree as is at all desirable. Being made waterproof, we can discover no possible reason why it should not be as durable, or even more so, than pine or even oak, while its adaptability is evidently as great for roofing purposes, as for the fine work of a dwelling.

The question of cost appears to us to be the most important element yet to be practically solved. We can see no reason why it is not susceptible of being worked under the plane or other ordinary tools of the carpenter, and when once fitted to its place, we can readily believe that it will be free from shrinkage or swelling. In appearance, the sample before us resembles hardwood, being about as dark as oak and more dense in texture, with a specific gravity one-fifth greater than thoroughly seasoned black walnut. For finishing purposes, it will not, as a rule, be necessarily as thick as ordinary lumber, its tensile strength being apparently double that of wood of the same thickness. On the whole, we are favorably impressed with the appearance of the new artificial lumber.

In connection with the new styles of building material, we may mention a new block of buildings now in course of erection on the corner of Randolph and Dearborn streets in this city, the facings and trimmings of which are wholly of terra cotta, which is another name for baked clay. These trimmings are moulded to the desired shape, and may be made as highly ornamental as is the carved pattern in which they are formed. By adding a mixture of sawdust with that portion of the clay which does not require a finished surface, the block may be reduced in any reasonable degree as regards weight, while, being hollow, a large piece is comparatively light. The faces being made of finer clay, carefully moulded, present a finished character, and the block as a whole presents as rich an appearance as any in this city of elegant buildings, and is in favorable contrast with the massive stone pillars of the lower part of this or the surrounding buildings. It is evident that inventive art combined with æsthetic taste will, in the future, readily adapt itself to the demands of civilization, and while building timber may grow scarcer, succeeding generations will think of the age of wood as well suited to the needs of a generation which, in its rapid settlement of a new country, found it indispensable, at the same time congratulating themselves upon the possession of more durable, fully as ornamental, and equally as cheap a substitute in clay, glass, paper, and iron. We may speculate upon the details of architectural estimates in the future as including paper for doors and window frames, floors, mouldings, and roof; glass for porches and pillars, as well as for lighting; terra cotta for window caps and sills, and as well for cornices and walls; and iron for beams, joist, and rafters, with not a sliver of wood in the whole construction. Future generations will realize what at present we but anticipate.—*N. W. Lumberman.*

INTERNATIONAL GEOGRAPHICAL CONGRESS.

The Italian Geographical Society, to whom the direction of the Third International Geographical Congress has been committed, announce that the meeting will be held this year in Venice, September 15 to 22.

The Third International Geographical Exhibition will be held at the same place, beginning September 1 and closing October 1.

The preparatory work of the Congress and the Exhibition has been intrusted to a managing committee, presided over by the President of the Italian Society. It is probable that the Congress will be divided into seven scientific groups:

1. Mathematical Geography, Geodesy, Topography.
2. Hydrography, Maritime Geography.
3. Physical Geography, Meteorology, Geology, Botany, Zoology.
4. Historical, Ethnographical, Philological Geography; History of Geography.
5. Economical, Commercial, Statistical Geography.
6. Methodology, Tuition and Diffusion of Geography.
7. Explorings and Geographical Travels.

The Congresses at Antwerp, in 1871, and at Paris, in 1875, were very successful, and have had an important influence on the progress of geographical discovery. Correspondence, whether with regard to the Congress or the Exhibition, should be addressed to the Managing Committee of the Third International Geographical Congress, 26 Via del Collegio Romano, Rome.

Explosive Medical Compounds.

The medical and pharmaceutical journals have recorded a number of cases of explosions having taken place by the admixture of explosive substances. Among the prescriptions having given rise to such accidents we will mention the following: 1st. Mixture of hypophosphite of lime, 50 centigrammes; chlorate of potash, 3 grammes 75 centigrammes; lactate of iron, 30 centigrammes. 2d. Solution of glycerine, 8 grammes, in acid chromic, 4 grammes. 3d. Mixture of chlorate of potash, tr. ferri perchlorid. and glycerine has exploded in the pocket of a patient. 4th. Chlorate of potash mixed with catechu and used as a dentifrice, may explode in the mouth of the patient, provided hard friction is used. 5th Pills of oxide of silver (frequently used in England in affections of the stomach) have exploded in the patient's pocket. Pills of permanganate of potash and ferri reduct., pills of golden sulphur of antimony and chlorate of soda, may explode during or after their preparation. It is, therefore, essential to avoid associating glycerine, and, in general, substances easily reduced, with such oxidizing agents as chromic acid, chlorates, permanganates, and certain organic acids.—*Bull. gén de thérapeut.*

A FAST ATLANTIC PASSAGE.—The Arizona, of the Guion Line, arrived at Queenstown February 2, having made the quickest trip on record. The time from New York was 7d. 22h. 23m.

ELECTRO-METALLURGY.

CLEANSING AND PREPARING OBJECTS FOR ELECTRO-PLATING.

The first and most important operation in the electro-deposition of one metal upon another is to effect a thorough chemical cleansing of the surface of the metal upon which the coating is to be deposited, for if this is not accomplished the deposited metal will not adhere to the surface.

In cleansing, different metals usually require a somewhat different treatment.

The surface of most metals when clean soon become coated with a film of oxide when exposed to the air, especially when the surface exposed is wet, and to avoid this it is usually necessary to proceed with the plating immediately after cleansing.

Before proceeding to cleanse the articles they are usually "trussed" with copper wire to avoid the necessity of handling them during the operation or afterward, until the plating is finished. A very slight contact with the hand is often sufficient to make a second cleansing necessary.

If the article to be plated presents a smooth finished or polished surface the deposit will be "bright." If, on the contrary, the surface is rough or unpolished the deposit will ordinarily have a dead luster. If left too long in the acid dips used in cleansing, a polished surface is apt to have its finish deadened.

No interval should be allowed between the various operations of cleansing.

CLEANSING COPPER AND COPPER ALLOYS.

Potash, caustic	1 pound.
Water, soft	1 gallon.

Heat nearly to boiling in a cast iron pot provided with a cover.

Brush to remove any loosely adhering foreign matters, truss, and suspend for a time in the hot lye; usually a few minutes will suffice if the article is not heavily lacquered. If any of its parts are joined with solder it should not be allowed to remain too long immersed, as the caustic liquid attacks solders and their solution blackens copper. On removing rinse thoroughly in running water.

If the articles are much oxidized, pickle in a bath composed of—

Water	1 gallon,
Sulphuric acid	1 pint,

until the darker portion is removed. Rinse in running water and dip in the following solution:

Water, soft	1 gallon.
Cyanide of potassium, common	8 ounces.

Remove from the bath, and quickly go over every part with a brush and fine pumice stone powder moistened with the cyanide solution. Some electroplaters prefer to give the articles a preliminary "brightening dip" in nitric acid, or a mixture of nitric and sulphuric acids and salt, followed by rinsing in water; but the cyanide, aided by the mechanical action of the pumice and brush, does very well without it in most cases. After the scouring dip the work momentarily in the cyanide solution, rinse quickly in running water, and transfer immediately to the plating bath.

Where the article is to receive a deposit of gold or silver its surface is usually softened by slightly amalgamating it with mercury, to insure perfect adhesion of the deposited metal.

The amalgamating is performed by dipping the article, after the cyanide scouring operation, for a few seconds in a solution of—

Mercuric nitrate	½ ounce.
Sulphuric acid	½ "
Water	1 gallon.

Stir until the solution becomes clear before using. Rinse the work quickly on coming from the mercury dip, and transfer to the plating solution.

The acid, cyanide, and mercury dips may be kept in glass or stoneware jars (avoid jars with lead glazing) provided with covers to prevent evaporation.

A "dead luster" is imparted to articles of copper or copper alloy by dipping them for a few minutes in a bath composed of

Nitric acid (36°)	20 pounds.
Sulphuric acid (66°)	10 "
Salt	⅛ pound.
Zinc sulphate	⅛ "

Mix the acids gradually, add the zinc salt, then the salt, a little at a time (out-of-doors to avoid the acid vapors), stir well together, and let it get cold before using. Rinse thoroughly, and pass through the cyanide before putting in the plating bath.

CLEANSING CAST IRON.

Cast iron is freed from grease, etc., by dipping in hot alkali solution used for a similar purpose with copper, and after rinsing thoroughly is pickled in water containing about one per cent of sulphuric acid for several hours; then rinsed in water and scoured with fine sharp sand or pumice and a fiber brush. It is then rinsed and returned to the acid pickle for a short time, rinsed again, and put into the plating bath directly. If more than one per cent of acid is used in the pickle the time of immersion must be shortened, otherwise the iron will be deeply corroded, and the carbon which the metal contains, and which is not affected by the acid, will not yield without a great deal of labor to the sand and brush.

Cast iron does not gild or silver well by direct deposit. Copper or bronze deposits are better, though not perfect; but if the iron is tinned the coat is adherent and will readily receive the other metals.

CLEANSING WROUGHT IRON.

The cleansing of wrought iron, if much oxidized, is effected in the same manner as cast iron; but it will bear a stronger pickle and a longer exposure. Whitened, filed, or polished iron may be treated like steel.

CLEANSING STEEL.

Dip in the caustic lye used for copper, etc., rinse thoroughly, scour with pumice powder moistened, rinse, and pass through the following dip:

Water	1 gallon.
Hydrochloric acid	4 pounds.

Rinse quickly (but thoroughly) and plunge in the bath.

Clean wrought iron and steel gild well without an intermediary coating in hot electro-gilding baths. It is difficult to obtain an adherent coating of silver on these metals without interposing an intermediate coating of copper or brass, which renders the further operation of silver plating easy.

CLEANSING ZINC, TIN, AND LEAD.

Zinc is cleansed by dipping for a few moments only (as the alkali quickly attacks the metal) in the hot potash lye, rinsing, and dipping into water containing about ten per cent of sulphuric acid for a few minutes. Rinse in plenty of hot water, and, if necessary, scour with pumice stone powder and a stiff brush, moistened with a weak cyanide solution, or scratch brush. This last operation is especially useful when parts have been united with tin solder.

Tin, lead, and the alloys of these metals are more difficult to cleanse perfectly than zinc or iron. Scour rapidly with the hot potash and brush, rinse quickly and brush, or dress with a piece of soft clean wood. It is very difficult to obtain a satisfactory deposit of gold or silver directly upon these metals or their alloys. The results are much better if a coating of pure copper is interposed.

SCRATCH BRUSHING.

The scratch brush is often resorted to to remove the dead luster on or to impart a smooth surface to an object. They

are usually made of brass or steel wire, and of a variety of shapes to suit the object. Some of the forms are shown in the figure

The wheel brushes are used on the lathe, the objects being manipulated in contact with the rapidly revolving brush. The brush is usually kept moistened by a small stream of water while in use.

Ancient Works in New Mexico.

New Mexico is perhaps the most noted country in the world for research. The historian, the wealth seeker, and the "curious" can here find a rich field and reward for their labor. The Abo and Gran Quivira counties are perhaps the most renowned in the Territory for research. In the former there are evidences of great volcanic eruptions which overwhelmed cities and buried the inhabitants in ashes and lava long ages ago. It is evident that these people, who are perhaps older that the Aztecs, were a prosperous race, with not a little advance in civilization, as the Abo ruins in the Manzana Mountains indicate; also some indications of fine art; rude figures and the images of animals being found upon the interior of the walls of the structures beneath the *débris*.

It is evident that this non-historic race were seekers after mineral, and evidences also exist that mineral was obtained by them in paying quantities, there being the ruins of many old smelters and acres of slag found near Abo. Here mines are found with the timbers so rotten with age that great difficulty is experienced and danger incurred in going down into the old shafts, where shafts are formed.

One of our informants gave as his belief that either the flow of lava or falling leaves and dust had filled many of the shafts up, and the sand, earth, and leaves so completely covered the ground that great care is required to find them, with but one or two exceptions—the Mount of the Holy Cross (so named) being about the only one that could be easily discovered.

One especially was found where human hands or lava or falling leaves and dust had filled it level with the earth, no shaft being discernible, and would not have been found, perhaps, had not an old trail been discovered. This was dug into, and at a depth of twelve feet a man could, in places, thrust his arm in up to the elbow between the granite walls of the mine and the earth which filled the old shaft. The mineral, unlike our White Oaks country, does not seem to outcrop, but seems to be deep in the earth; no float having been found as yet except near the shafts or around the old smelters. On the eastern slope of the Manzana Mountains no quartz has been found excepting in a very burned and blackened condition. This part of the country will perhaps yield immense mineral wealth in time, and further developments and prospecting are awaited with great interest to many.

The walls of some of the old ruins at Abo are six feet of solid stone—lime and red sand—the walls in places are yet six feet in height and in a state of perfect preservation. In the ruins are found vessels of various designs and sizes made of pottery—some representing birds and animals. Stone hammers are found here, but no indications that sharp-edged tools were used in this ancient period. In digging down one place the remains of an old aqueduct was found, which was probably used, as in the present day, by the Mexicans for supplying the inhabitants with water.

It is thought and believed, by specimens of ore found, that gold, silver, and copper were found in paying quantites. All the rock is more or less copper stained, and some of it is so much so that some of the "country" rock has run as high as 37 per cent copper.

Surely our bright, sunny land has been enjoyed long before the Anglo-Saxon made his appearance upon the scene. The future of New Mexico can only be surmised. Every day new evidences of untold wealth are thrust upon us, and the day is not far distant when the multitudes of the East will flock to our borders and assist in the development of the greatest mineral region in the world.—*Era*.

The Brush Electric Light in London.

Very remarkable progress continues to be made with the installation of the Brush electric light by the Anglo-American Electric Light Company, says *Engineering*. The Great Western Station at Paddington has been most successfully lighted by thirty-two Brush lamps, and we believe this company proposes to light up their goods station at Smithfield as well as the principal stations along their line by the same system. The Charing Cross Station of the Southeastern Railway Company has been now lighted for more than a week by sixteen Brush 2,000 candle lamps worked by a dynamo-electric machine in the Anglo American Electric Light Company's Works in Lambeth. The globes used at Charing Cross are very similar to Sugg Albatrine globes, and give a very soft light, of which, however, far too much appears to be lost by diffusion toward the roof. Some other large metropolitan terminal stations will also be shortly lighted by the same system. In the provinces Messrs. John Bright Brothers, of Rochdale, Messrs. Horrockses, Miller & Co., the Blaina Iron Company, and Messrs. Courtauld, of Bocking, in Essex, are among the most recent users of the Brush system. The Bristol municipal authorities completed a series of experiments on Saturday last, to which we refer in more detail in our Notes from the Southwest, with a view to lighting the main streets of that city with the same system: the results obtained were in all respects satisfactory. Similar steps are being taken by the municipal authorities of several large continental towns, and also of towns in India with the same object. In Palace Yard Westminster, the number of Brush lights will be increased in a few days. There can be no doubt that this system fully merits the favor thus being so widely extended to it.

The New Orleans Cotton Exchange Building.

The attention of architects is invited to the professional opportunity offered in the competition of plans for a cotton exchange building in New Orleans, advertised in another column. The building is to be four stories in height, with an attic or mansard, absolutely fireproof as to elevator shafts and stairways, and as nearly fireproof elsewhere as can be without the use of iron.

The cost of the building, complete, is not to exceed $150,000. The nature of the cotton business and the peculiarities of the climate of New Orleans necessitate large window spaces for light and ventilation, and a plan of building adapted to strong architectural effects. A premium of $1,000 is offered for the design chosen (to be submitted on or before March 15, 1881), with $500 additional for details and specifications in case they may be required. Particulars with suggestive sketch-plans may be had on application to Henry G. Hestor, secretary of the New Orleans Cotton Exchange, New Orleans, La.

Preservation of Meat by Dextrine.

In the *Comptes Rendus* of the French Academy for December 6, there is a note by M. J. Seure on some experiments made by him in drying and preserving meat by means of dextrine.

Of the three specimens exhibited before the Academy the first was a slice of lean meat which had been buried in dextrine and left exposed to the air on a shelf in a closet for twenty months. The meat had become mummified; but, on putting it in water, it separated from the dextrine and assumed its original physical character. The second was meat which had been chopped up coarsely and mixed without any particular care with dextrine, so as to obtain a thick paste. This paste was dried in the air, and retained its properties like the former. The third was meat beaten to a fine pulp with dextrine and run into a mould, the result being a very hard, dry, homogeneous cake of a handsome appearance. Each of these specimens when exhibited had been preserved for the same length of time—twenty months.

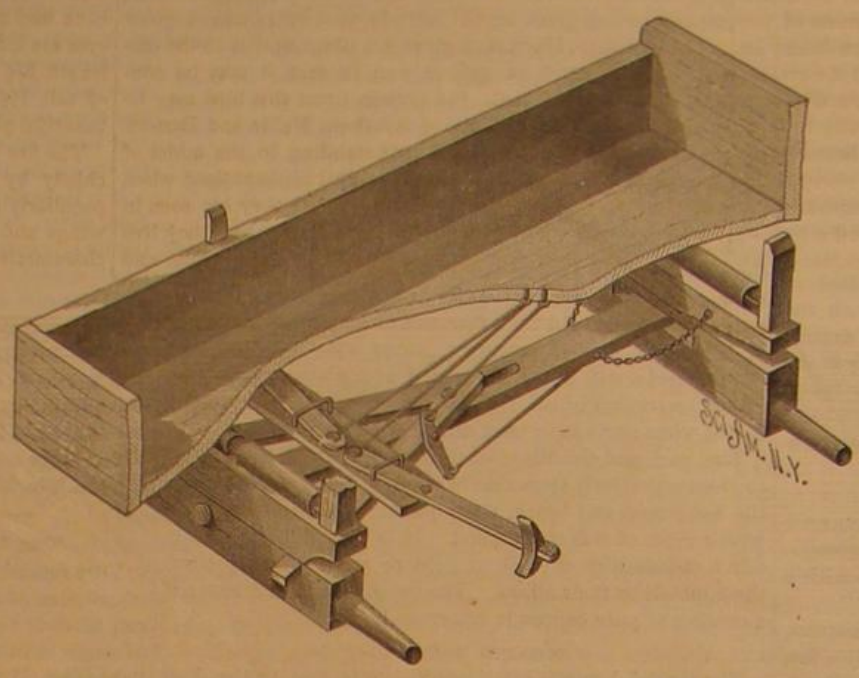
IMPROVED WAGON BRAKE.

We give herewith an engraving of an improved automatic wagon brake recently patented by Mr. A. L. Withers, Jr., of Summit Point, W. Va., which is operated by a forward motion of the load on its roller supports on the bolsters. The connection of the rear hound with the reach is by means of a bolt or stud extending through a slot in the reach, and permitting the hound to move through a limited distance. A cross bar secured to the hound carries two brake levers, projecting in opposite directions, having at their outer ends shoes which are capable of pressing the peripheries of the rear wheels of the wagon. These brake levers are pivoted about centrally to the cross bar, and their inner ends are connected by rods or chains with the bottom of the platform or wagon body, so that should the body move forward more or less on its roller supports, as in going down hill, the brakes will be automatically applied to the wheels.

A short lever pivoted to the side of the hound has its shorter arm connected by a rod or chain with the wagon body, and the longer arm is connected with the king bolt of the wagon by a rod or chain.

When the wagon reaches a level, the reach being drawn forward, the chain or rod connecting the short lever with the king bolt is drawn upon, moving the lever and drawing the wagon body backward, releasing the brake shoes from the wheels. The forward and backward movements of the body are limited by suitable stops.

This simple apparatus is entirely automatic, and applies the brakes with more or less force according to the requirements of the case, and it may be readily adapted to any wagon.



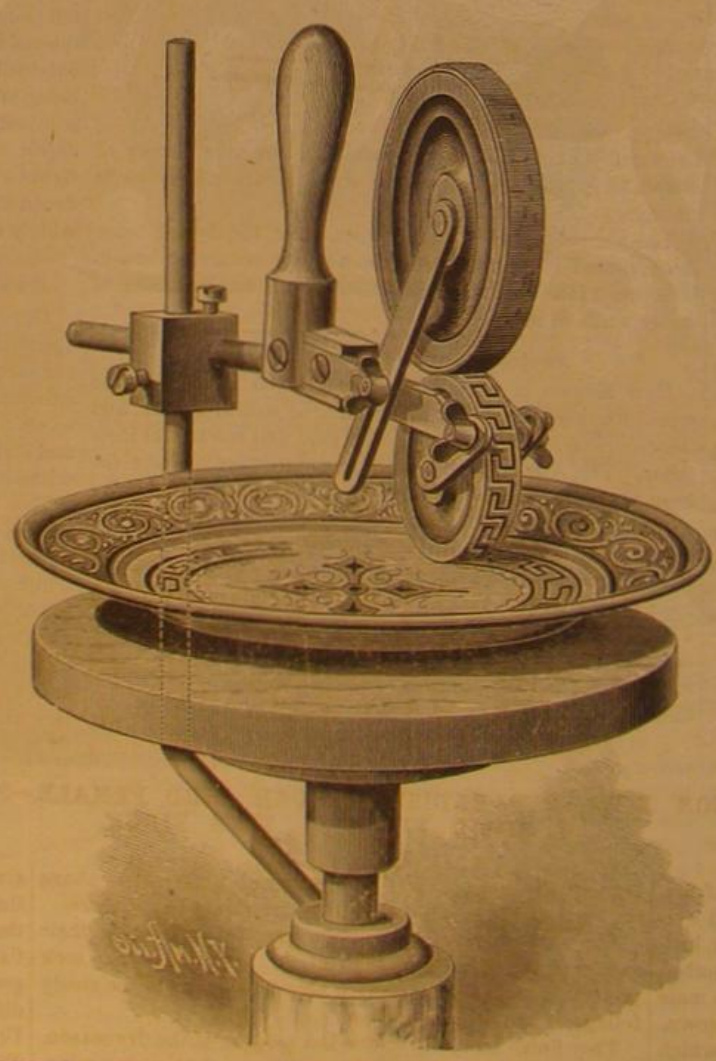
WITHERS' IMPROVED WAGON BRAKE.

APPARATUS FOR DECORATING POTTERY.

The decoration of china, until quite recently, has been done almost exclusively by hand, rendering it not only a slow but expensive operation. The engraving shows a simple machine, invented by Mr. S. J. Hoggson, of New Haven, Conn., for applying various styles of ornaments, but principally designed for borders.

The engraving shows the invention so clearly that a description is hardly necessary. The wheel which rolls upon the work to be ornamented carries the design and receives the color from the wheel above, and both wheels are sustained by a pivoted support provided with a handle, by which they may be raised or lowered or turned sidewise, as may be required to conform to various surfaces to be ornamented. The object to be ornamented is supported by a freely turning table, which is revolved as the impression roller is pressed upon the work. The inventor claims that there is no border or ornamentation, no matter how delicate or minute, ever came from the matrix of the type founder that cannot be produced upon china or any vitreous substance as perfect as if the impression had been taken by a master workman upon the finest paper, and with great rapidity.

The great advantage of this machine is in its applicability to plane, concave, convex, or any other surface, creeping over it as gently as a spider would, yet leaving its web-like tracings in enamel, which, when fired into the glaze of the ware in the usual manner, will last forever. It will work from ordinary type, electrotype, stereotype, wood-cut, or phototype patterns. The advantage of this over the transfer system used in old countries, on the cheaper kinds of ware, will be readily seen, and when we consider that, heretofore, all such decorations done in the United States were applications of the brush, in the same manner as an artist would paint a picture, we can begin to realize to what extent this little machine can be used.



APPARATUS FOR DECORATING ENAMELED SURFACES.

Progress of the Telephone.

Lowell, Mass., is connected by telephone with over one hundred cities and towns in the States of Massachusetts, New Hampshire, and Rhode Island. The longest circuit is from Springfield, Mass., *via* Worcester, Fitchburg, Lowell, Lawrence, to Exeter, N. H., over 150 miles, which is worked successfully. The telephone business between Boston and Lowell, a distance of 26 miles, amounts to $3,000 annually. The Lowell District Telephone Company, which owns and operates the systems of Worcester, Lowell, and Fitchburg, and the lines of the Northern Massachusetts Telephone Company use 2,500 telephones, and pay the American Bell Company a monthly royalty of over $1,200.

The company controls over 1,500 miles of wire, and employs in all divisions about twenty-five ladies and seventy-five men and boys.

MISCELLANEOUS INVENTIONS.

Mrs. Frank J. Kellogg, of Flint, Mich., has patented an apparatus for draughting patterns, by which the waists of ladies' dresses may be cut from measurement accurately and conveniently. It is a combined rule and square made in the form of a triangle, by which the form of the pattern may be laid out, a curved scale being used in connection with the rule and square for obtaining the proper shapes for the neck and arm-holes.

Mr. John C. Banks, of Vincennes, Ind., has patented an iron railing and fence, more particularly relating to the tubular post and rail variety of iron railing. The rails are polygonal tubes, each composed of two longitudinally flanged parts, the flanges of one part overlapping those of the other part. The posts are analogously formed, and the parts are connected by solder.

Mr. James C. Bowen, of North Springfield, Vt., has patented an improved refrigerator for supplying cars with cold air. The refrigerator is stationary, consisting of an ice box having a valved opening near the top, with a pipe leading from such opening to connect the refrigerator with an opening in the top of the car, and a second pipe leading from another valved opening in the refrigerator to a pipe or flue in the car which delivers the cooled air at the bottom of the cars. By these means the cooled air is made to circulate several times through the car and among its contents before disconnecting the source of cold, and the contents are more thoroughly and uniformly cooled than heretofore.

Messrs. Egesippe D. Melançon and John H. Ayrand, Sr., of Paincourtville, La., have patented an improvement in plows, by which an adjustment for cutting deeper or shallower furrows, and of the handles to adapt them to taller or shorter plowmen, is easily made by simple devices.

Mr. Edward A. Pearse, of Downend, near Bristol, county of Gloucester, England, has patented a machine for aerial navigation. The invention consists in improved means for suspending an aerial car from a gas bag, and in a set of adjustable legs for propping up one end of the car before rising, in order that the propeller may act in the direction of an ascending plane.

Joseph E. Culver, M.D., of Jersey City, N. J., has patented a steam generator intended to abstract more of the heat from the gases of combustion and prevent loss of heat by waste from the smokestack. A very novel and interesting arrangement and construction of parts is employed. The gaseous products of combustion and the steam may be used either separately or mixed for motive purposes. In the latter case the mixture is accomplished in a mixing pipe, into which both the steam and the gases are introduced through separate entrances.

Mr. Charles R. Nelson, of Corinna, Me., has patented a sheet-metal notching machine, which makes both square and bevel notches, at the same time clipping the lower corners of the plates preparatory to seaming and wiring the same. A flat bed plate is supported on suitable standards, having secured upon it a fixed and an adjustable cutting jaw and adjustable guide plates. A rocking shaft is journaled in the standards parallel with the bed plate, having keyed upon it a stationary and an adjustable dog, each of which carries a cutting jaw corresponding and operating with the stationary jaws of the bed plate.

Mr. Thomas H. Davies, of Fairview, N. Y., has patented a harrow which consists of two or more series of longitudinal zigzag bars, connected together at their angles by short cross bars, the several series of bars so connected being hinged together. The zigzag bars carry sockets for the teeth, and each series has an eye at each, by which means the draught may be applied at either end of the harrow.

Mr. C. Gordon Buchanan, of Brooklyn, N. Y., has patented an improved stone breaker of that class having two movable jaws. One of the jaws is pivoted at the top and the other at the bottom. The jaws are connected at the top by rigid links, and at the bottom by tension rods or tie bolts in such manner that almost all the tensile strain due to crushing is imposed upon the links and rods, thus obviating the necessity of casting the frame in one piece and of great weight and strength as heretofore. By pivoting the two jaws so that the motion of one is from the top and the motion of the other is from the bottom, a uniform crushing motion may be obtained from the top to the bottom of the crushing plates, if desired, and the throw of the jaws may be made shorter, saving power and securing more uniform crushing.

Mr. John P. Allen, of Dawson, Ga., has patented a seed planter and guano distributer, which will distribute cotton seed, corn, pease, and other seeds and grain, as well as guano, and other fine fertilizers, in drills, uniformly and in greater or less quantity, as may be desired, and which is simple in construction, strong, durable, and inexpensive in manufacture.

Mr. John W. McCorkle, of Freeport, Washington Territory, has patented an improved tuyere, which delivers either a single straight blast or a number of blasts radially inward toward the center. A sort of triple channel is formed in an annular casting, in such manner that two of these castings fitted together inclose one straight passage and two semicircular ones, each of which is controlled by a valve. From the two semicircular passages radial passages direct the flow of air toward the center.

Mr. Edward M. Richardson, of Laconia, N. H., has invented a car coupling so constructed that it is unnecessary for an attendant to enter between the cars for coupling or uncoupling. The coupler has a longitudinal perforation and side slots, a bar, sliding in the perforation, a crossbar attached to the sliding bar and working in the cross slots, pivoted horizontal bars, pivoted triangular lever plates, pivoted upright bars, a cross bar carrying the coupling pin, and a push bar placed in the rear part of the longitudinal perforation. The cars couple automatically and are uncoupled by moving the sliding bar forward.

Mr. Robert Cartwright, of Rochester, N. Y., has patented a head rest which can readily be attached to the back of a chair or other seat, and which can be raised or lowered, or adjusted forward or backward, as circumstances may require.

WEAVER BIRDS.

Among the most important families of the finches are the true weaver birds, all of which inhabit the hotter portions of the Old World, the greater number of them being found in Africa, and the remainder in various parts of India.

The ribbon bird or collared as an inhabitant of West Africa, but its extent of territory is not confined to the western part, but reaches as far as the eastern coast. In the Nile regions it is met with from the sixteenth degree north latitude to the gloomy forests of the steppes. It avoids the real desert, and is seldom found in the primeval forests, as these forests do not afford the grasses rich in seed from which it obtains its food. It is not known whether it eats fruit. In captivity it takes readily to fruit and similar food, but lives principally upon grain and especially grass seed.

In North Africa these birds are commonly met with in communities of from ten to forty individuals, and are often united in large flocks with others of their species. This flock approaches the huts of the villagers fearlessly. In the morning hours they may be seen diligently employed in searching for their food, never running around upon ground, but climbing upon the low grasses. If the flock is disturbed the birds rise, fly to the neighboring trees, adjust their plumage, and the males begin to sing. As soon as the disturbance is over they all return to the ground. If a bird of prey approaches, the flock flies close together as swift as an arrow to some thick bush or tree, which affords them the necessary protection. In the middle of the day they sit quietly half asleep in the branches of a shady tree.

The male is distinguished from the female by a more beautiful coloring and a broad, magnificent carmine red collar, which extends from one eye to the other over the white throat. The eyes are dark brown, the bill and feet pale brown. The main color of the female is a pale brown, the back being darker and the under side lighter; every feather is edged with black. The wing coverts have a large grayish spot at the end, which is quite conspicuous. The bill is very strong, scarcely longer than it is broad and high, flattened at the top, the under part being very broad. The wings are of medium length, and the tail short and rounded. The whole length of this pretty bird is five inches, the wings two and one-half inches, and the tail one and one-half inches.

The nest of this bird is not known. The breeding time in Eastern Africa at least is in September and October, which period may be compared with our last spring months.

In captivity these birds collect the building material offered them into a more or less orderly nest. The females lay from six to nine white eggs, and the male alternates with the female in setting upon the eggs. The eggs mature in thirteen days.

In West Africa they are furnished by the natives in great numbers to bird dealers. They endure transportation well and require but little care.

The paradise whidah bird (*Vidua paradisea*) is often found in cages and menageries, as it is quite common in its native land, and bears confinement better than most tropical birds. It is an inhabitant of Western and Central Africa. It is a very graceful bird, perpetually in motion, and evidently admires its beautiful tail. Although not very brilliant in hue the paradise whidah bird is beautifully clothed with softly tinted plumage. The general color of the male bird is black, the wings dark brown, edged with pale brown. Round the neck runs a collar of rich ruddy brown, which edges the black line down the breast. The iris is dark brown and the foot brown. The female is the color of a sparrow, with two black stripes on the crown of the head, and black wings; on the breast it is a rusty red. The wings are edged with rust color. The length of the bird, with the exception of the long tail feathers is six inches; the length of the wings a little more than three inches.

The tail of this bird is very singularly formed. Both webs of the two central feathers are extremely broad for about three inches, and then suddenly disappear, leaving the bare slender shaft to project for two or three inches; the two next feathers are equally elongated and rather broadly webbed, being nearly three-quarters of an inch in width. They are often more than eleven inches long, and sweep in a graceful curve from the insertion of their quills to the extremity of their points. The beautiful tail feathers fall out after the breeding season, and the bird exhibits the sincerest grief for his loss, appearing to be thoroughly ashamed of his undress. Of its habits in a wild state but little is known.

The blood finch (*Lagonosticta minima*) inhabits all of Central Africa from the eastern to the western coast, and from twenty-two degrees north latitude to twenty-five degrees south latitude. Hartmann gives it a place similar to the one our house sparrow has gained, and, in fact, it may be considered as a house bird. At certain times this bird may be found in all of the villages of Southern Nubia and Eastern Soudan, even in the isolated huts standing in the midst of the forest. It is one of the first tropical birds noticed when traveling from Egypt to Soudan. Usually they are seen in the neighborhood of villages in large flocks, but they live also at a distance from men in the lonesome steppes, and even in the mountains at an altitude of 1,500 meters above the level of the sea, although they are rarely found there.

They are very active, and are excelled by few of their species in the rapidity of their flight. At midday they seek protection from the oppressive heat of the sun in the shady foliage of the evergreen trees.

They finish moulting in the last months of the dry season, and the breeding season begins with the first spring rains, somewhere in the beginning of September. Until then they live in flocks, but now separate in pairs and go into the cities and villages and look about for a suitable place for their nests under the roofs of the thatched houses and the clay huts of the natives. Here in some cavity or upon some suitable foundation they build a tangled nest of dry stalks, whose inside is well rounded. Their nests contain from three to seven white round smooth-shelled eggs. It is said that they breed more than once in the year; and this is in accordance with the knowledge we have of imprisoned birds of this kind. The male is very tender in his behavior to the female, and quarrelsome in presence of a rival. The male and female alternate in setting upon the eggs. The eggs are matured in thirteen days, and the young are fed with insects and softened seeds of various kinds.

The color of the blood finch is a purple wine red, fawn colored upon the crown and shoulders, every feather being edged with purple. The side of the breast is marked with small white spots. The under tail feathers are a pale brown. The female is nearly all fawn color, purple appearing on the back and neck, and the breast is spotted with white. The eyes are a deep brown, the bill red, the feet reddish. Their length 3½ inches; length of wings, 1¾ inches; and length of tail, 1½ inches. The blood finch is not only a bird of beautiful plumage, but is also an agreeable pet.

The fire weaver, fire finch, or orange bird, is distinguished chiefly by its plumage, which, in the breeding season, is peculiarly soft and velvety, and, with the exception of the wings and tail feathers, is black and vivid red. The other characteristics are a short conical bill, whose edges are slightly curved toward the point, feet provided with strong claws, the wings reaching down to the middle of the tail, the first quill feathers being very small and short, while the four following ones are nearly equal, and a short slightly rounded tail.

Aside from the breeding season the male and female wear a modest sparrow colored garment. Towards the breeding season the plumage of the male changes completely, not only in respect to the coloring, but also in respect to the quality of the feathers. Only the wing and tail feathers retain their usual character. At this time the male bird is of a velvety black upon the upper part of the head and breast, dark brown upon the wings with pale brown marking, the other parts being a brilliant scarlet. The new tail feathers grow to such a length as to nearly conceal the old ones. The pupil of the eye is brown, the bill black, the feet yellowish brown. The female is the color of a sparrow upon the upper side, a yellowish brown underneath, the throat being lighter. There is a yellow stripe over the eye; the bill and feet are the color of horn. The length of this bird is nearly 5 inches; length of the wings, 2½ inches; and of the tail, little more than 1½ inches.

The fire finch inhabits the durra fields in regions abounding in water from Central Nubia to the depths of inner Africa. It prefers cultivated regions under all circumstances to uncultivated. A durra field is its paradise, from which it can only be driven away with difficulty. Its habits are more like those of the reed bird than like the other weaver birds. Like them it climbs dexterously up and down upon the grass-like stalks, slides upon the rush grass to the ground, and when in danger, like the reed bird, conceals itself among the thickest of the stalks. After the fields which have given it shelter during the breeding season are harvested, this bird, with others of its species, makes raids about the country. The fire finch is notable for its sociability. Although the males are excited to sing at the same time they seldom come into contest. There exists among them the most harmless kind of rivalry, and they appear to enjoy each other's society. Their nests are skillfully woven together, but are built more simply than those of the other weaver birds. They are held up by the grass stalks, but not suspended from them, and are partially, sometimes wholly, concealed by the high tufts of grass between the stalks of the durra. In form and size they differ from each other; some are round and some elongated. Upon an average their length is from seven to eight inches. The walls are lattice-like, and so loosely joined together that the beautiful blue eggs may be seen through them. There are from three to six eggs in a nest. Often from ten to twelve of these nests are found near together. It is thought that the female alone sets upon the eggs, but it cannot be asserted with certainty. The young fly before the durra is harvested, and after the birds have left their nests they collect themselves into large flocks and become a plague to the country. In order to protect their grain the poor Nubians are obliged to keep a constant watch over their crops during the whole day.

The fire finch may be found in our bird market, but is

1. RIBBON BIRD.—2. PARADISE WHIDAH BIRD, FEMALE.—3. MALE.—4. BLOOD FINCH.—5. FIRE FINCH.

often passed by by those not familiar with it, because it has on its beautiful plumage only a few months in the year. In cages it is kept upon the customary food, and with proper care will breed in them.—*Translated from Brehm's Animal Life.*

BOTANICAL NOTES.

The Number of Existing Species of Plants.—Dr. Müller, of Geneva, has recently made the following calculation as to the total number of existing botanical species: We have at present, described in our books, about 130,000 species; and, if we suppose that, in round numbers, 30,000 belong to countries like Europe and North America, where there are hardly any species, excepting some cryptogamic ones, to be discovered, the remainder, or 100,000, representing exotic plants, more or less tropical and southern, we may double the latter for new species, giving 200,000 for these less known regions, and altogether 230,000 for the whole globe, with the exception of countries still quite unknown botanically. Adding only 20,000 species for the latter, we reach a minimum sum of 250,000 species of plants.

The Effect of Freezing on Plants.—When frost attacks plants to such an extent that ice is formed in their tissues, says the *Gardener's Chronicle*, it has been observed that the ice does not occur within the bags or cells of which the plant is made up, but outside or between them. The reason of this is probably because the contents of the cells are thicker and denser, and do not freeze so readily as do the thinner and more watery juices in the spaces between the cells. In this manner the essential part of the cell—so far as its life actions are concerned—the thick protoplasm, is less liable to injury. Moreover, as a consequence of the low temperature, the watery part of the cell-contents exudes from the interior through the cell-walls and there freezes. The expansion which takes place when water freezes, therefore, does not, at least in slight cases, take place within the cell, where it would do mischief by bursting the cell-walls, but outside them, where there is more room to expand and less risk of tearing the tissues. When the frost is more severe the tissues do become torn, cracks and fissures occur, the protoplasm is killed, branches fall, leaves wither or rot, and death ensues. But where the injury is less, and especially where the protoplasm is uninjured, when the thaw comes the ice outside the cells becomes melted, and the water, by the power of diffusion, passes once more through the cell-wall into its cavity, there to mix again with the more dense protoplasm. It is clear, then, that the danger to plants from frost is proportionate to the water they contain. If they are in an unripe, sappy condition the danger is far greater than if they are comparatively dry and at rest. Tubers and seeds, for instance, are specially adapted to resist cold; and how well they do so has been shown in the case of wheat which germinated at home after having remained throughout the winter in the Arctic regions.

The Power of Movement in Plants.—Mr. Darwin, in his recent work under the above title, now shows, after a prolonged course of experiment and observation, that "all the parts or organs in every plant, while they continue to grow, are continually circumnutating"—that is, the point of a growing stem, etc., is found to describe an irregular circular figure. This movement is not uniform, but consists, in some cases at least, of innumerable small oscillations. The phenomena thus produced closely resemble many of the actions performed, as is supposed unconsciously, by the simpler and lower animals. The author tells us that even among allied plants one may be highly sensitive to the slightest continued pressure, and another highly sensitive to a slight momentary touch. The author considers that the most striking resemblance between plants and animals is the localization of their sensitiveness and the transmission of any influence from the part excited to some other part, which consequently moves. It is not, of course, contended that plants possess a brain or other true nervous center, and a system of nerves by which it is connected with the whole body. But it is, to say the least, doubtful whether such structures exist in the lowest animals, and it is probable that where present they serve merely for a more perfect transmission of impressions and a more complete intercommunication of the several parts. Mr. Darwin calls attention to the wonderful character of the tip of the radicle, which is remarkably sensitive. If, says he, the tip be lightly pressed, or burnt, or cut, it transmits an influence to the upper adjoining part of the root, causing it to bend away from the affected side; and, what is yet more surprising, the tip can distinguish between a slightly harder and a softer object, by which it is simultaneously pressed on opposite sides. If, however, the radicle is pressed by a similar object a little above the tip, the pressed part does not transmit any influence to the more distant parts above, but bends abruptly toward the object. If the tip perceives the air to be moister on one side than on the other, it likewise transmits an influence to the upper adjoining part, which bends toward the source of moisture. Taking these various kinds of sensitiveness into consideration, Mr. Darwin pronounces it hardly an exaggeration to say that the tip of the radicle thus endowed, and having the power of directing the movements of the adjoining parts, acts like the brain of one of the lower animals, where the brain, seated within the anterior end of the body, receives impressions from the sense-organs and directs the several movements.

The Mexican Ocotilla.—The curious genus *Fouquiera* includes three described species, to which the Mexicans give the name "ocotilla." Although associated in the same natural order with the well known *Tamarix* by botanists, their relationship would scarcely be guessed from their aspect, especially as they have long, showy tubular corollas. Rev. E. Lee Greene, in a narrative of a botanizing tour in the Colorado desert, published in the *American Naturalist*, describes *Fouquiera splendens* as follows: "Extremely odd-looking, and not more odd than beautiful, is the small tree locally known by its Mexican name, ocotilla. It grows to the height of from 8 to 12 feet, and in outline is quite precisely fan shaped. To show how this may be, let me more particularly describe its mode of growth. The proper trunk, usually 10 or 12 inches in diameter, is not more than 1½ feet high. At just a few inches above the surface of the sand this trunk abruptly separates into a dozen or more distinct and almost branchless stems. These simple stems, rising to a height of 8 or 10 feet, gradually diverge from one another, giving to the whole shrub the outline of a spread fan. Each separate stem is clothed throughout with short gray thorns and small dark-green leaves, and terminates in a spike, a foot long, of bright scarlet trumpet-shaped flowers. This splendid oddity flourishes in great abundance in many places. The stems are not so thickly armed with thorns but that a man may handle them if he will seize them circumspectly with his fingers, and being very hard and durable, as well as of a convenient size, they are much employed for fencing purposes about the stage stations and upon the ranches adjoining the desert. Give a skillful Mexican ocotilla poles and plenty of raw-hide thongs, and he requires neither nail nor hammer to construct a line of fence which, for combined strength, neatness, and durability, fairly rivals the best work of that kind done in our land of saw-mills and nail factories. As a tree or shrub of strange beauty the cultivators will vainly desire to add this to their list of varieties, unless their art can reproduce the parched and sterile gravel heaps, and the dry withering atmosphere which it finds congenial."

The Compass Plant.

The last number of Curtis's *Botanical Magazine* contains the following interesting account, by Sir J. D. Hooker, of the compass plant (*Silphium laciniatum*) of the Western prairies:

This noble plant was introduced (from America) into Europe in 1781 by M. Thouin, and flowered for the first time in the Botanic Garden of Upsala, in Sweden. It has been in cultivation in Europe ever since, though its name and fame as the compass plant of the prairies are of comparatively modern date, it having before that borne the popular names of turpentine plant and rosin weed, except among the hunters and settlers in the Western States. With regard to the history of its reputed properties as an indicator of the meridian by the position of its leaves, I am fortunate in having recourse to my friend, Professor Asa Gray, now in England, who has most kindly furnished me with the following very interesting account of this matter:

"The first announcement of the tendency of the leaves of the compass plant to direct their edges to the north and south was made by General (then Lieutenant) Alvord, of the U.S. Army, in the year 1842, and again in 1844, in communications to the American Association for the Advancement of Science. But the fact appears to have been long familiar to the hunters who traversed the prairies in which this plant abounds. The account was somewhat discredited at the time, by the observation that the plants cultivated at the Botanic Garden at Cambridge, U. S., did not distinctly exhibit this tendency. But repeated observation upon the prairies, with measurements by the compass of the directions assumed by hundreds of leaves, especially of the radical ones, have shown that, as to prevalent position, the popular belief has a certain foundation in fact. The lines in "Evangeline" (familiar to many readers, and beginning—

'Look at this delicate plant that lifts its head from the meadow,
See how its leaves are turned north as true as the magnet,' etc.)

were inspired by a personal communication made by General Alvord to the poet Longfellow. Since the leaves tend to assume a position in which the two faces are about equally illuminated by the sun, it might be suspected that their anatomical structure was conformed to this position. This has been confirmed, first by Mr. Edward Burgess, who, when a pupil of mine, observed that the stomata were about equally abundant on the two faces of the leaf; and next by Mr. Arthur, of Iowa, who has recently published in Prof. Bessey's 'Introduction to Botany' a figure of a section of a leaf showing that the arrangement of the 'palisade cells' of the upper and lower strata is nearly the same. The leaves always maintain a vertical position, except when overborne by their weight. As to their orientation, not only is this rather vague in the cultivated plant, but subject to one singular anomaly, which may be commended to Mr. Darwin's attention. I have several times met with a leaf abruptly and permanently twisted to a right angle in the middle; so that, while the lobes of the basal half pointed, say, east and west, those of the apical half pointed north and south."

To the above (says Dr. Hooker) I have little to add. I have not been able to detect any orientation of the leaves in the Kew cultivated specimens, but these not being planted in a good exposure all round, are out of count as witnesses. On the other hand, when traversing the prairies with Dr. Gray, in 1877, I watched the leaves of many hundred plants from the window of the railway car, and after some time persuaded myself that the younger, more erect leaves especially, had their faces parallel approximately to the meridian line. I may mention that I, on the same occasion, convinced myself that the flower heads of various of the great helianthoid compositæ that grew in hosts on the prairie did follow the sun's motion in the heavens to a very appreciable degree—their morning and evening positions being reversed. This observation did not, however, extend to the compass plant, the rigid stout peduncles of whose flower heads would not be expected to favor such a motion.

Fool's Parsley Not Poisonous.

For several centuries the common umbelliferous weed known under the common name of "fool's parsley," and botanically as *Æthusa cynopium*, has been an object of suspicion and classed by botanists and toxicologists among poisons. But now Dr. John Harley, of England, comes forward and presents a vindication of this plant, which he calls harmless and innocent. In the St. Thomas's Hospital reports he relates several facts to corroborate the truth of his assertions. Having collected the plants at two seasons of the year, just before flowering and also after the plants had set their fruit, he expressed the juices of both stem, leaves, and roots, and preserved the extracts by the addition of alcohol. Being thus provided with a supply of material which supposably represented the active principles of the plant, he exhausted his supply upon four persons, one a little girl six years old, who took the extracts in quantities ranging from two drachms to two ounces; himself, who took them in quantities ranging from two to four ounces; and two other adults, who were the subjects of spasmodic torticollis. These two took one or other of the juices, ranging from one to eight fluid ounces. Effects were carefully looked for, but none followed after any one of the doses.

Dr. Harley feels compelled to say, in conclusion, that the "fool's parsley" of Sussex, Essex, Kent, Surrey, and Hertfordshire, is not only absolutely free from the noxious properties ascribed to it, but that it is pleasant to the taste, sight, and smell, and, in the absence of the more fragrant and succulent herbs, might well be used as a pot-herb or salad. Moreover, he asserts that his conclusions are independent both of locality and season, the only influence that these conditions have on "fool's parsley," as on "hemlock" (*Conium*), being that of increasing or diminishing its succulency. Some years ago, Dr. Harley, after similar experiments, came to the same conclusion in regard to the alleged poisonous properties of hemlock (*Conium maculatum*). This weed, although for all ages it has been esteemed extremely poisonous, is nevertheless eaten as a pot-herb by northern natives—especially Russians—although the precaution is always taken to boil it in several waters.

The poisonous properties found in many plants, however, are quite volatile, and are readily dissipated by certain manipulations—especially by cooking. Those who have read Linnæus' "Flora Lapponica" must be familiar with the author's anecdote of the old Northland woman whom he saw picking the leaves of the aconite (*Aconitum napellus*). Asking her what she was going to do with them, she answered she was going to use them as food. He, thinking she had mistaken the plant for some species of geranium, warned her against its very poisonous nature; but she, smiling, assured him that she knew what she was about! He followed her to her dwelling, saw her boil the aconite leaves into a broth, and then, to his intense horror, observed the family of four persons sit down and partake of the terrible compound. But the great botanist is compelled to admit that not one of the persons seemed a bit the worse for their strange meal.

NEW INVENTIONS.

Mr. John T. Todd, of Chrisman, Ill., has patented an automatic car coupling, which consists of a concave-faced drawbar, provided with interior upper and lower spring-actuated hooked jaws, and suitable levers for opening them. The coupling link has beveled ends, and shoulders or dogs for engaging the jaws.

A beehive, patented by Mr. David C. Cripe, of North Manchester, Ind., is so constructed that the bees are compelled to build their combs straight and of a uniform size. The comb frames are substantially supported, and there is no exposed metal within the hive to attract moisture and frost. The hive is inexpensive to construct and convenient in use.

A corset steel fastening, patented by Isador Ulman, of Santa Cruz, Cal., consists of a pair of steels, one of which is provided with a series of transverse plates, having a catch on one end and an eye on the other end, while the other steel is provided with corresponding transverse plates, having a tongue on one end to engage in the opposite catch, and an eye on the opposite end.

Mr. John N. Brown, of New London, Conn., has patented a seat pocket for vehicles, the invention consisting in a metallic frame peculiarly constructed and arranged, and designed as a substitute for the pockets usually made of enameled cloth heretofore used.

Mr. Charles McQueed, of New York city, has patented a neck ruching pressing machine, whereby the work of pressing collars, collarets, or neck ruching, is rendered more accurate and effective, and performed with a great saving of time and labor, as compared with ordinary methods.

Mr. William E. Stanton, of Ridgeville, Ohio, has patented an improved lawn mower, to which an initial movement can be given that enables it to work with the same power when starting as after it is fully in motion.

A refrigerating apparatus, patented by Mr. Kennard Knott, of London, England, comprises an air-tight or nearly air-tight non-conducting preserving chamber, and maintains a constant current of cooled, dried, and purified air through said chamber, for which, however, heated air may be substituted for certain purposes.

MECHANICAL INVENTIONS.

Mr Newton P. Merchant, of Blaine, Mich., has patented an improved stump-puller, so constructed that it can readily be adjusted to operate with a quicker movement and less power for pulling small stumps and snags, or a slower movement and greater power for pulling larger stumps. The invention relates to that class of stump-pullers having inclined posts connected at their upper ends, a suspended frame for supporting the operating mechanism, and wheels and a pivoted shoe to adapt the puller to be readily moved from place to place.

Mr. Dolphus Torrey, of New York City, has patented an improvement in bells, which consists in a bell swaged from a composite plate made by inclosing steel in a box-pile having iron top and bottom plates, and sides made by bending a narrow plate of iron so that its ends overlap each other, heating the pile so formed, and subjecting it to hammering or rolling to produce a plate having a steel center and iron surfaces thoroughly welded together. It is claimed that such plates are harder, stronger, and more sonorous than iron plates, and possess better welding qualities than steel plates; and that out of them may be made bells lighter, stronger, and more durable than those of cast metal.

An improvement in traction engines, patented by Mr. Samuel S. Barr, of Waukon, Iowa, provides better means for guiding and controlling the movements of such engines than has hitherto been supplied. To the centrally pivoted front axle is attached, on each side of the center, the ends of a rope, which is coiled tightly around a rod journaled in boxes attached to the under side of the vehicles. A cog wheel is attached to one end of this rod, and is actuated by suitable gearing. Turning the bar winds off the rope at one end of the coil, and on at the other, thus inclining the axle in accordance with the turning of the wheel.

Mr. James H. Gressom, of Erin, Wis., has patented an improved wagon coupling, by which the front axle and sand-board are not weakened by the mortise commonly made for the wagon-reach, and by the usual nine bolt holes for the three bolts which ordinarily hold together the axle, sand-board, and front bolster. Other objections are also overcome by his improvement, in which he employs a coupling block transversely mortised on the under side to fit over and upon the sand-board and front axle, to which latter it is held by a single fore-and-aft bolt, and having a circular socket in its top for the reception of the circular base of the bolster support, held therein by a cover and provided with a rearward forked lug that clamps the forward end of the wagon reach.

Mr. James J. Kean, of San Francisco, Cal., has patented a spark arrester for locomotives, etc., which consists in a revolving turret, closed at the top, and formed with sides of perforated material, and a receiving chamber for the sparks; also in a conical and perforated sleeve, which is fitted within the turret, for assisting in breaking up the sparks, and a movable scraper for cleaning the inside of the turret.

Mr. Agustin Blasco y Fabregas, of Manila, Philippine Islands, has patented an improvement in vehicle wheels. The felly, or rim, and the hub combine great strength and elasticity, and any of the spokes may be removed without necessitating the removal of others or of the tire or rim. The felly is composed of laminæ of wood fastened together by screws; and on the metal tire which confines it are placed strips of leather which constitute a layer of elastic material. These strips of leather are separated at the ends, and on them are laid segmental steel plates, which form the peripheral portion of the wheel and sustain the wear. The hub is formed of the tapered butts of the spokes with lateral metal rings and tie-bolts.

Mr. Frank B. Galloway, of Farm Bridge, Ill., has patented a car-mover for starting and moving railway cars by hand. It consists of a lever provided with a hook at one end for the engagement of the car axle, and a spring pawl which engages the perimeter of the wheel. Devices for adjusting the instrument to different sized wheels and for varying the purchase are supplied.

A car coupling attachment, patented by Mr. Thomas C. Steward, of Chattanooga, Tenn., permits coupling of cars by the common link and drawhead without requiring the operator to enter between the cars. An adjustable bar or lever is employed to manipulate the link and guide it into the drawhead.

Mr. Henry Kenney, of New York city, has patented a machine for bending iron bars, for use in railroad work and where angular braces or stays are required, which is simple in construction and both convenient and powerful in operation. A bed-block with inclined arms, a top-block with inclined perforated and countersunk arms, with an arrangement of bolts, nuts, spiral springs, and a pivoted crosshead having a lever whereby the machine can be adjusted to bend different sized bars, are the principal features of the invention.

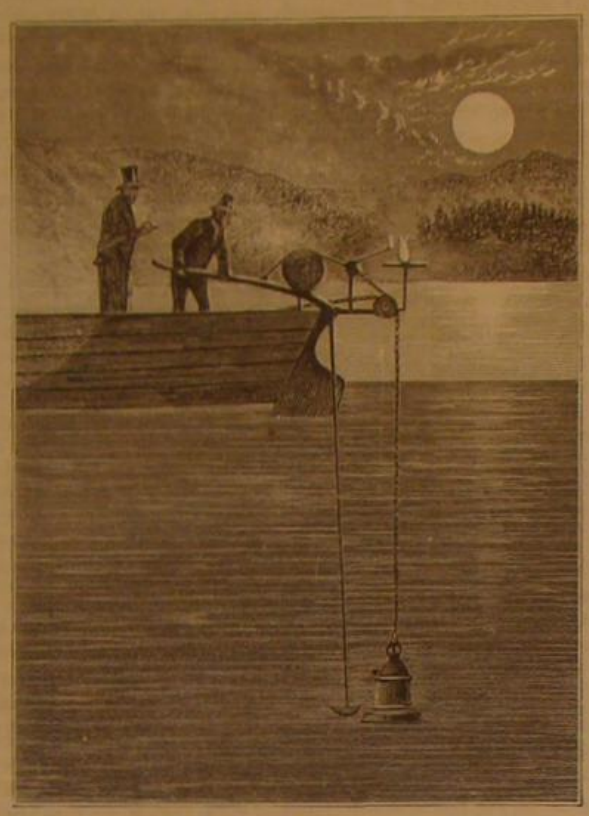
Mr. William Shortlo, of Springfield, Ill., has patented a fish-plate joint which consists in the combination of an inner plate having screw-threaded bolt holes, an outer plate having inner and outer longitudinal keyways, bolts having their shanks flattened on one side, and keys to fit in the keyways and bear against the shanks and heads of the bolts to prevent them from turning.

Mr. Lockhart Bibb, of Madison Station, Ala., has patented an automatic car coupling. The coupling link is provided with dogs or hooks at its ends, and is also longitudinally slotted for the reception of a safety pin which holds the cars coupled should either of the dogs break. The dogs on the link are engaged by spring-actuated drop catches to automatically couple the cars when the draw heads are brought together. The drop catches are raised by chains or other suitable device when uncoupling the cars.

Mr. Teodor Remus, of Dresden, Germany, has patented a pocket light which consists of a tubular case provided with a cylindrical cover with a roughened outer surface, which case contains a small candle or taper and a piece of tape covered with inflammable matter so arranged that when the cover is drawn off from the case the taper is ignited. The device is simple in construction, safe, convenient, and reliable.

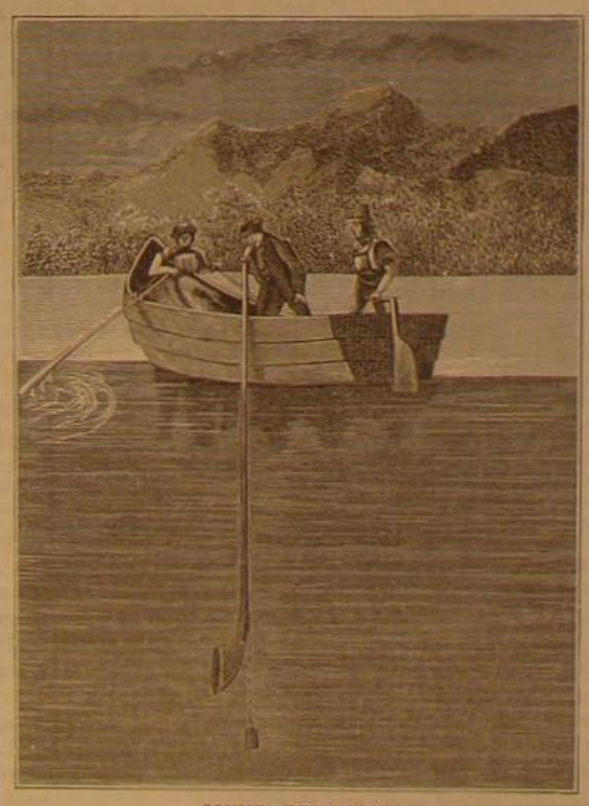
EXPERIMENT ON THE LAKE OF GENEVA TO ASCERTAIN THE VELOCITY OF SOUND IN WATER.

The velocity of sound in water has been the subject of patient investigation. Observers were placed in two



SOUND PRODUCING.

boats, which were moored at a certain distance apart on the Lake of Geneva. One boat was furnished with an apparatus, by which a submerged bell was struck, at the same instant that a charge of gunpowder was ignited in the air above it. In the other boat an ear trumpet was used to detect the arrival of the sound through the water, the lapse of time between the noise and the flash being noted by a chronometer. By this means it was ascertained that sound travels in water at the rate of 4,708 feet per second, being about four times



SOUND RECEIVING.

more quickly than in air. It must be understood that the velocity of sound in water, as in air, is subject to variation by temperature; the higher the temperature the greater the velocity.

PRESERVATION OF THE COLORS OF DRIED PLANTS.—According to M. Storhzl the slow immersion of the fresh plant in a boiling solution of one part of salicylic acid in six hundred parts of alcohol, and then shaking off superfluous moisture, previous to pressing in the usual way between blotting paper, will more nearly preserve the natural color than any other method.

GEOLOGICAL SURVEY OF NEW JERSEY.

We are in receipt of the Annual Report of the State Geologist (Prof. Geo. H. Cook) of New Jersey for the year 1879, setting forth the progress of the geological survey of the State. The survey being charged with work of an economic and practical character, the reports are necessarily largely confined to results related to this work. Joined to this there is, however, some work of a scientific character, and every year something is added to geological science.

The practical topics discussed in the report pertain to the iron mines of the State, soils, drainage, water supply, artesian or driven wells, economic geology of the State, topographical map of northeastern New Jersey, and the U. S. geodetic survey of the State.

Considerable space is devoted to the discussion of artesian or driven wells, of which there appears to be a large number, some of which supply water of a fair quality for economic purposes. In general, however, there is a large percentage of mineral matters held in solution. The deeper wells appear to afford water of a less satisfactory character than the shallower ones. Sulphates of lime, soda, and magnesia abound in nearly all the water drawn from deep wells in the State, and render it unfit for use in steam boilers or other apparatus in which scale is liable to accumulate. The water is of great use, however, for cooling purposes in breweries, etc., and for washing and rinsing where neither heat nor soap is required.

The question of water supply is of very great importance to New Jersey. It is difficult, if not impossible, in many localities to obtain water sufficiently pure for drinking and domestic purposes, except by the collection of rain water in cisterns. Especially is this the case in thickly settled regions near the seaboard. While these regions were sparsely inhabited the surface water, easily obtained by shallow excavations, could be used with comparative safety; but there is now so much danger of contamination from surface drainage that the use of such water is attended with great risk.

The report is an able and interesting document.

Hot Ice and Critical Pressure.

Prof. Carnelley's paper upon the effect of pressure on melting points which was published in the SCIENTIFIC AMERICAN of Oct. 23, 1880, continues to attract considerable attention at home and abroad. The fact that boiling points are influenced much more by pressure than are melting points has long been known. An increase of a single atmosphere (760 mm.) will raise the boiling point of water, for example, from 100° C. to 121·4°, equal to an increase of 39° Fah., while sulphur, which melts ordinarily at 111·5°, will melt at 133·2° under a pressure of 520 atmospheres, an increase of less than half a degree for each atmosphere of pressure. Since the temperature at which a substance boils can be depressed by simply diminishing the pressure upon its surface, it was but reasonable to expect that we could attain such conditions as would place the boiling point of a given substance below its melting point. In that case sublimation would precede and of course prevent fusion. Under the ordinary pressure the boiling point of metallic arsenic is lower than its melting point, so that it is only possible to melt it under increased pressure, which pressure is Carnelley's critical pressure. In the same manner ice has a boiling point lower than its melting point, provided the pressure be reduced to 4·6 mm. of mercury. It does not, therefore, appear probable that the actual temperature of the ice in his experiment, was higher than 32° Fah., for it is well known that when a body has been heated to its boiling point all the heat subsequently imparted to it is converted into work and rendered latent by converting said body into a gas. Neither can we heat any substance above its boiling point until it has been entirely vaporized. Ice boils at 32° under a pressure of 4·6 mm., and no amount of heat can raise its temperature above 32° under this pressure.

Carnelley tells us that for corrosive sublimate the critical pressure is 420 mm. Haass, therefore, proposes, in a communication to the German Chemical Society at Berlin, to use the corrosive sublimate for an instructive lecture experiment to illustrate "critical pressure." Take a strong glass tube, says he, sealed at one end, and place in it a piece of this substance, then connect the other end with a common filter pump provided with a manometer. As soon as the mercury has fallen to 420 mm. the corrosive sublimate may be heated as strongly as it is possible to do with a gas burner, and yet the salt does not melt, but sublimes into the colder part of the tube. If a little air is admitted so that the pressure is increased to 450 mm. it begins to melt. The experiment will prove an interesting one for the lecture table.

The phenomenon is easily explained. Corrosive sublimate melts at 265° C., and boils, under ordinary pressure (760 mm.), at 295° C. We notice here a very slight difference between the boiling and melting point, hence we ought not to be surprised to find that a comparatively slight reduction of pressure, less than half an atmosphere, would bring its boiling point below its melting point.

The critical pressure of Carnelley signifies, when translated into familiar language, the pressure at which the melting and boiling points of a substance coincide or pass each other. Probably, in the exhaustive paper on boiling points which he promises to publish soon, Carnelley will take the same ground as above laid down, and admit that his hot ice was not heated above 32° Fah.

E. J. H.

Atlanta, Ga., Jan. 15, 1881.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion, about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) R. L. W. asks: How much water evaporated from 212° is a horse power? Some say 21 lb., others 27 lb., 30 lb., and some as high as 36 lb.; if there is a rule, I would like to know it. A. It depends upon the perfection of the machine or engine through which the steam is used. 21 lb. per horse power would be deemed an excellent result. It is a very good engine that uses less than 24 or 25 lb.; a very poor engine may not only use 36 lb., but even more.

(2) J. B. V. inquires: Has there ever been so early a winter as the present? What is the cause of the polar waves or cold snaps? Can you send a record of the weather for the past fifty years? Can a person foretell what kind of a winter we will have? Can accurate predictions be made as to what kind of weather we will have a day, week, month, or year in advance? Have you published anything about the weather in the SCIENTIFIC AMERICAN or SUPPLEMENT? If so, please refer to the number. A. There are certain things that are quite unknown to any one on the staff of the SCIENTIFIC AMERICAN, and the ability to give an "accurate prediction" of the weather daily, monthly, or a year in advance, is a fair type of those matters that transcend their powers. Our correspondent will have to propound his queries to some of those entities which are said to be hovering about in mid air, and who may thus be assumed to be cognizant of such matters, for to answer them is clearly beyond the province or powers of ordinary mortals.

(3) A. and E. ask: Can you tell us of a cement that will cement cloth or felt to iron? A. See marine glues, page 2510, No. 158, SCIENTIFIC AMERICAN SUPPLEMENT.

(4) G. F. H. asks: How can I drill a one-sixteenth inch hole through Arkansas stone? A. Use a very hard steel drill with slow speed, or a copper or soft iron drill with emery or diamond dust and higher velocity.

(5) R. F. M. asks: What is used for thinning printer's inks, both common and fine inks? A. Printer's varnish, or a thinner printer's ink. The varnish is prepared by inflaming boiling linseed oil and stirring it while it burns until a black "varnish" of the proper consistence is obtained. The flame is extinguished by placing a tightly fitting cover over the pot.

(6) F. L. B. asks: 1. Do the directions given in SCIENTIFIC AMERICAN, of January 25, 1881, No. 35, under Notes and Queries, make a similar pad to that advertised as the hektograph? A. Yes. 2. Would not a tin trough or plate answer as well as one of zinc? A. Nearly as well. 3. Will Cox's gelatine, such as can be bought at the grocers (used in cooking), do for the gelatine part? A. Yes. 4. When you say, "parts" do you mean by weight or bulk? A. Parts by weight.

(7) W. E. J. asks: 1. Are oscillating engines used now and for what? A. Yes, for many purposes. 2. Would there be any value in an engine with similar valves to an oscillating toy engine, but with stationary cylinder, thus saving the power required to move the latter? Would such an engine make a good motor? A. We think it would not be desirable for actual use.

(8) A. J. C. asks: Will wood 3 feet long in a stove a little over 3 feet high and 2 feet wide last longer than wood cut short enough to lay across the stove? A. In either case, its slow or rapid burning depends upon the manner it is laid. If the sticks are laid parallel and close, they will burn slowly; if laid partially crossing each other, so as to be open, they will burn rapidly.

(9) F. L. S. asks how much more power a steam engine would have if there was no dead center, or, in other words, with the full force of crank for full revolution. A. The difference would hardly be appreciable, using the same amount of steam.

(10) A. S. L. writes: We have a boiler and furnace connected with our establishment; is it cheaper to run both with pea coal, or to run the first with pea and the latter with furnace coal? A. It depends upon the prices of the different kinds of coal in your market; but as a rule the pea coal is most economical.

(11) C. J. H. writes: I have a quantity of granulated test lead carrying, say, one ounce silver to the ton. How shall I desilverize the lead and reduce to absolutely pure metallic lead? If reduced to a nitrate how shall I desilverize and manipulate the resultant salt after evaporation? A. For small quantities the following will answer. Dissolve in a small quantity of hot nitric acid diluted with half its volume of water and evaporate by heat nearly to dryness. Decompose with an excess of dilute sulphuric acid (acid 1, water 2). Let stand (in the dark) with the liquid several hours, then decant the latter (which contains the silver), wash the white lead sulphate with fresh dilute sulphuric acid, dry, heat to low redness then intimately mix with dry bicarbonate of soda and powdered charcoal in the proportion of 1 oz. lead sulphate, half an ounce bicarbonate of soda, and 40 grains of charcoal. Charge into a clay crucible, cover, and fire at a bright red for fifteen minutes. Pour, or cool and break. Assayers rarely desilverize their lead; it is preferable to determine accurately by assay the amount of silver present in a given quantity, and allow for this in calculating results.

(12) D. P. asks: 1. Can you tell me how the paint used in painting window curtains or shade cloth is made, mixed, and applied? A. Consult "The Painter's and Gilder's Companion." See addresses of book dealers in our advertising columns. 2. How can I perforate heavy paper for transferring designs? The perforations in postage stamps is what I want on manila paper. A. The perforations in postage stamps are effected by passing the sheets between two cylinders, one above the other, and provided with a series of raised bands which are adjusted to a distance apart equal to that required between the rows of perforations. Each ring on the upper cylinder has a series of cylindrical projections or punches which fit corresponding depressions in the bands of the lower cylinder; by these the perforations are punched out. An endless band separates the perforated sheet from the rolls. The sheets require pressing to remove the roughness caused by the perforating machine. The machine was invented and patented in 1853, by Mr. Archer, of England.

(13) A. B. asks (1) for a simple test by which to distinguish alkali water from pure water. A. Add to the water a small quantity of strong neutral tincture of litmus. If the water is alkaline the litmus will change in color to a deep purplish blue. 2. How is the quantity of alkali in a given quantity of water determined? A. The quantity of alkali in a water is most readily determined by titrating a measured sample with a standardized solution of acid. Consult Thorp's Chemical Analysis. 3. What is the best filter I can use to purify water that contains foreign matter, so as to make it suitable for raising steam? A. Consult our advertising columns for filters.

(14) E. H. L. asks (1) whether a lawn sprinkler would revolve if worked in a vacuum. A. Yes. 2. The query is, what produces the revolution? Is it the difference of pressure of the water on the inside and at the openings, or is it the resistance of the air to the small streams? A. It is the difference of pressure.

(15) A. Y. F. asks for the process by which the ribbons used in type writers, hand stamps, etc., are made and prepared. A. Saturate the ribbon with a strong solution of one of the soluble aniline dyes in hot glycerine.

(16) W. S. R. writes: I have a Wedgwood sirup cup that is cracked and leaks, although the crack is only visible on the inside. Can you give me a receipt for some varnish, or cement that can be used as a varnish, that will be insoluble in hot sirup or water, and stop the leak? A. See the thirtieth cement in the list, page 2516, No. 158, SCIENTIFIC AMERICAN SUPPLEMENT.

(17) J. L. M. asks: Is meerschaum a manufactured article? Is it manufactured from sea foam? A. True meerschaum (*Ger., sea foam*) is a native mineral, a hydrous silicate of magnesia. Much of the so-called meerschaum in the market is manufactured—not from sea foam, but from waste chips and powder of meerschaum cemented together, or from a composition of magnesia, water, silicate of soda, sulphate of magnesia, etc.

(18) J. F. S. asks for some simple way of rendering horns soft and pliable (without destroying their original shape). Have tried steam at 80 lb. without any satisfactory result. A. Digest them in pure hydrochloric acid diluted with three volumes of water until softened.

(19) G. B. S. writes: I have a small sawmill engine 10 inches by 20 inches, and the connecting rod is only 34 inches. I think it a very poor proportion. Give me a better one, and give dimensions the fly wheel should be, also the speed? A. A connecting rod in length 2½ times the stroke is considered a good proportion. According to the usual proportions your wheel should be about 6 feet 6 inches diameter and weigh 3,000 lb. If your engine is well balanced it may run from 120 to 160 revolutions per minute, or even faster if the work requires it.

(20) E. A. C. writes: In putting up the feed water pipe on one set of boilers, which of the two valves must be near to the boiler, the stop valve or the check valve? A. The stop valve should be placed next the boiler.

(21) J. D. A. asks: What ingredient can be mixed in the manufacture of tinner's solder (half and half) which will be harmless to use and give a quick flow to the solder? Should such solder be moulded hot or cool? A. Try a small quantity of bismuth; mould cool.

(22) C. H. H. asks: 1. Do freight trains on N. Y. L. E. & W. R. R. haul broad and standard gauge cars indiscriminately on same train? A. Yes. 2. If so, how are draw bars arranged? A. Draw bars for passenger trains by special link and distance block, and for freight trains by three-link coupling. 3. Are some trains made up of broad and others of standard gauge cars? A. Yes; but all one gauge if possible. 4. Do they use broad gauge passenger coaches? A. Yes, on branches running through to Jersey City. 5. Is there a third rail whole length of road; if not, between what stations? A. Yes, on all the main line from Jersey City to Buffalo.

(23) H. J. C. asks: Will the thickness of a belt run over the same size pulleys make any difference in speed, other things being equal? A. No, if there is no slip of belt.

(24) W. S. wants to know how much a one and one-eighth inch ship cable chain will sustain and what size hook it will take. A. Ultimate strength 19·7 tons to 21·5 tons; proof test 15·2 tons to 15·75. Should not be worked regularly over one-fourth the ultimate strength. Opening of link for hook or pin 1¾ inch.

(25) H. S. asks: 1. Would a half-inch board hold up a piece of earth 10 feet thick? A. It would depend entirely on the area of the board. 2. What sized battery (Bunsen's) would be required to light a room 10 feet high, 15 feet long, and 12 feet wide? A. 20 to 25 quart Bunsen cells.

(26) P. writes: SCIENTIFIC AMERICAN, February 12, 1881, page 106, Notes and Queries, No. 19, "Should be thicker than if vulcanized" ought to read *galvanized*. There is no such thing as vulcanized iron. [Clearly a mistake of the typo. Our correspondent is also mistaken—it should have been *ungalvanized*.]

(27) C. P. T. asks: 1. Does the pitch of a propelling screw increase or decrease its resistance to the motive power? A. Increased pitch requires more power, and decreased less. 2. Does a sharp pitch propel at a greater speed than a less pitch? A. It propels at a greater speed, if you have the power to drive it at the same velocity as the wheel with less pitch. 3. Supposing I had sufficient power, so that the question of necessary power was not considered, what pitch would give the greatest speed? A. There is no fixed pitch, for it depends upon many conditions, and each case must be determined by its own conditions. 4. Would a shaft 20 feet in length, upon which were four pairs of wings, 5 feet apart, give more propelling power than a single pair—that is, supposing the wings or screws to be all of the same pitch and diameter? A. We think not.

(28) W. R. H. writes: With a 10x24 engine running 100 revolutions, steam ports 1¼x4 inch, exhaust 2¼x4 inch, bridges seven-eighths inch, valve steam lap half an inch, exhaust lap one-quarter inch, what would be the right travel of valve, and are the steam ports too small for the speed of engine? A. Your openings are rather small. Valve should have 3 inch travel, 1½ inch each way. Reduce the exhaust lap to one-sixteenth inch scant.

(29) G. R. asks: Does the strain on belt driving an emery wheel increase with an increase of speed? If so, in what ratio? A. Not appreciably, the amount of work done by the wheel remaining the same per revolution.

(30) D. E. T. asks: 1. What number of Calland cells is required to work bell calls, ordinary single stroke, on a half mile line of No. 12 wire, one at each end? A. It will require five cells. 2. How is a relay constructed, and what purpose does it serve? A. A relay is much the same as a sounder. Its magnet is wound with finer wire, and its armature lever, which is very light, is made to open and close a local circuit. It is used in lines in which the current is too weak to work a sounder. 3. In the transmitter described by Mr. Hopkins, in SCIENTIFIC AMERICAN of May 8, why could not the bottle be constructed with a cork in the top with small piece of glass tube for the carbon, and the platinum wire inserted at the side of the small tube and save the glass blowing, which seems to be the only part of any difficulty for amateurs with limited facilities to make? A. The experimental transmitters of this kind were made in the way you suggest. There is no objec-

tion to the plan, provided the ends of the glass tube are fused to remove the sharp edge. By attaching a small platinum point (about the size of a pin's head) to the diaphragm instead of the carbon button the effectiveness of the instrument will be increased. 4. What size should the platinum wire be? A. It is immaterial; copper wire will answer just as well if used in the manner proposed by you.

(31) J. H. writes: 1. Our mechanic has made a dynamo machine as designed in SUPPLEMENT, No. 161, which did not work before it was connected with a battery, and after it was disconnected from the battery about an hour it began to work, and has done so ever since. Now, will a dynamo machine work without it being charged with a battery? A. Iron is usually more or less magnetic, and the slightest degree of magnetism in the iron of your field magnet would have been sufficient to start a current in the armature, which would have increased rapidly until the maximum current was reached. It seems that your field magnet must have been neutral. After having been charged by the battery it retained sufficient magnetism to start the current. It has been found that when the field magnet is neutral sufficient magnetism to start the machine may be imparted to it by placing it on the earth's magnetic meridian. 2. Can you give us a design of a dynamo machine which is strong enough to magnetize a piece of steel in the form of a horseshoe magnet which is 12 inches long, 1½ inch wide, and ½ inch thick? A. For this purpose you would need a large machine such as the Edison, Maxim, Brush, Weston, or Siemens, all of which have been described in our columns.

(32) J. P. E. writes: 1. In a late edition of your valuable paper you give directions for building an upright, single-acting rocking valve engine. Please tell me how I can get up a cheap, effective, steam supply for an engine on that principle, having 2 inch bore, and 2½ inch stroke. Would a copper boiler, 11 inches in diameter and 22 inches long, tested to stand 150 lb. to square inch, with 4 4-inch wicks burning good refined petroleum, be at all effective and efficient? A. Such a boiler should have 20 to 25 1-inch tubes. You would hardly get the full power of the boiler with the four wicks. 2. Would a grate burning fine coal be better than the oil supply? A. Yes, much better. 3. What should be bore and stroke for a pump for engine of given dimensions. A. A pump having a piston one-quarter inch in diameter and 1 inch stroke would be sufficient to supply the boiler. It would be well to make either the speed or stroke of the pump variable.

(33) P. S. writes: I would like to make an induction coil, but I think the one in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, too large, and in the SCIENTIFIC AMERICAN, vol. xxxix., page 208, No. 14, too small. Would you please answer me the following questions. 1. Would a coil 4½ inches long on inside, by 2½ inches diameter, be too large to give shocks, using small battery power? A. It would not be too large, as you can regulate the strength of the current as may be required. 2. If not, please give diameter of core, weight, and number of primary and secondary wire? A. Diameter of core, five-eighths inch. Three layers of No. 18 silk covered wire for a primary, and 12 to 14 layers of No 36 silk covered wire for the secondary. 3. Would a thin brass tube covering the wires of core, which draw out to regulate the current, keep the coil from working? A. It would modify the action somewhat, but it would not entirely prevent its working.

(34) F. S P. asks (1) how the connections are made in a "Gramme electro-magnetic" machine. After having wound the soft iron ring armature with a number of lengths of insulated wire, how are the ends of these coils of wire connected to the copper strips upon the axis? A. The inside terminal of one coil is connected with the outside terminal of the next, and both together are connected with one of the copper strips, and so on throughout the entire series of coils and strips. 2. What position do these strips of copper have upon the axis as the coil passes from north to south pole of the magnet? A. The strips are parallel with the axis, and the collector brushes which press upon opposite sides of the commutator cylinder should be adjustable, so that they may be moved from the neutral point to the point where the maximum current is obtained.

(35) S. R. M. asks: Could a telegraph message be sent over a wire of any length, one end being well grounded in the earth, the other in a large water tank or lake of any size which was well insulated from the earth? A. No; a complete circuit is required.

(36) H. B. writes: Referring to an article in your paper some time since, "How far can cannonading be heard?" would say many of us (I among them) distinctly heard, two days (and think three) in succession, at Lynchburg, Va., while prisoners in the rebel lines, the sound of the guns of McClellan's battles on the Peninsula. It was clearly heard towards close of the afternoon, days bright and clear sky. It sounded like a bucket being dropped inverted in water. Whatever the distance is, there is no mistake about it.

(37) S. R. asks: What is the longest railway bridge in the world? A. It is said that the railway bridge over the estuary of the Solway, near Annan, is the longest in the world, being 1,940 yards in length. The next longest to it is that built for the Orenberg railway over the Volga near Syzrau, which is a few yards short of 1,624 yards.

(38) A. B. M. inquires: How is pyroligneous acid (wood vinegar) made? A. It is obtained by distilling wood in iron retorts resembling those used for making illuminating gas. The condensed products of the distillation contain, with tar and numerous other bodies, crude pyroligneous acid or wood vinegar, amounting in a well conducted distillation to about 7 or 8 per cent of the wood employed. The gas that accompanies the liquefiable distillates is conducted to the furnace under the retort, and serves to continue the distillation without other fuel. In purifying the acid, it is first saturated with lime, evaporated to dryness, roasted at a moderate temperature so as to free it from volatile matters, and decomposed in a retort, having a helm of copper and a condenser of tin or silver, with hydrochloric acid (90 parts acid to 100 acetate of lime), and the acetic acid distilled.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

D. R. Y.—No. 1. Hornblende schist. No. 2. Red sandstone. No. 3. Dolerite. No. 4. Cherty flint.

COMMUNICATIONS RECEIVED.

On Parhelia. By U. F. G.

On a Simple Experiment with Polarized Light. By E. G. H.

On a Singular Atmospheric Phenomenon. By H. B. C.

NEW BOOKS AND PUBLICATIONS.

THE LOGICAL-MATHEMATICAL DEVELOPMENT.

The logical-mathematical development of the causes of the principal phenomena of nature, such as gravity, elasticity, light, color, heat, electricity, chemical combinations, etc., from a single fundamental principle. By Theodor Wiesemann. Brussels: 1879. Paper, 63 pages.

THE PHOTOGRAPHIC TIMES.

The *Photographic Times*, which was formerly issued as an addendum to the Philadelphia *Photographer*, began the new year of 1881 as an independent publication, with an able editor—Mr. J. Trail Taylor, formerly of the British *Journal of Photography*. The January number of the *Photographic Times*, now before us, contains a large amount of matter of interest and value to practitioners of the art beautiful. $3 a year. Single copies 25 cents. Scovill Manufacturing Company, publishers, 419 Broome street, New York.

JOHNSTON'S ILLUSTRATIONS OF ELECTRICITY. SHEET 5. ELECTRO-DEPOSITION OF METALS. WITH HAND-BOOK. By Alexander Watt. Edinburgh and London: W. & A. K. Johnston. 10s. Size 50x 42 inches.

One of a series of charts in color for use in teaching natural philosophy. The illustrations of apparatus, etc., are large, so as to be readily seen by a class, and the several parts are colored as in the objects themselves. The sheet before us pictures twenty-three forms of voltaic battery, dynamo-electric machines and their elements, thermo-electric apparatus, and apparatus for electrotyping, electroplating, gilding, nickel plating, etc. The hand book briefly describes the objects figured and their uses. The charts would seem to be admirably adapted for use in schools unprovided with a physical laboratory; and if the price were reasonable, say fifty cents or less a sheet, they might find a wide acceptance among our common and private schools.

A TEXT BOOK OF ELEMENTARY MECHANICS FOR THE USE OF SCHOOLS AND COLLEGES. By Edward S. Dana. New York: John Wiley & Sons.

Though specially designed for use in schools this elementary treatise seems well adapted for individual study. Its scope is limited to the mechanics of solids. It would add much to the practical value of the mathematical courses in our schools if a treatise like this could take the place occupied by surveying, navigation, or mathematical astronomy.

SMITHSONIAN MISCELLANEOUS COLLECTIONS. JAMES SMITHSON AND HIS BEQUEST. By William J. Rhees. Washington: Published by the Smithsonian Institution.

This is the first authentic account of the man who has laid the United States and the world at large under such great obligation by his bequest to found the institution which bears his name. Though barred by law from claiming the family name and honors of his father, the Duke of Northumberland, Smithson sought a higher fame in the discovery and propagation of scientific truth. In one of his manuscripts was found this memorable prophecy following a reference to his relationship to England's noblest families: "My name shall live in the memory of man when the titles of the Northumberlands and the Percies are extinct and forgotten." The prophecy bids fair to come true.

AMERICAN SANITARY ENGINEERING. By Edward S. Philbrick, C.E. New York: The Sanitary Engineer. 8vo, cloth, pp. 129.

A dozen lectures covering in a peculiarly suggestive and practical manner the subjects of ventilation, house and town drainage, sewerage, and the like. The matter is presented in a way well calculated to command attention from home makers as well as house builders and sanitary engineers. The methods and appliances recommended have been chosen for their fitness to meet the conditions of our climate, our modes of life, and more obvious sanitary needs. The single marked defect of the book is the lack of an index.

DEBAUN'S PRACTICAL CALCULATOR, No. 1. New York: Bicknell & Comstock. Folio. 50 cents.

A multiplication table extended to 100x100, and very compactly arranged, so that one can readily find at a glance the product of any two numbers within the limit. Obviously it can be used as a division table with equal readiness, and with slight figuring extended to products and quotients of larger numbers.

CIRCULARS OF INFORMATION OF THE BUREAU OF EDUCATION. No. 4. RURAL SCHOOL ARCHITECTURE. No. 5. ENGLISH RURAL SCHOOLS. Washington: Government Printing Office. 1880.

The Bureau of Education is doing good service in preparing and distributing information of the kind given in these circulars. They should go not only to all school officers or communities intending to build schoolhouses, but to every school district in the land, for the instruction of school trustees, teachers, and parents. There is a vast amount of barbarism in and about our country school-houses which these circulars will help to mitigate.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

January 25, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866, but at increased cost, as the specifications not being printed, must be copied by hand.

Air compressor, J. R. Cushier ... 236,992
Air engine, A. S. Lyman ... 236,954
Axle lubricator, vehicle, J. R. Rochelle ... 236,958
Bale bands, splicing, L. Miller ... 237,039
Bale tie buckle, H. D. Starr ... 237,063
Baling press, M. F. & M. W. Connett, Jr ... 236,988
Bedstead, folding, S. S. Burr ... 236,981
Beehive, J. Mills ... 236,903
Beer, etc., apparatus for cooling, H. J. Handwerck 236,945
Bench clamp, J. Murphy ... 237,041
Bobbins, apparatus for drying, L. C. Baldwin ... 237,074
Book, scrap, C. Sneider ... 237,061
Bottle, dose measuring, J. M. Dodge ... 236,997
Bottle stoppering device, B. Hegele ... 237,015
Bracelet, J. Barclay ... 236,975
Bracelet, F. W. F. Kistner ... 237,025
Brush fly, Braddock, Pack, & Jeffs ... 236,928
Buckle, J. B. Noyes ... 236,908
Buggy gear, side spring, Thompson & Hayward ... 236,919
Burglar alarm and door fastening, C. F. Crary ... 237,076
Button fastener, R. B. Banister ... 236,973
Button, separable, J. H. Fleisch ... 236,880
Cables, machine for compressing, J. Brady ... 236,929
Candlestick, M. Brassill ... 236,873
Cane, R. Lamb ... 237,027
Car brake and starter, E. & J. E. Dawson ... 236,936
Car coupling, C. Gifford ... 236,943
Car coupling, W. M. Hiatt ... 237,016
Car coupling, W. C. Kelly ... 236,893
Car, dumping, C. R. Shepler ... 236,962
Car, railway, C. T. Jeffries ... 237,022
Car, stock, J. W. Paul ... 236,909
Cars, cooling and ventilating, I. H. Fridenberg ... 237,009
Caramels, manufacture of liquid, A. D. Curran ... 236,991
Cardboard, machine for making, R. Shackleton ... 237,055
Cards, apparatus for blacking borders of, H. A. McAfee ... 236,902
Carding machines device for raising the under flats of, W. H. Gould ... 237,079
Caster, sewing machine, B. F. Ryder ... 237,050
Cement, bituminous, E. J. DeSmedt ... 236,995
Christmas tree decoration, T. C. Knauff ... 237,026
Church heater, J. J. Johnston ... 236,891
Churn, S. L. Nelson ... 236,955
Churn motor, J. J. Smith ... 236,964
Clock, F. A. Lane ... 237,028
Clothes rack, F. T. Wing ... 237,073
Coffee roaster, C. L. Hall ... 236,888
Coffee roaster, C. Hendrie ... 237,018
Coke oven, A. M. Chambers ... 236,935
Collar and cuff, E. M. Espenhain ... 236,879
Cooker, steam, I. B. Olmsted ... 237,042
Corn shelling machine, F. M. Kent ... 236,894
Corpse lifter, J. L. Highbarger ... 236,949
Covers to earthen and other vessels, attaching, T. W. Brown ... 236,931
Cranks of engines and other shafts from off their dead centers, mechanism for moving the, J. F. Holloway ... 237,020
Cultivator, hand, H. B. Sherwood ... 237,057
Cultivator, cotton, R. G. S. Austin ... 236,970
Damper, stovepipe, J. K. Clark ... 236,985
Damper, stovepipe, W. Scully ... 236,913
Door check, F. V. Phillips ... 236,910
Dumping boat, automatically, N. Barney (r) ... 9,544
Earring, A. Claude ... 236,935
Easel and back rest, picture frame, C. E. Kellogg ... 236,953
Electric circuits, switch board for, E. F. Frost ... 236,884
Electricity, electroplated insulated conductor of, T. & J. Cochran ... 236,986
Electro-magnetic brake, Walter, Duwellius, & Merrell ... 237,071
Evaporating solutions in contact with air or other gas, apparatus for, J. L. Faesch ... 236,940
Evaporator, F. S. Harman ... 236,946
Exhibiting case, J. M. Clapp ... 236,934
Farm gate, J. Bovee ... 236,872
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Fence barb former, wire, Pooler & Jones (r) ... 9,543
Fence, portable, C. F. Bahnson ... 236,971
Fence, portable, J. M. Keller ... 236,892
Fertilizer distributers, feed cup for, W. Marks ... 236,900
Fertilizers, machine for disintegrating and drying, G. Mercer ... 237,090
Fire kindler, Hammer & Greiner ... 236,889
Fire service harness, R. Hudie ... 236,952
Flood gate, W. Donnan ... 236,998
Form, dress, J. Hall ... 236,887
Game, A. O. Hall ... 237,012
Game board, puzzle, C. J. Schumaker ... 237,053
Gas regulator, Merritt & Ford ... 237,034
Gas retort lid, W. J. Dooley ... 236,999
Glove, O. Guittard ... 237,011
Grain binder, J. F. Steward ... 237,064
Grain drill, Elam & Boggs ... 237,001
Grain drill cleaner, D. J. Shults ... 236,963
Grate bar, Stevens & Borthwick ... 236,965
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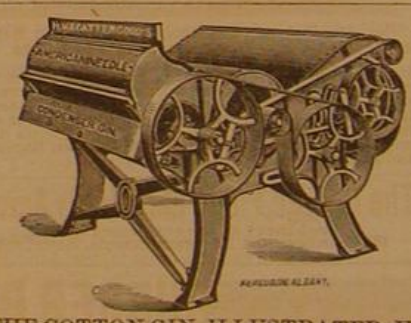

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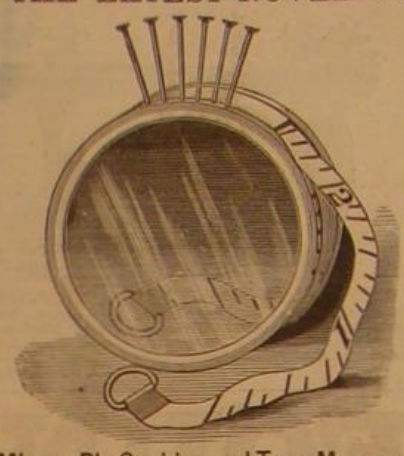
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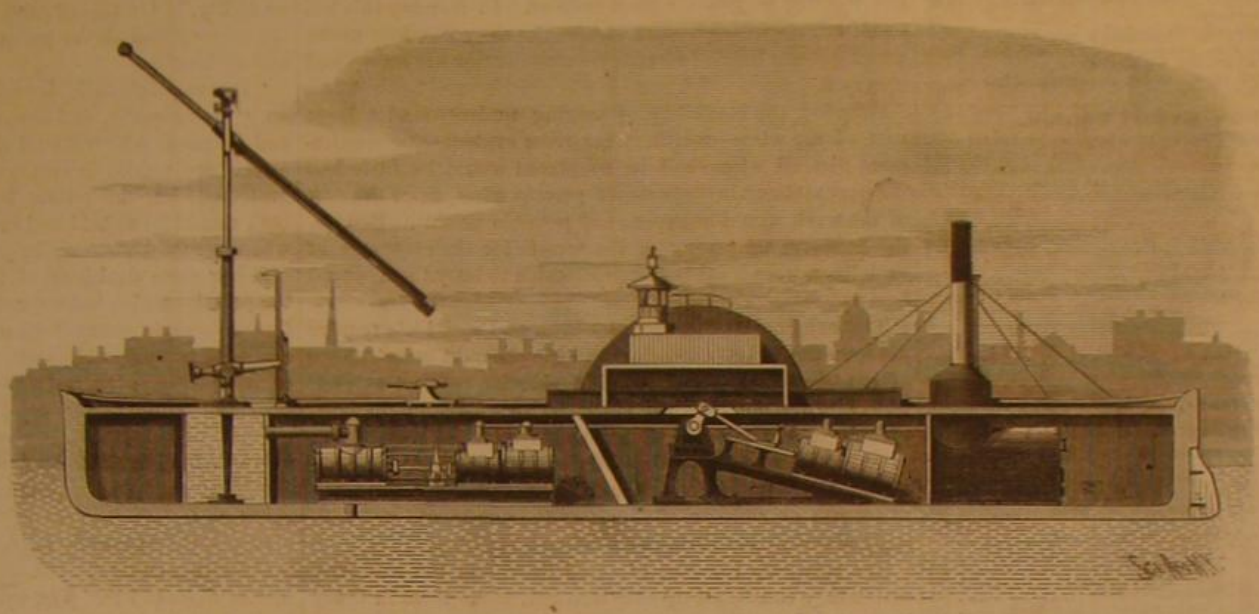
The tendency, of late years, to erect large and high buildings has been such that our present system of combating fires is in many cases wholly inadequate for the purpose. Buildings are now erected double and treble the height they were twenty years ago, while our means of combating fires in them remain practically the same. The miniature fire engine used in Turkey has its use in extinguishing fires in the shops and bazaars of that country, but would be wholly useless here or in London or Paris. Our old hand engine did good duty when we had small two-story houses, but it had to give way to its more powerful rival, the steam fire engine, when our cities became larger and buildings higher. But the present steam fire engine, powerful though it be, has in many cases shown itself completely inadequate to combat fires in large and high buildings. Many of our large structures have a thousand tons of combustible material in them, each ton of which, in burning, will give off heat sufficient to evaporate ten tons of water. Therefore the heat generated would dissipate ten thousand tons of water, and, moreover, only a small fraction of the water used ever reaches the fire.

Fully one half of the fires in New York and Brooklyn are confined to the river front, where an unlimited supply of water is at hand, only requiring steam power to place it where it will do the most good. In our engraving on this page will be seen a new fire boat, which has been designed by H. S. Maxim, M.E., of this city. Mr. Maxim proposes to make a fire boat on a grander scale than has ever been thought of heretofore—one that shall have power sufficient to completely and almost instantly extinguish any fire, great or small, that may be within its reach. The hull is of iron, 250 feet long and 40 feet beam. She has two complete engines, so that one wheel may back while the other goes ahead, thus enabling her to turn, as it were, on a pivot, or to move in almost any direction. The space below the deck is full of machinery. The boilers, 3,000 horse power, are so constructed that their full force may be used either on the paddle wheels or on the pump. The engines are of the compound type, using steam at 80 pounds pressure to the square inch. The pumps are of the compound duplex pattern, and are of great size and strength, being able to convert the full energy of the boilers into power for projecting a stream of water. The novel features of this boat consist of the vertical stand pipe and the two discharge pipes mounted on trunnions, as shown in the engraving. The stand pipe connects with the pump below deck, and may be revolved in any direction, while a telescopic joint admits of running it up or down. The lower discharge pipe is designed to extinguish fires on shipboard or for sinking a ship. It has a nozzle of 20 inches diameter, which, of course, is immense, considering that it has the sea for a supply and 3,000 horse power to force it. The top

[*Continued on page* 149.]



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NEW YORK, SATURDAY, MARCH 5, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 270,

For the Week ending March 5, 1881.

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TELEGRAPH WIRES IN CITIES.

The ice storm which so seriously interfered with electric communication in and around this city recently, exposed many defects in the usual method of supporting telegraph and telephone wires. The rapid restoration of the lines to working efficiency has strikingly exhibited the inherent convenience and value of aerial lines.

How to secure immunity from such interruptions in the future, without laying too great a burden upon the owners of wires, and without restricting the easy extension of electric communication, is a problem of no small importance.

The first demand, particularly from those who had no property interest in telegraph or telephone lines, was that the practice of setting up wires on poles and houses should be stopped, and that all electric wires should be put under ground.

In response to this demand a bill was introduced in the New York State Legislature to secure such a placing of wires within city limits before July 1, 1882. The bill provided that after the date given it should not be lawful to use any wire above ground for telegraphic, telephone, or electric lighting purposes, except indoors. In framing this bill its author neglected to take account of the conditions under which private lines of electric communication are set up and operated.

Granting the feasibility of putting underground a large part of the wires—which is far from evident—the requirement that all wires shall be so placed would be little less than prohibitory in the case of private wires, since the cost of the work would outweigh any possible benefit. Besides, the frequent upturning of the streets for the extension of such lines, were it otherwise practicable to bury them, would be a nuisance quite unbearable.

The exigencies of modern business and social life require not only the widest extension and the cheapest maintenance of electric service attainable, but also its readiest extensibility. This, not by great corporations solely, but by individuals. It is a common thing nowadays for business houses to supplement the facilities offered by the telegraph companies and telephonic exchanges by maintaining from one to a dozen or more private lines. The public will not willingly assent to any curtailment of such facilities.

The relatively low cost of aerial lines, and the ease with which they can be set up and repaired, make them in many instances of this nature the only available means of electric communication. As for lines which might go underground the question would arise, Which is the greater nuisance, the poles for the support of aerial lines, cabled or separate, or the frequent tearing up of the pavements for extension, alterations, and repairs, if the lines are buried? Then would come the difficult problem of determining whether the subways for telegraphic, telephonic, and electric lighting wires should be owned by the city, or whether some company or combination should be allowed to acquire a monopoly of the means of electric communication within the city limits.

Plainly the time has not come for an abandonment of aerial lines. While the sinking of through lines should be encouraged, if it can be done without introducing greater evils than the change is intended to cure, the first effort should be to improve the modes of supporting and distributing the existing lines. The difficulty with these lines, as they are, arises chiefly from the insecurity of their supports, the lack of concert of action in their erection, and the absence of any orderly supervision of their distribution.

It may be that legislation will be required to remedy these evils, but that should be had without difficulty, and without necessitating any sweeping change in the systems, or endangering in any way the freedom and economy of electric service.

There is ample room on the roofs of houses for such an orderly distribution of aerial wires as would meet the public requirements and avoid at the same time the unsightly tangle of wires now prevailing. There is no great objection to the supporting of wires on houses if the supports are properly placed and sufficiently strong. Hitherto individual permission so to place wires has had to be obtained. The essential value and necessity of electric service would seem to justify the granting of the right of way over houses for the running of wires in some systematic manner, the damages to be assessed and met in the usual way. Under such legal privileges, restraints, and regulations, most of the confusion, misplacing, imperfect supporting, and other faults of aerial lines, could be corrected and the way left clear at the same time to extend our systems of electric communication unlimitedly.

ANOTHER IMPORTANT REISSUE DECISION BY THE SUPREME COURT.

The tendency of recent decisions of the Supreme Court of the United States, with regard to reissued patents, lately commented upon in this paper, received another illustration in the decision delivered by Mr. Justice Swain in the case of Densmore *et al. vs.* Scofield *et al.* (December 20, 1880), appealed from the United States Circuit Court for the Northern District of Ohio.

It would appear that the complainants had patented a method of attaching to ordinary flat cars over the trucks two large wooden tanks for holding petroleum while in transit on railways, so as to carry the oil in bulk instead of in barrels or other commercial vessels. Subsequently, after the well-known iron tank car had come into general use, the patent was reissued. The specifications of the reissued patent were so drawn as to cover not merely the original two tanks and the method of attaching them to the car, but "their equivalent when constructed and operated in combination with an ordinary railway car"—that is to say, any form of tank car.

Suit being brought for infringement, the answer set up, among other defenses, that the reissued patent was too broad and was therefore void.

The court saw fit to disregard this plea, deeming it proper to dispose of the case upon a more radical and comprehensive objection. After citing the unimpeached and uncontradicted testimony of witnesses called by the appellees, to the effect that the complainants' wooden tanks had been discarded for reasons given, and that the use of return casks placed and fastened as described in the patent had been practiced for twenty years or more, the court said:

"This testimony leaves nothing of the substance of the plaintiffs' alleged invention. . . . But, irrespective of this testimony and of any testimony, upon looking this reissue in the face and examining its several claims by their own light, we find nothing that brings any of them within the sphere of what is patentable. There is no novelty and no utility." On this ground the Supreme Court pronounced the entirety and all the particulars of the claims "frivolous and nothing more."

"Patents rightfully issued," the court observed further on, "are property, and are surrounded by the same rights and sanctions which attend all other property. Patentees as a class are public benefactors, and their rights should be protected; but the public has rights also. The rights of both should be upheld and enforced by an equally firm hand, whenever they come under judicial consideration."

A few more decisions of this tenor should put an end to the practice which has wrought so much injustice to the public and brought so much discredit to the patent system, we mean the extension of obscure and often trivial patents so as to make them cover, on reissue, valuable processes or products not within the scope of the original.

PHYSICAL TRAINING AS A MEANS OF MENTAL HEALTH.

One of the serious problems which modern science encounters is how to deal with—more particularly, how to prevent—the excessive nervous development, and through that the frequent mental failure or derangement characteristic of modern life. The mad poet's sarcastic remark, that brains had brought him to the asylum—a fate his interrogator ran no risk of—was bitterly true; but it is not volume of brain so much as an unbalanced development of brain that leads to insanity or a liability to that distressing malady. That the rapid, eager, restless, anxious life which the most of us lead tends to produce an increasing complexity of the nervous system, all physiologists agree. That this complexity of nervous organization lays us liable to the development of a condition of unstable mental and nervous equilibrium is only too clearly proved by the statistics of our asylums.

What are we to do? We cannot radically change our style of living to that of our slow-going ancestors; on the contrary, the indications are that our children's children will, by contrast with their more active life, look back upon our age as measurably serene. It is remotely possible that a new order of invention may reverse the tendency of the race and relieve the future of much of the mental and nervous strain which we have to endure; but it does not look that way now. The immediate future, at any rate, is pretty sure to intensify the conditions which so many break down under to-day. Must the mental breaking down increase in frequency in proportion? Or can we pitch upon some means whereby the rising generation can be fitted to endure the strain which will come to them, better than the men and women of to-day bear the burden of to-day?

A generation ago the popular theory was that mental discipline, with the brain development which early and long-continued schooling gives, would furnish the capacity for mental work and mental endurance which would best fit the coming man for the work he would have to do.

The result has been to increase the work to be done, and the speed of doing it, without materially increasing man's capacity for toil. In many instances the course of education pursued seems rather to have lessened the endurance of our people, and to have hastened the mental collapse of many of our brain workers.

And the school children of to-day have more to do than their fathers and mothers had, and have to bear no inconsiderable portion of the evils of modern life besides; that is, if constant excitement, haste, and worry are to be accounted obstacles to healthy mental and nervous development. That they cannot fairly be considered beneficial is sufficiently evident.

Speaking of the nervous excitements and their results, due to our modern education and the rate and manner of our living, an eminent English physician (Dr. Browne, editor of the *British Medical Journal*) says: "The cerebral tissue becomes more and more highly organized, convolutions obtain secondary gyri, and with each differentiation in structure, new possibilities of disturbances are introduced; while the very differentiation in question produces in turn new mechanical devices, which again introduce a more complicated mode of life with which the nervous system must keep pace."

If there were no possible corrective to this tendency to increase the nervous strain of life more rapidly than the nervous organism can acquire power to endure it, the inevitable destiny of civilized men would be the madhouse or something near it. But there is promise of such a correc-

tive. The late Dr. Seguin demonstrated many years ago, that the undeveloped brains of the feeble minded could be stimulated to healthy growth by patient and systematic training of the muscles and the organs of sense. Dr. Browne looks to a corresponding physical culture of those of normal brain endowment to give them the increased brain capacity which will fit them for the severer needs of our increasingly active intellectual life, and at the same time make them better able to resist the inroads of mental disease.

"Muscular exercise," he says, "has been hitherto thought to expand the lungs, quicken the circulation, and brace the nerves; but to this must now be added the pregnant idea that it also contributes to the brain growth and mental evolution. As a large part of the brain is composed of motor centers, we may, in the nascent state of the organ, powerfully act on the brain, by putting into methodical exercise the muscles which we know to be directed by its various parts; and especially the centers governing the movements of the hand ought to be brought into training by careful drill of manual movements, so that, in due time, a cunning right hand may be the servant of every man to some mechanical art, and of every woman to some technical work."

And not only is it possible, as Dr. Browne suggests, to fortify the young against the inroads of mental and nervous disorders by the development of brain capacity, stability, and symmetry, through manual training, but there is gained also, by means of such training, the additional safeguards, which come from much dealing with realities, from having always at hand the means of healthful recreation, and from the conscious ability to do, if necessity compels, something that will win support.

Industrial education thus takes on an importance far greater than has hitherto been accorded it. It becomes a necessity, not merely to those who are likely to spend their lives as artisans, but even more to those who may never earn a day's wages at the bench—men of independent fortune, professional men, business men and women in all the walks of life, to whom physical training may mean not bread and butter, but mental health.

STEAM ENGINES FOR ELECTRIC LIGHT MACHINERY.

A field for the manufacture of steam engines specially adapted to the propulsion of dynamo electric machines has been opened by the recent extensive and rapid development of the electric light.

It is the aim of inventors and manufacturers of electric lamps to provide automatic adjustments which will secure the greatest possible uniformity in the light, and these adjusting devices are called upon not only to compensate for unequal combustion of the carbons, but also for the irregularities of the propelling power, every variation of which produces a corresponding variation in the strength of the electric current. This effect is more strikingly illustrated in electric lamps of the incandescent variety, by whose regular fluctuations the strokes of the engine may be sometimes counted. The highest measure of success in electric illumination demands the employment of high speed engines running with great uniformity.

It requires but little reflection to perceive that as the electric light is the continuous product of mechanical energy, it must be of primary importance to uniformity in the product that the supply of energy should be uniform.

Sir J. W. Bazalgette, in his report upon the electric lights which have proved so successful on the Thames Embankment in London, states that the success reached is in great measure due to the remarkable steadiness and regularity of movement in the 20 H. P. steam engine which supplies the lights, and which was built by the Messrs. Ransomes and fitted with their patent automatic expansion gear. This engine, during a period of twelve days, running at an average speed of 142·36 revolutions per minute, has been found to vary not more that one-twelfth of a revolution under suddenly varying loads.

In view of the progress which this kind of illumination is making in this country, together with the great variety of automatic governing valve gear of great excellence in use, it would pay some of our best engine builders to give attention to this special class of work. The field is large and constantly growing, and offers rich promise to enterprise.

NEW THEORY IN REGARD TO LUNAR VOLCANOES.

M. Faye, according to the *Chronique Industrielle*, recently delivered a lecture at the Sorbonne, in which he criticised the prevalent belief that volcanoes exist on the moon, and offered a theory of his own to account for the objects that have been taken as craters due to volcanic action. Water, said he, is the sole cause of volcanic eruptions. Now, on the moon there is no atmosphere; this is a fact recognized by every one, and it is absolutely confirmed by observation of occultations. Since there is no atmosphere there, of course there can be no water, for the latter would instantly evaporate under such conditions, even did it exist. So, since there is no water in the moon, it follows that there can be no volcanic action and consequently no volcanoes. But there are circular cavities on the moon, nevertheless. What are they, then, and how have they been formed? To account for these, M. Faye asked his auditors to imagine a river frozen over from shore to shore. Such being the case, the tides will exert a pressure on the under surface of the ice, and if a hole exist in the latter the water will quickly issue up through it and congeal around its edges. And so each successive outflow will freeze over its predecessors until the successive layers form a marginal ring of some height around the aperture. From this we may get an idea of the alleged lunar volcanoes, which are diametrically the opposite of those that exist on the earth. The craters of our terrestrial volcanoes, that of Vesuvius particularly, are at the top of high mountains; the craters of the so-called lunar volcanoes are, on the contrary, in the center of low hills. The bottom of terrestrial volcanoes is greatly elevated above the mean level of the surrounding land; that of the alleged lunar ones is deep down beneath the surrounding ground. Terrestrial volcanoes are conical mountains thousands of feet in height, having at their summit a crater some hundreds of feet in depth, while the circular cavities on the moon are wells several thousands of feet deep and surrounded by a sort of curb some hundreds of feet in height. The circular hollow called *Copernicus*, for instance, is 11,000 feet deep, while its marginal hill is only about 2,600 feet in height. These circular cavities, then, are veritable wells, and they were formed, according to M. Faye, as follows:

At the epoch in which the moon, covered with a thin solid layer, took less than a month to accomplish its revolution around the earth, tides were created on its surface by the latter. The incandescent and liquid mass, covered by a thin coating that might be well compared to an egg shell, was attracted by our planet and thereby caused to dash up against this solid layer. Now, if we suppose that small orifices were accidentally created in various parts of the still thin crust, the waves formed by the tide would cause some of the molten mass to issue through these apertures, while the surrounding crust would everywhere else resist it. This liquid would flow over the edges of these well holes, and being unprotected against the cold of space would at once solidify. And, as we have just seen in the case of the frozen-over river, at every tide the margin would increase in height by the superposition of new outflows. Finally a moment would come in which the bottom would itself solidify. But this being situated at a great depth, and being protected against external influences, would remain for a short time in a pasty condition. If at such a moment a new flux should take place, the middle of the pasty bottom would be thrust up, and in solidifying would remain considerably elevated in comparison with the surrounding portions of the bottom. Thus may be explained the existence of the peaks which are observed in a large number of these lunar cavities.

Such is an outline of M. Faye's new theory. "If," says the author, "I am asked by what considerations I am led to make known the results of my observations and researches, I answer that I am seeking, first, to banish from science a gross error by proving that these lunar cavities are not volcanoes, for no explosion can take place where there is no explosive material. Then, again, from a geological point of view, I have wished to study in the formation of the moon those phases of the past which may give us an idea of the phases to come. Although the geology of the moon differs completely from that of the earth, this very opposite nature is a valuable element of discussion. It will serve to banish vain theories and to put in a clearer light the phenomena of which the earth has been the theater."

WHITE ANTS IN COURT.

An intimation of the mischief done in regions infested with white ants, by the wood destroying habits of these insects, is furnished by a recent law suit in New South Wales. The plaintiff, a contractor, had received from the defendant instructions to repair a house which had been damaged by white ants. As the work proceeded, the plaintiff found that the house was almost eaten away by the white ants, and that a considerably increased expenditure would be required to put the house into thorough repair, and he informed defendant of the fact. The bill for the work done was disputed as excessive.

A considerable amount of evidence was taken on both sides as to the work performed, and it was stated that an estimate could not be given of the contract price of work, as the white ants operate during darkness, and the extent of their ravages could only be seen as the work progressed. One witness described the house as being so seriously injured that new material would be required throughout, and the best way to have dealt with it would have been "to put a fire stick under it." The estimated cost of the repairs before the work was begun was about $1,150. The defendant had paid $2,000, and the court adjudged that he should pay $230 more.

THE HUMANE ASSOCIATION'S CATTLE CAR COMPETITION.

The first result of the American Humane Association's offer of an award of $5,000 for an improved stock car, capable of carrying live animals long distances without suffering or having to be unloaded to be fed and watered, appears to be an accumulation of business not at all anticipated by the officers of the association, and not altogether in harmony with objects for which the society was organized.

The judges' circular, No. 2, dated Feb. 1, acknowledges the receipt of 420 models and about 200 plans and sketches; and (since Jan. 1, the limit set to the receipt of plans and models) they have been overwhelmed with correspondence asking why the award is not made or the models, etc., returned. In other words, the office of the association has been turned into a sort of local patent office, for the work of which it was ill prepared. The judges suggest that, even if they neglect their own business and devote their entire time to the examination of the models, plans, etc., and the comparison of them with the 111 U. S. patents already granted for stock cars, several months must elapse before a decision can be arrived at. Indeed it is likely that months will have to be devoted to clerical and expert work before the special competitive examination by the judges can begin. When made, the result will be announced to the association, as specified in the circular of July 12, 1880.

Obviously the competitors will have to be patient; and if any one feels himself slighted by the silence of the association he should first make sure that his model has been received or was intelligibly marked, since thirteen of the models received had no names or addresses on them, and it is probable that others are lying unclaimed in express offices for lack of prepayment of charges.

A TELEPHONE REISSUE.

The Patent Office, after careful hearing, has granted to Mr. E. Berliner, a reissue of his original telephone patent, of January 15, 1878, with several new claims, among which is one that virtually awards to the above author the priority of invention and use of the local battery in conjunction with telephone instruments.

Prior to the invention of Mr. Berliner it was necessary to yell very loud in order to make anybody hear at any considerable distance through the telephone, and even then the speaker's voice was heard quite faintly.

But now, with this improvement added, the telephone is rendered so sensitive that conversation in whispers may be readily carried on, and the ordinary tones of conversation are delivered by the instrument in the most perfect and admirable manner. Mr. Berliner is entitled to the highest honor for his remarkable invention, which is now used in all parts of the world. The patent is held by the National Bell Telephone Company, of Boston, Mass.

Spontaneous Combustion of Dyed Goods and Yarn.

The heaviest loss that has occurred in 1880, within the line of mutual insurance, has again been caused by the spontaneous combustion of dyed cotton yarn of various colors; and while this particular fire opens some entirely new questions that are now under investigation, it gives us reason, says Mr. Edward Atkinson, President of the Boston Manufacturers' Insurance Company, to renew our warning against a danger which has been the cause of thirty per cent of the losses that we have incurred since January 1, 1878, a period of two years and nine months.

Blacks, browns, slates, and Turkey red goods, dyed with cutch, gambier, aniline, iron liquor, and chromic acid, appear to be most liable to oxidation, if rolled hot or warm from the dry cans or piled hot from the dyeing kettles. In almost all the premises insured by us, complete arrangements have been made for thoroughly cooling cloth and yarn as it comes from the cans or kettles, or special fireproof apartments have been provided for storing rolls of cloth from the dry cans over night. Yet, within the first month, hot rolls of cloth have been found by one of our inspectors in one of our risks.

This last fire discloses the fact that old yarn, some of it imported five years since, and some made two years since, that had been softened with a mixture or emulsion of olive oil and soda to prepare it for knitting, took fire spontaneously when stored in the attic of an old-fashioned mill, where the heat was doubtless excessive.

Whether the combustion ensued from the emulsion or from the dyestuffs is the point now under investigation, but it is evident that care should be taken not to expose some of these colors to excessive heat, whether the goods are freshly dyed or old.

The present indications are that the combustion in this case occurred from the oxidation of the dyes used in the black yarn, combined with the olive oil used in the emulsion, as we have succeeded in promoting spontaneous combustion with this color, but not with any other of those that have been prepared for our trial, precisely like those stored in the attic of the mill burned.

American and French Silks Contrasted.

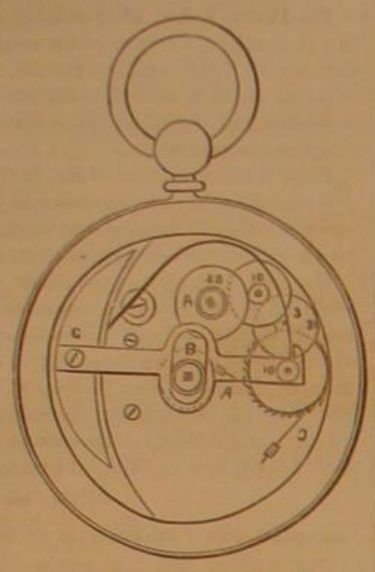
Foreign correspondents complain very much of the miserable quality of the silks and satins from the Lyons looms; that, as they scarcely outlast half a dozen wearings, plush, brocade, and Sicilienne take their place. This emanates from France, but the English have for several years previously acknowledged the superiority of the American silks, brocades, damasses, and armures, as well as gros-grains, which are free from all injurious matter, and will neither crack nor fray, but outwear several French silks. Another great defect in black silk is "wearing shiny," which comes from the action of the soap and alkali developing a grease under friction. Cracking arises from the strain of the delicate silk to carry the heavy load of iron, potash, logwood, soda, oil, soap, and other chemicals used in foreign treatment. Raveling a thread from the silk, passing it through, and straining it over the fingers, is a good test. In heavily dyed silks the thread will feel rough and lumpy, and if a small quantity be burned it will simply smoulder, leaving a yellow, greasy look, while if pure it will immediately be consumed to a crisp, leaving only a pure charcoal. A new feature in silk trade has been the importation of raw silk from Asia through the Suez Canal and the Mediterranean direct to New York, though the greater part of the Asiatic importation of silk comes across the Pacific Ocean, and is brought here by rail.—*N. Y. Tribune.*

SELF-WINDING WATCH.

The annexed engraving represents a device for winding a watch by means of the motion of the wearer's body in walking, which has been patented by A. R. von Loehr, of Vienna, and described in the *Horological Journal*.

It will be observed that the mechanism is in principle the same as that which constitutes the pedometer. The inventor is aware that the motion of a weighted lever has been used before for winding a watch, but he claims to have overcome the objections existing in former arrangements.

A weighted lever, G, is pivoted at one end, and kept in its normal position against the upper of two banking pins, as shown, by the long curved spring. The strength of this spring is so adjusted that the motion of the body in walking is sufficient to cause the lever to descend to the lower banking pin at each step. There is a ratchet-wheel with very fine teeth, pivoted at the same center as the weighted lever, and fixed to the lever is a pawl, *A*, which engages with a ratchet-wheel. It is considered a special feature of the invention that this pawl is made very elastic, in order to take up the strain arising from any tendency of the pendulum to vibrate after the mainspring has been fully wound up. A is the barrel arbor, and the connection between it and the ratchet-wheel is made by means of a train of wheels, as shown; *B* is a second pawl to prevent the return of the ratchet wheel.



LOEHR'S "PERPETUAL" WATCH.

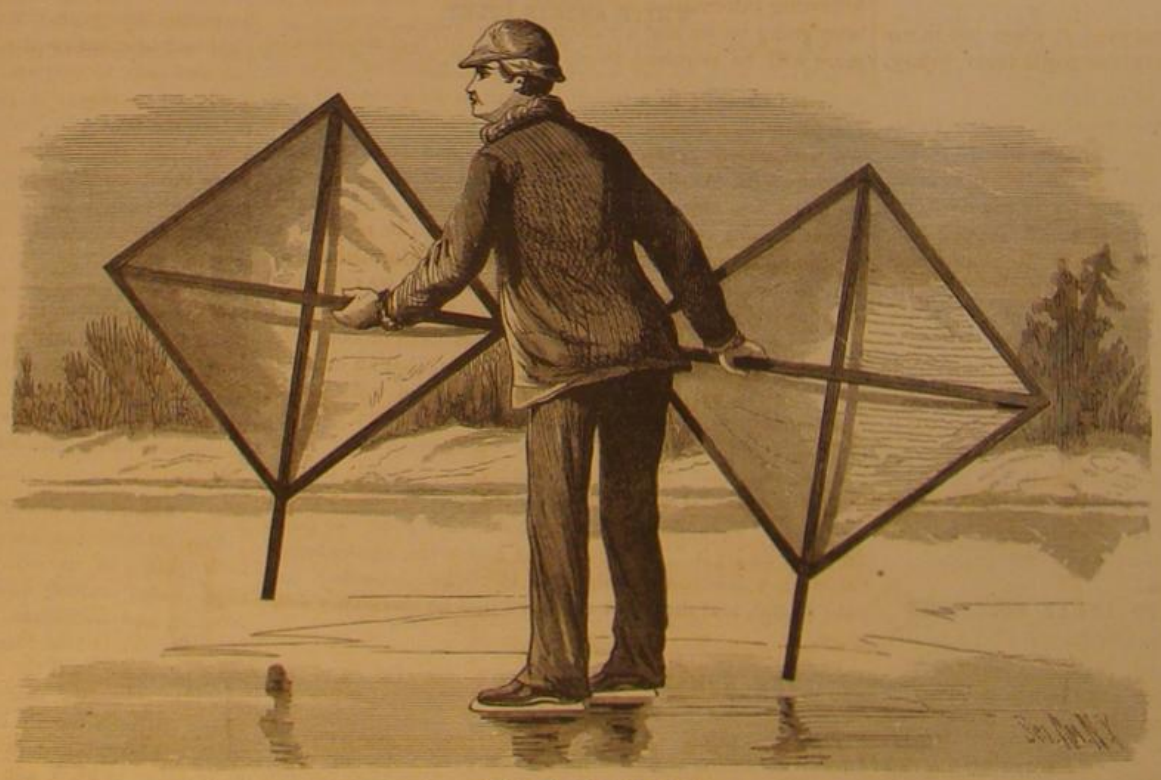
It is urged that a watch wound in this automatic manner yields a better rate, by reason of the lesser range of mainspring in use, than when wound in the ordinary way.

In connection with this invention is an up and down indicator, with a revolving dial, which does not need special description.

For setting hands there is a disk, B, which has a milled surface, slightly cupped to suit the point of the finger.

SKATE SAILING.

The new sport of skate sailing appears to be making fair progress toward popularity. In some places—as at Havre de Grace, Md., where our artist sketched the figure in the illustration herewith—the sails appear to be used also as a means of easy and rapid transit for other purposes than amusement. In the main, however, their chief use must be to increase the scope and variety of winter sports; and for this purpose they have the merit of cheapness as well as of capacity for calling out competitions of endurance, grace, and skill. The successful skate-sailor has to be a practical navigator; and probably there is no better or more enjoyable way of learning the action of the wind upon sails, or the effects of sail positions upon the motion and stability of a craft, than by converting one's self into both craft and crew. For pleasure sailing the vertical standards, as shown in our illustration, are sometimes omitted, their use being simply to support the sails when the human craft is at anchor. The framework which carries the sails is of light and simple construction, and the spread of canvas is easily adjusted to the strength and skill of the user. With a fair expanse of suitable ice the skate-sailor can perform all the evolutions of an ice yacht, and possibly may be able, like the ice yacht, to outstrip the wind. The advantage of having two sails lies in the better outlook afforded, enabling the sailor to see his course under all circumstances, and removing the liability to collisions and other mishaps incident to the use of a single sail.



SKATE SAILING.

Bread Making in the East.

On our return an instructive sight awaited us. We saw how bread was baked in an adjoining building. It was done with a rapidity which explains how of old the supply was prepared every day, and how if some guests arrived the housewife could make the necessary provision without delay (Gen. xviii., 6.)

Among the Fellaheen the dough is generally leavened. A large round hole in the ground, some one and one-half feet deep, and the same in diameter, forms the oven. In this lie some live coals, which as in Hosea's time (Hosea vii., 6), are not allowed to go out at night, and when baking has to be done are again revived.

The housewife first forms a lump of dough with her hand, then suddenly spreads it out with an indescribably rapid action of both hands—which can as little be imitated as a conjurer's movement—into a cake as thin as a leaf, which with a moistened dab or rag she presses into the hot oven, where it remains sticking. In a minute it begins to move, and is at once taken out to make room for the following one.

The bread is now ready, not thicker than parchment, not very relishing, and somewhat sandy on the outside, but really very enjoyable for any one who has a good appetite. Although of the size of a large plate, such a slice contains but little nourishment, and Jeremiah could hardly have been saved from starvation when only one such piece of bread was given him every day.—*Obell.*

A Canadian Sewing Machine Factory.

While the industries of Canada are, as a rule, the reverse of flourishing, Montreal boasts of an establishment which, thanks to excellent management, energy, and abundant capital, is not only holding its own, but is steadily increasing in capacity, scope, and financial prosperity. This exceptionally prosperous establishment is devoted to the manufacture of the Williams improved sewing machines, and is owned and operated by the C. W. Williams Manufacturing Company, of which Sir Hugh Allan is president, Mr. Andrew Allan vice president, and Mr. D. Graham managing director.

The C. W. Williams Manufacturing Company, of Montreal, was organized in 1863, and incorporated in 1872. It was formed by several of Montreal's most prominent, far-seeing, and successful business men and capitalists, most of whom are still its stockholders and directors. Foremost among these is Sir Hugh Allan, whose name is so frequently found in connection with successful Canadian enterprises. The first factory situated on St. Germain street soon became too small to satisfy the increasing demand for the Williams improved machines, and last year arrangements were made for the erection of a factory building on a scale sufficient, it was thought, to meet all probable calls on it for many years to come. Accordingly, a site was chosen at St. Henri, a populous suburb of Montreal, and the three story and basement building was erected and fitted with the latest and most approved machinery for the manufacture of sewing machines. Already the business of the company has doubled, and extensive additions must be made to the new factory.

Thus far the company have found no need for a store room, the demand for their machines being such as to prevent any accumulation of stock. The city salesroom of the company, at No. 347 Notre Dame street, Montreal, is connected by telephone with the factory.

The improved machine manufactured by this company is adapted to any and every kind of work, and for the past eight years has obtained the first prize at all the Provincial exhibitions held in Canada at which prizes have been given. It ranked with the first at the Centennial Exhibition in Philadelphia, and gained the only first prize at the Sydney Exhibition of 1878, in a contest with fourteen other competitors, including the leading American makes.

The managers state that their business of 1880 was three times as large as that of any former year, and the present year gives indications that the sales of 1881 will be double of those of last year.

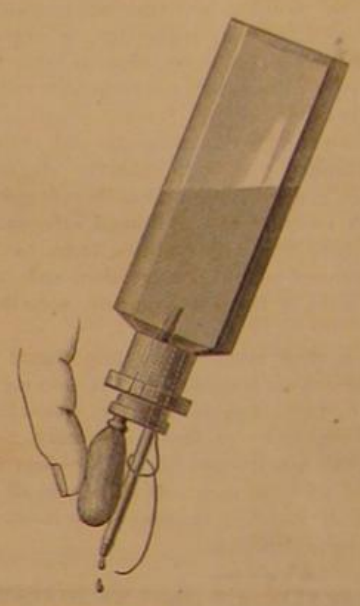
The American market for these machines is supplied through a branch establishment at Rouse's Point, N. Y.

Railway Prizes.

Mr. Hinton R. Helper, a wealthy resident of St. Louis, and well known throughout the country as the author of the "Impending Crisis," some time ago offered $5,000 in prizes for three prose articles and two poems in favor of the construction of a double track steel railroad through the centers of North and South America. The prizes have been recently awarded as follows: First prize, $1,300, to F. R. Hilder, of St. Louis; second prize, $1,200, to Fred A. Beelen, Cortland on Hudson, N. Y.; third prize, $1,000, William W. Archer, Richmond, Va.; fourth prize, $1,000, F. D. Carpenter, Washington, D. C.; fifth prize, $500, F. A. Deekens, Norwich, Canada. The first three were in prose and the last two in poetry. They are to be published in pamphlet form.

NEW DROP ATTACHMENT FOR BOTTLES.

The engraving shows a simple device for delivering liquids from bottles in drops as slowly or rapidly as may be desired. It consists of a tube inserted in the stopper and provided with a flexible air bulb for blowing air into the bottle, and another tube inserted in the stopper through which the liquid escapes. By pressing upon the rubber bulb with more or less force the liquid is made to escape with more or less rapidity.



BRAVAIS'S DROP ATTACHMENT FOR BOTTLES.

This device will be found particularly advantageous in dropping medicines, and it may in many instances replace the pipette used by chemists. This invention was recently patented by Mr. Raoul Bravais, of Paris, France.

MECHANICAL INVENTIONS.

Mr. Cyrus Smith, of Irwin's Station, Pa., has patented a smoke-consuming furnace which is an improvement on an invention patented by him February 4, 1879. A peculiarly constructed exhaust fan, gas, and air mixing-chamber devices for removing ashes, etc., are the features of the invention

Mr. Charles F. Crary, of New York city, has patented an improved burglar alarm and door fastening. The fastener can be attached to the knob spindle in such manner that the latter cannot be turned sufficiently to unfasten the door. The fastening is also connected with an alarm gong, which gives warning in case it is tampered with.

Mr. Manuel de la Torre, of Mexico, Mexico, has patented a turbine wind motor which consists of a wheel with curved vanes rotating on a vertical axis within a cylindrical frame which is closed on two opposite sides. The wind entering the wheel on one side escapes at the other. The frame is controlled by vanes to admit more or less air to the wheel according to the velocity of the wind.

Mr. John Till, of Canton, Pa., has patented an improved printing press constructed to perform easy, rapid, and accurate work. A four-sided frisket frame, which revolves one quarter of its circumference for each impression that is made by and between the rocking bed and the platen, is employed, together with other novel points of construction.

Mr. James Murphy, of San Antonio, Texas, has patented an improved bench clamp for carpenters' and cabinetmakers' use, whereby pressure may be brought against the ends of any object to hold it in position on the work bench. It is strong, durable, and inexpensive, requires no bolts or screws to hold it on the bench, and is easily and quickly put in position or removed. It occupies small space, and can be applied to any piece of work without marring it.

Mr. Ethelbert J. Moore, of Villisca, Iowa, has patented a concussion spring for vehicles which consists of a rubber plate having upon its face rubber blocks in the shape of truncated pyramids placed between the bolster and bed of the vehicle, by which construction the shock of light or heavy loads is sustained with equal effectiveness.

NEW HATCHELING DEVICE.

The engraving represents an apparatus for hatcheling or straightening and removing the gummy matter and roots from hair combings or other snarled and tangled hair.

The invention consists in a bed or table fitted with hatcheling and combing teeth arranged in a peculiar manner. These teeth are carried by blocks fitted to slide in the bed to allow change or removal of the teeth and the substitution of fine and coarse teeth one for the other, as required.

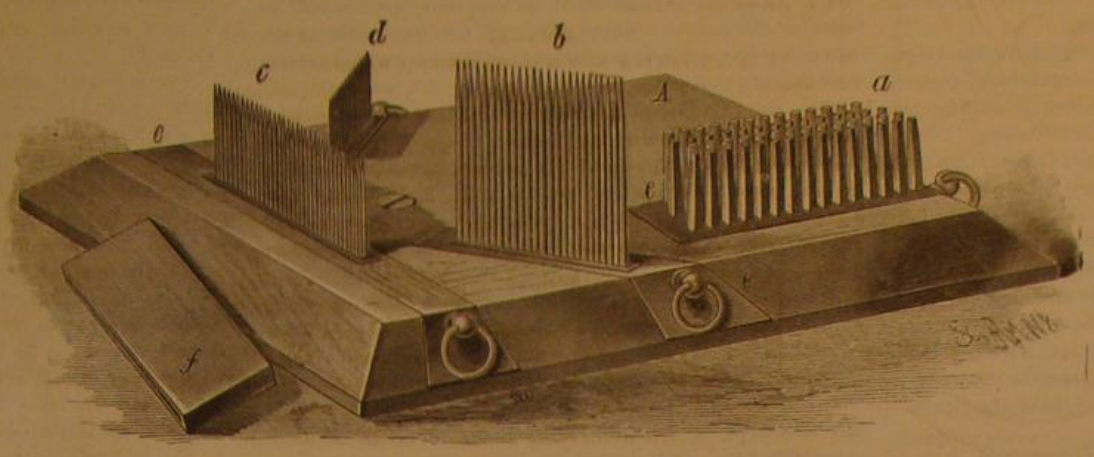
The bed, A, is screwed fast to a suitable table, and carries the hatchel, *a*, and combs, *b*, *c*, and *d*. The hatchel and comb teeth are sustained in blocks, *e*, fitted in dovetail grooves or mortises of the bed, A, so that they may be removed when desired.

The teeth of the hatchel, *a*, are arranged in four parallel rows with the required number in each row, two rows being of round teeth and two of flat teeth placed alternately. These teeth are secured in place by being driven through holes in the block, so that they may be adjusted as required.

The comb, *b*, is for gumming the hair, and is fitted in a diagonal position at the left of the hatchel as the operator stands.

The coarse rooting comb, *c*, is placed across the end of bed, A, and *d* is the fine rooting comb, placed at the opposite side of bed in a diagonal position. This arrangement of the combs gives the greatest facility for the successive operations, especially if more than one operator is at work with the apparatus.

The teeth of the combs, *b*, *c*, *d*, are needle-pointed, and are soldered at their lower ends between metal strips fitted in slots in their respective blocks, so that the teeth may be removed from the blocks for cleaning or the substitution of others.



CHENEY'S HATCHELING DEVICE.

In using the apparatus the operator stands facing the hatchel, *a*, and holding the hair in the right hand, draws it toward him through the teeth of the hatchel. In the same manner the hair is drawn through the gummer, *b*, the teeth of which remove the gummy matters and dirt.

In using the rooting comb, *c*, the operator stands at the end of bed, A, and taking the hair in small locks, draws it through the comb, at the same time pressing the hair toward the base of the comb with the left hand, so that the teeth will remove the roots. If the fine rooter, *d*, is required the operator stands at the back of the bed, or the block, *h*, and comb *d* may be put in place of comb *b*, and the operator stand in front of the machine.

The blocks, *e*, are each fitted with a ring for drawing the block out, and when two persons are working on the same machine these blocks may be drawn out partially, so as to give more room for working.

The combs are covered by metal caps, *f*, when not in use to keep them clean and preserve the teeth from injury. By the use of this apparatus the work of hatcheling, gumming, and rooting tangled hair can be readily and quickly done.

The hatchel teeth are arranged in four parallel rows, two of fifteen round and two of fourteen flat teeth, placed alternately in the block and secured by being driven through holes, so as to be adjustable for cleaning or putting in new teeth. The round teeth keep the hair from being cut or broken, causing it to separate as it is drawn through. The flat teeth receive the knotty and matted hair as thrown off from the rounded teeth and hold it while the good hair is drawn through, they also keep the hair down toward the base and prevent it from slipping off the hatchel.

This invention was recently patented by Mr. Aaron D. Cheney, of Three Oaks, Mich.

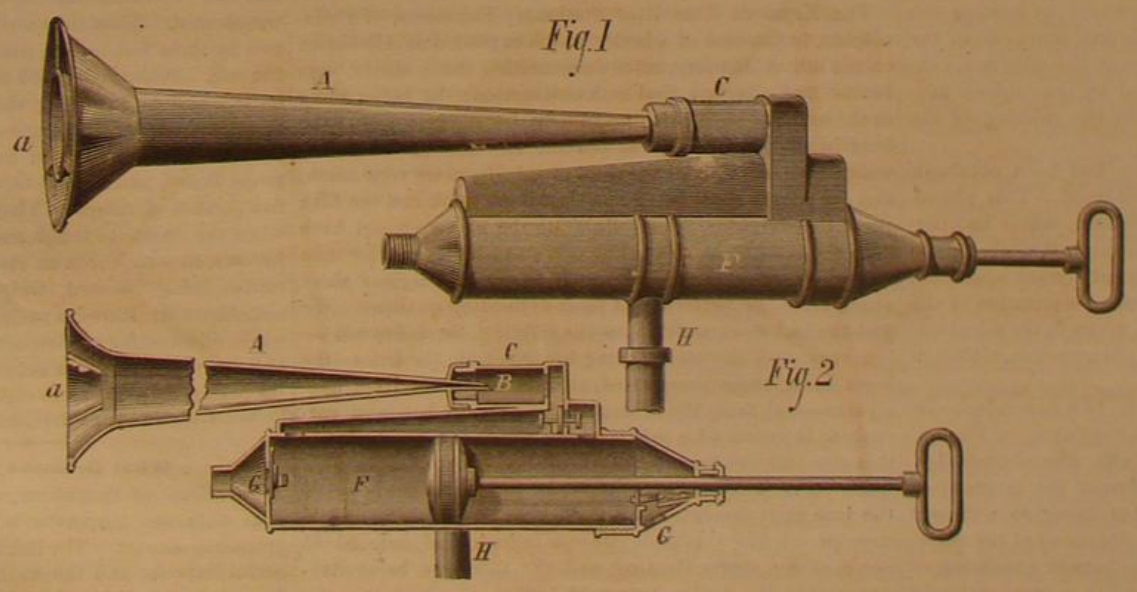
IMPROVED FOG HORN.

We give an engraving of an improved fog horn lately patented by Mr. Richard Chester, of Chicago, Ill. It is designed more particularly for sailing vessels and boats not propelled by steam. It is of the simplest character, and may be worked by one or more men.

The trumpet, A, is of the usual form, and at the larger end is provided with a conical disperser sustained in place by radial arms. The smaller end of the trumpet is inserted in the chamber, C, and provided with a reed, B.

The chamber, C, communicates with the air cylinder, F, whose piston is moved by means of a handle at the end of the piston rod projecting through a stuffing box at the end of the cylinder. Air enters at either end of the cylinder through valves, G, and is forced through a passage containing a check valve into the air chamber, C.

The details of construction may be clearly seen in Fig. 2, which is a longitudinal section of the apparatus. By a reciprocating movement of the piston the air is compressed sufficiently to give strong blasts from the horn, which may be heard long distances.



CHESTER'S FOG HORN FOR VESSELS.

Motive Power and Machinery of a Mill.

A gentleman of ample experience furnishes *Leffel's Mechanical News* the following sensible hints for millers: The first requisite is good motive power, and among all hydraulic motors yet discovered none can compete with a good turbine, for the following leading reasons: The turbine is not affected by ice; it is not affected by backwater, save the loss of power due to the loss of head; it is much cheaper in first cost; it is more cheaply and easily transported and erected; it is suited for all heads and all locations; and, above all, it is more economical in the use of water, for its high velocity dispenses with the cumbrous double gearing which is absolutely necessary with under or over shot wheels. Look well to your foundations, both of the building and of the penstock and flume. Never connect the husk of a mill with the frame of a building; it should be framed entirely separate, for the stones will work better and will not be thrown out of level by the settling of the building. In planning a mill, study how to render it complete with as little machinery as possible. Above all, avoid complications in machinery, which waste power and cause delays and expense for repairs.

The Geological Survey of Pennsylvania.

In a long account of the progress of the State geological survey of Pennsylvania, the *Press*, of Philadelphia, gives the following information of general interest: The survey has been going on six and a half years, and two and a half years more will be required to complete the work. Forty-two counties have been fully surveyed and eighteen partially; six counties remain untouched. The anthracite coal field was entered upon for the first time the past season in the Mahanoy and Wilkesbarre districts. The publication of the reports has nearly kept pace with the field work. Twenty-eight county reports and sixteen special reports are already in print, and thirteen of the former and three of the latter are in preparation.

One of the most valuable results of the season's work is a third report on the oil regions, with maps and illustrations, prepared by Mr. Carll, who has a high reputation as an expert. A special paper, which promises to be of great importance, has been prepared by Mr. Franklin Platt on the waste in anthracite mining. This report is now going through the press, and will be laid before the Legislature at an early day, having been prepared in response to a call by that body for such a report. Professor Lesquereaux, who is the leading fossil botanist of the world, has prepared a volume of nearly 700 pages on the fossil plants of the State, which is said to be the most perfect work of the kind in existence, and Dr. Genth, who has been making a special chemical investigation of the slate, gneiss, and trap rocks, has made some remarkable mineralogical discoveries.

NEW INVENTIONS.

Mr. Rufus M. Brundige, of New York city, has patented an improved dust and wind guard for windows. A plate having eyes at its ends and bent rods for supporting the plate, whereby the plate can be adjusted at either side of the window, constitutes the invention.

Mr. James N. Lee, of Natchitoches, La., has patented an improved portable chamber for hot air, vapor, warm water, and similar baths. The invention consists of a portable bath chamber formed of a detachable, top, and of sides made with sections hinged to each other, provided with doors having glass lights and openings for stovepipes, the whole resting on a base frame provided with a stove or furnace for heating the chamber.

Mr. Leonard Tilton, of Brooklyn, N. Y., has patented an improved canceling stamp, which can be readily manipulated to bring it into the desired position on the bed, and which gives a uniform pressure in stamping to insure plain marking.

Mr. Edward Heyde, of East Saginaw, Mich., has patented a boat rowing apparatus, the object of which is to facilitate the working of oars of boats by a better application of the power of the rower. It dispenses with ordinary rowlocks, and makes use of the weight of the rower in working the oars. The boat is provided with a rocking seat, upon which the oars are supported, their inner ends being pivoted to a central standard rising from the seat between the supports. The motion of the operator causes the seat to rise and fall, and thereby carry the blades into and out of the water.

A novel foot bath recently patented consists of an oval vessel with a half cover set at an angle to deflect the steam toward the limbs and to prevent clothing from dropping into the water, and when blankets are used, as in taking a steam bath, it forms a support for them. It is provided with a special device for adding hot water, and forms a very desirable article. Mr. R. B. Robinson, 145 Broadway, is general agent.

Experiments in Gunpowder.

From our English contemporaries we learn that several new descriptions of prismatic powder are being prepared at the Royal Gunpowder Factory at Waltham Abbey for the future experiments of the Committee on Heavy Guns and Explosives. The prisms will be of various forms and sizes, and some will be perforated to accelerate combustion. The researches into the properties of prismatic powder have engaged military and scientific men of various nations for many years, but it is only of late that the introduction of air spaces into the cartridges has given a direction to experiments and developed the full advantages of the system. Some powders of this description made in Russia and Germany have recently been tried, and the German prisms, which are about an inch long, have been found to be the best yet produced. The government works at Waltham Abbey have manufactured some prisms so large as to weigh 4¼ oz. each "grain," but this powder has been discarded as overstepping legitimate growth, and the qualities about to be tested will probably not exceed 1¼ in. in length, or rather more than 1 oz. per grain. There is now very little doubt that, in some form or other, the explosive material for employment with great guns in the future will be prismatic gunpowder.

MATCHES.—There are in the United States about 28 establishments, large and small, devoted to the manufacture of matches, about 4,000 persons being employed in the business. The trade, however, is monopolized by six or seven more prominent concerns, of which the Barber Match Company, of Akron, is the largest.

Correspondence.

The Coming Electrical Exhibition at Paris.

To the Editor of the Scientific American:

The Committee of Organization has been somewhat modified, and the names of Count Du Moncel and Dr. Cornelius Herz have been added.

The funds necessary for organization will be partially furnished by the government and partially by a guarantee society, the members of which have subscribed a certain amount of money.

The Emperor of Germany signed a decree on the 4th of January, in which he promises the participation of Germany in the Congress of Electricians and the Electrical Exhibition. The Government of Holland has also made an official announcement of the participation of that country.

The Government of Belgium has nominated as delegates to the Congress Messrs. Banneux and E. Gerard, Telegraph Engineers. In Italy the Minister of Public Instruction and Public Works is also making preparations for the participation of that country in the Exhibition.

In the last session of the seventy members of the Organization Committee some new and important facts concerning the Exhibition were announced, which it may be interesting to mention here.

The Commissary General, Mr. George Berger, communicated to the assembly that the power which will be at the disposition of the exhibitors will amount to 800 horse power, which, besides furnishing power for moving the machinery, will be sufficient to have 600 lamps burning simultaneously. This fact alone is sufficient guarantee to the public that the exhibition will be a brilliant one. A large hall will be connected by telephones with the Grand Opera, and the experiment of transmitting the music of the choirs and of the orchestra in this way from the Opera to the Palais de l'Industrie will be tried.

Several electric railroads will be erected, and, it is reported, Mr. Siemens, of Berlin, has announced that he will expend 150,000 francs for the construction of the new railway which has been used with such grand success in the Prussian capital.

A note read before the Academy by Mr. Blondlot throws some new light upon the properties of selenium metal, an element much spoken of since the invention of the photophone by Mr. Graham Bell.

Mr. Blondlot has, by means of a platinum wire, attached to the one pole of a capillary electrometer, a fragment of annealed selenium metal, and to the other pole a platina plate. When the selenium was brought into contact with the platina (using for this purpose insulating handles) and then quietly kept there, the electrometer remained at zero, but as soon as the platina was rubbed with the selenium, the electrometer showed a great deviation, similar to that produced by a sulphate of copper battery. Mr. Blondlot has shown that neither the rubbing of two metals with each other, nor that of an insulating body with a metal, nor that of two insulating bodies, is able to produce a deviation of the capillary electrometer.

The current produced in the experiment described moved the electrometer around in the direction from that part of the selenium which was not rubbed to that part which had been rubbed, and it may easily be ascertained that the thermo-electric current, which is produced by heating the contact point of the selenium and platina, moves from the warm part of selenium to the cold part of the selenium, consequently the electric current produced by the rubbing cannot be ascribed to the *heat* created by the rubbing of the two elements.

If, after the electrometric deviation had been obtained, the rubbing ceased, this deviation remained. This phenomenon is due to the fact that the selenium, which had permitted the electric current to pass through it while in the high tension produced by the rubbing, afterward opposed a resistance which could support the feeble polarization of the mercury of the electrometer. A shock given to the selenium, or even a pressure, produces the same phenomenon, although in a less marked degree.

There is much talk in Paris in regard to a new telephonic system, a description of which Mr. Kroetlinger, of Vienna, has just published in the *Angewandte Electricitaetslehre*. This system is based upon the variations of the intensity of thermo-electric currents, the apparatus being so arranged that the heat can be modified by the vibrations of the voice. Mr. Kroetlinger uses a thermo-electric battery consisting of long elements, one end of which is kept at a comparatively low temperature, while the other is heated by the upper part of a candle flame. The candle is kept at a constant height by a mechanism similar to that used in carriage lamps. Surrounding the front and the sides of the battery there is a telephonic mouth-piece, which is placed in an invariable position.

The diaphragm of this mouth piece is flexible, and is pierced by a great number of holes varying in size, and the whole apparatus is surrounded by a box, which prevents the interference of exterior noises, and through which only the mouth of the telephone and the poles of the thermo-electric battery enter.

This disposition permits a change in the normal conditions of the air current (which is heated by the flame) to take place by means of the vibrations created by the voice. The corresponding variations of the heat acting upon the thermo-electric pile may be easily determined.

These variations create variations of the same nature in the current produced by the battery, and consequently the words are reproduced in the telephonic receiver, which is connected with the wires in the battery.

Experiments made with this telephonic arrangement have given very satisfactory results, and the idea is certainly of great scientific interest.

Paris, January 19, 1881.

The Late Dr. Sandford.

To the Editor of the Scientific American:

With your permission I would correct the unjust reflection upon Dr. Sandford in the article entitled "An Unwise Physician," published in the January 8th issue of the SCIENTIFIC AMERICAN, my attention having just been called to it. First, let me say that my information is principally obtained from a friend who assisted the doctor in the operation of tracheotomy, which proved so fatal to himself.

The little one on whom the operation was performed was *not* a patient of Dr. Sandford, as reported; neither had he watched the patient "night and day," but was called by the attending physician to perform the operation, which he had successfully done on other occasions.

The child had been under treatment for "membranous croup," and not diphtheria, as stated.

Had the doctor supposed for a moment it was the latter he would never have resorted to the knife, as it would then have been a useless attempt. Had it been "membranous croup" the fatal consequence would not in all probability have occurred.

It is asserted that a rubber tube was used, through which the membrane was drawn. This is also incorrect, as nothing was used for that purpose until afterward, when a silver tube was inserted, through which the child breathed.

It is customary in such operations, I am informed, to open the windpipe, which allows the lungs to inhale rapidly; when filled the sudden exhalation drives the membrane out through the opening. In this case, for some reason known only to himself, the doctor, seeing the membrane, and thinking to be more sure, without previous intent apparently, clapped his mouth to the open wound and drew the membrane out.

In reply to a suggestion by my friend that it "would be bad for him if diphtheria was there," he said, "Yes, it would!" and immediately rinsed his mouth with water.

It was not until this moment apparently that he thought of diphtheria.

The doctor's large heart and anxiety to save human life, rather than "professional zeal," prompted the act.

The act of drawing the membrane with the mouth perhaps cannot be justified, as the consequence cannot always be foretold. An inspirator should be used in such cases.

The doctor was familiar with the operation, having performed the same successfully on several occasions; also had written several papers on the subject.

A young man in years, but stood far in advance of many older practitioners by his untiring study and labor.

His loss is mourned by a large circle of friends, and it is but just to his memory, his friends, and science, that the above errors be corrected. E. G. R.

A Steam Boiler Explosion.

The Keystone Council of Stationary Engineers, of Philadelphia, in the case of a boiler which exploded at Allentown on the 6th of January, after summarizing the evidence, say: In the first place we find malconstruction; the boiler hung at the extreme ends, with no support for the center, and the hole in the shell being cut out the full size of the dome, which tends to weaken the shell of this diameter very much, and the fourth sheet being five sixteenths thick and the fifth sheet three eighths thick, while all the sheets should have been the same thickness. The one sheet being heavier than the other, the heavier sheet tends to pull the lighter sheet apart, from the difference of their expanding qualities. We find the bad workmanship in the riveting, the holes not being even, and the rivets being too small for the holes—the holes being three-quarters of an inch and the rivets five-eighths—and from the evidence, the pressure has been carried far in excess of a safe working pressure for a boiler of this size and thickness. As we estimate the strength of a boiler by its weakest part, we would judge the character of the iron as it presents itself to be able to sustain a tensile strength of 52,000 pounds per square inch, and reduced 44 per cent for single riveting, and the thickness being five-sixteenths—the boiler being 36 inches in diameter—the bursting pressure would be 5'5 pounds, and one-sixth of the bursting being the safe working pressure (by our city ordinance), the safe working pressure would be 84 pounds. This would be the safe working pressure of the rim that gave way, the fourth sheet; while the fifth sheet, being three-eighths by the same rule, would give a bursting pressure of 606 pounds and a safe working pressure of 101 pounds. This would be a calculation of a boiler, new and first-class workmanship, and being hung from three saddles, distributing the weight. When we consider the weight o the boiler at 6,000 pounds and a weight of 8,000 pounds of water and 5,000 pounds of bricks and mortar laid on top of the boiler, there is not much wonder why it gave way in the center, particularly by the assistance of at least 90 pounds per square inch on the heads, which would be the mean between 60 and 120 pounds, which would be equal to a force of 91,608 pounds pressure on the heads, tending to pull the boiler apart in its curvilineal seams, while the curvilineal seam in its full strength, admitting it to be equal to 52,000 pounds per square inch, and reducing it 44 per cent for riveting, and it being 113 inches in circumference, its tensile strength would be 1,028,300 pounds, and one-sixth of this being a safe load for it to bear, would be 171,386 pounds, and subtracting 91,608 pounds, which would be the pressure of steam exerted on the head by a pressure of 90 pounds, would leave us 79,778 pounds as a surplus to support the weight of the boiler; weight of water and weight of bricks and mortar would be 19,000 pounds. There is not much wonder that the boiler gave way in the center, which, theoretically and practically, is the weakest point, when hung from the ends, and no support for the center. The boiler should undoubtedly have been condemned before the last patch was put on; the boiler is evidently a great deal older than six years.

DECISIONS RELATING TO PATENTS.

United States Circuit Court.—District of New Jersey.

FLOWER *v.* RAYNER.—PATENT FOR DECORATING TIN PLATES.

Nixon J.:

1. The statutory provisions concerning reissues require that the original patent must be inoperative or invalid either from a defective or insufficient specification or from claiming as new more than the patentee has the right to claim; and, in addition to this, the error which is sought to be corrected must have arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. If the party interested can bring himself within these conditions and limitations, the Commissioner is authorized to issue a new patent for the same invention. When the original shows upon its face that the grounds and reasons for the reissue do not exist, or where a comparison of the letters patent discloses different inventions, the reissue is void, as an act unauthorized by the law.

2 The reissued letters patent No. 7,556, dated March 13, 1877, for improvement in decorating tin plates, cans, etc., held to be invalid, as being an undue expansion of the original letters patent.

United States Circuit Court.—District of Delaware.

WILT *v.* GRIER.—PATENT FRUIT DRIER.

Bradford, J.:

This is a bill in equity brought by the complainant Wilt against the defendant Grier for alleged infringement of said Wilt's Letters Patent No. 190,368, issued May 1, 1877, originally to A. Quincy Reynolds, of Chicago, Ill., for an improvement in automatic fruit driers.

1. Where a person procures a patent for the building of a machine which produces certain results which are novel and useful, by reason of certain mechanical contrivances and appliances, any person who attempts to accomplish the same results by mere substitutions, which are equivalents of the means employed by the first patentee, is an infringer.

2. Any application of known mechanical powers which will produce that result, although different in form from the means employed by the orignal patentee, is a mechanical substitute and equivalent of the same.

How Raisins are made in California.

In Mr. Blowers' vineyard, Yolo county, the grapes are allowed to remain on the vine until of a golden color and translucent. Then they are picked and put on wooden trays two by three feet in size, placed between the rows, sloping to the sun. When half dried they are turned by putting a tray on top, and by inverting them both, are transferred to the new tray. When the grapes lose their ashy appearance, and after removing the green ones, the rest are put into large sweat boxes, placing sheets of paper between every twenty-five pounds of raisins. They are left there for two weeks, when the stems are tough and the raisins soft. The packing follows, in which iron or steel packing frames are used, the raisins being assorted, weighed, inspected, and made presentable. Mr. Blowers prefers a rich, moist, sandy loam, in a warm climate, for raisins, and believes that winter irrigation will destroy insects and keep the vines in a thrifty condition. He prefers to plant vines eight by ten feet apart, or even ten by ten feet, and uses fertilizers.

What Becomes of the Soapstone?

The *Times*, of Bethlehem, Pa., is anxious to know what is done with the soapstone which is largely quarried and ground at Easton. The industry has lately received a wonderful impetus, and the mills are running day and night. The product is shipped to New York; thence where? "It is claimed to be used in paper pulp. It may be," the *Times* says, "to some extent. It is alleged to be used in hatter's felt. Perhaps so; but where is so large an amount disposed of? Soapstone, or steatite, is a combination of silica and magnesia. It is soft and greasy, and hence it is sometimes called lardstone. From its adaptability to making vessels, in some sections it is called pot rock. When ground, it is a soft, smooth, greasy, and almost impalpable powder. No one who has seen it in its ground state will question its almost diamond value for adulteration. Candies, sugars, flour, butter, it is alleged, can be adulterated to the extent of 20 to 25 per cent without any chance of detection."

Fortunately detection in such cases is not at all difficult. Dissolve the suspected candy or sugar; the insoluble mineral will remain. Burn a sample of suspected flour; an excess of ash will betray the cheat. Melting and filtering will do the same for suspected lard or butter.

MAMMOTH FIRE BOAT.

[*Continued from page* 143.]

discharge is 60 feet above deck, and the nozzle is 60 feet long from the trunnion. It may be moved up or down or turned in any direction; when at its highest elevation the nozzle is 100 feet above the deck.

A novel feature connected with this discharge pipe is the variable sizes of discharge nozzles, which are arranged in a cylinder like the chambers of a revolver, and may be changed without stopping the flow of water. The cylinder has five separate nozzles; namely, 6 inch for great distances and very high pressure, 8 inch for less distance, 10 inch for fires near at hand, and a sprinkler, consisting of one hundred three-quarter-inch diverging openings. The nozzles may be changed and the discharge directed by a single operator placed in a cab situated on top of the stand pipe. All the movements are made by the agency of small steam engines. When we consider that this boat can throw a ten inch stream of water, which is 100 times the size of a steam fire engine nozzle; that, instead of being thrown from the ground and nearly all its power lost in raising it to the fire, it is thrown from a height of 100 feet, and with a force great enough to break through iron blinds, wooden shutters, doors, or roofs, and that the force of the water would be such that it would be dashed into a spray of sufficient volume and density to fill every nook in a large building; that a large floor could be flooded in one minute, and that the largest fire possible in any building now erected could be extinguished as quickly as a fire in a drygoods box or barrel could be extinguished with old appliances—some idea of its great power can be formed. In addition to the fire-extinguishing features, she is also provided with a means for demolishing walls, staving in sides of ships, and for making fast to ships that are in flames.

For demolishing buildings in case of great fires, the usual mode has been to place under or near to them a large quantity of gunpowder. This was resorted to in Boston, but with poor success; its action is uncertain and unreliable. It often occurs that a fire is inclosed in a strong room with heavy walls, and that there is no means of getting a stream of water on to it. In such cases it becomes necessary to make an opening in the wall. To accomplish this, Mr. Maxim has invented a peculiar kind of a gun, which will throw a wooden projectile with any degree of force necessary. The projectile is of hard wood, 4 feet long and 16 inches diameter. The force used is gunpowder of a very coarse and slow grade. The powder chambers are from 2 inches to 6 inches diameter, and may be changed at will. For instance, if a charge of powder filling a breach tube, 3 inches diameter and 4 feet long (ignited at the end nearest the wood), should fail to penetrate a wall or the side of a ship, then a larger tube would be used with more powder, until, by experiment, a blow could be given with precision in the exact spot needed. When the fire is on shipboard, and it becomes necessary to make an opening in the deck, one of the two mammoth picks or hammers may be used. They are drawn up by steam and may be dropped at any height like a pile driver. A hole could thus be made instantly, while the same when only slightly embedded in the deck may be used to make fast and thus pull the ship out into the stream to sink, or to remove it from others which are on fire.

A boat of this kind, aside from a fire boat, would be well calculated for breaking up the ice in the harbor. Her great power and independent wheels would enable her to go anywhere.

Large fires, when within two or three blocks of the river front, could be reached with hose from this boat. It would supply over one hundred lines the same size as used by the steam fire engine, or better, four large lines twenty-five times as large (4 inch or 5 inch nozzles). The discharge pipes would have to be mounted on wheels like a field piece, and would constitute, as it were, the artillery of the fire department. Linen hose can now be made of any size and strength. With proper appliances, hose 8 inches diameter could be readly put down. What is wanted is a stream of water of mammoth proportion, one that will reach 200 or 250 feet, and will have volume sufficient to deluge any building within its reach.

Suppose a boat of this kind should be anchored off the Battery with a lookout, and also connected electrically with the fire alarm system of the three cities. Suppose the boilers all connected and a fire constantly in one of them; the furnaces of the rest carefully charged with cannel coal, as in steam fire engines. One single fire would keep the water in the whole at the steaming point, therefore steam would be always up with a single fire burning. Now, suppose a fire to break out, the lookout sees it, or the alarm is sounded at once, the torch is applied to all the furnaces, steam is turned on to the donkey engine, the anchor comes up, and at the same instant the paddlewheels move; by the time the fire is reached all the furnaces are burning, the steam is up to 80 pounds, and anthracite coal is put on. When the boat stops she turns the steam off her engines and allows it to be used on the pumps.

The cost of a boat of this kind would, it is true, be great, but there has not been a year during the last decade that such a boat would not have paid for herself; and, moreover, the cost of maintenance would be much below proportionately that of steam fire engines, such as are now in use. Many great fires have destroyed millions of property simply because the water pipes were not sufficiently large to supply the water for the engines. There are streets in New York and Brooklyn where, in case of a great fire, the supply of water would not be sufficient to supply the engines. In this respect the boat would have the advantage of an unlimited supply.

We are informed by Mr. Maxim that this boat is the result of a careful investigation of facts and observations, and that he designed it some years ago after witnessing the destruction of some large ships and warehouses by fire.

The fruitless attempts of the puny engine and fire boats to extinguish the fire proved to his mind that something new must be designed to meet the new demand. The result was the system here shown, which we think admirably adapted for the purpose, and which we must eventually adopt.

Any further particulars may be obtained from H. S. Maxim, 120 Broadway, New York.

How Artificial Pearls are Made.

Many persons have no doubt been frequently struck with the great beauty of artificial or imitation pearls. Those who make it their business to produce such articles of ornamentation have attained to a high degree of perfection in their art; so much so that in 1863, at the London Exhibition, a Frenchman who was an adept at their manufacture exhibited a row of large real and imitation pearls alternately; and without close inspection, we are assured, it would have been impossible even for a judge to have selected the real from the unreal. Some translations from French and German works on this manufacture have recently been communicated to *Land and Water*, and from these it appears that the art of making imitation pearls is ascribed to one Jacquin, a chaplet and rosary manufacturer at Passy, who lived about 1680. Noticing that the water after cleaning some whitefish (*Leuciscus alburnus*), a species of dace, was of a silvery appearance, he gradually collected the sediment, and with this substance—to which he gave the name of *essence d'orient*—and with a thin glue made of parchment, he lined the glass beads of which he framed his rosaries, and afterward filled them with wax. The method of making the round bead is by heating one end—which has first been closed—of a glass tube, which then, when blown into two or three times, expands into a globular form. The workman then separates the bead, places the end which has been heated on a wire, and heats the other end. This process is called bordering or edging. The best pearls are made in the same way, the holes of the tubes being gradually reduced by heat to the size of those of the real pearls, the workman taking each bead on inserted wire, and, by continually turning them round in the flame of the lamp used, they become so true as to be strung as evenly as the Oriental pearls.

The process of coloring the pearl is commenced by lining the interior of the ball with a delicate layer of perfectly limpid and colorless parchment glue; and before it is quite dry the essence of orient is introduced by means of a slender glass blowpipe. It is then allowed to dry; the pearl is filled with wax, and if intended for a necklace is pierced through the wax with a redhot needle. The essence of orient, as it is called, is the chief ingredient in the manufacture of the pearl. It is a very valuable substance, and is obtained from the fish above named by rubbing them rather roughly in a basin of pure water, so as to remove the scales; the whole is then strained through a linen cloth, and left for several days to settle, when the water is drawn off. The sediment forms the essence referred to. It requires from seventeen to eighteen thousand fish to obtain about a pound of this substance! Besides the French imitation pearls, as those above described are called, there are the Roman pearls, which are made of wax, covered with a kind of pearly luster. But these do not look so well as the French pearls; while, in a heated room, they are apt to soften and stick to the skin. A very extensive trade is now done in the manufacture and sale of French artificial pearls.

Astounding Fungi in Nevada Mines.

A gentleman who recently had occasion to explore the chambers, drifts, and caverns of the old deserted Mexican and Ophir mines, says that fungi of every imaginable kind have taken possession of the old levels. In these old mines, undisturbed for years, is found a fungus world in which are to be seen counterfeits of almost everything seen in our daylight world. Owing to the warmth of the old levels and to the presence in them of a certain amount of moisture, the timbers have been made to grow some curious crops. Some of the fungi in the old chambers are several feet in height, and, being snow white, resemble sheeted ghosts. In places are what at a little distance appear to be white owls, and there are representations of goats with long beards, all as white as though carved in the purest marble. The rank fungus growth has almost closed some of the drifts. The fungi are of almost every imaginable variety. Some kinds hang down from the timbers like great bunches of snow-white hair, and others are great pulpy masses. These last generally rise from the rocks forming the floor of the drifts, and seem to have grown from something dropped or spilled on the ground at the time work was in progress years ago. These growths have in several places raised from the ground rocks weighing from ten to fifty and even one hundred pounds. Some of the rocks have thus been lifted more than three feet.

In the higher levels, where the air is comparatively dry, the fungi are less massive in structure than below and are much firmer in texture. Some resemble ram's horns, as they grow in a spiral or twisted shape, while others, four or five feet in length and about the thickness of a broom handle, hang from the cap timbers like so many snakes suspended by the tails. One kind, after sending out a stem of the thickness of a pencil to the length of a foot or two, appears to blossom; at least produces at the end a bulbous mass that has some resemblance to a flower. In all the infinite variety of these underground fungi it is somewhat strange that not one was seen at all like those growing upon the surface in the light of day. Nothing in the nature of toadstools or mushrooms was found.—*Virginia City (Nev.) Enterprise.*

AGRICULTURAL INVENTIONS.

Messrs. William G. Kennedy, Leonard Z. Preston, Franklin A. Morand, and Edgar H. Kennedy, of Warren, Kansas, have patented a revolving harrow attachment for plows. The invention consists in attaching to the beam of a turn plow a frame in which a skeleton cylinder is set at a slight incline to the line of draught and provided with teeth rearwardly inclined.

Mr. Henry B. Sherwood, of Westport, Conn., has patented a hand cultivator so constructed that the hoes can be adjusted at any desired inclination, will break up the crust or baked soil, and protect small plants from soil moved by the hoes. The hoes, being held down by spring pressure when at work, are prevented from jarring the operator when obstructions are encountered.

Mr. Daniel G. Martz, of Mauzy, Va., has patented a seed drill so constructed that under ordinary circumstances the shovel will be held to its work; but when the shovel meets an obstruction the boot will yield and swing back, and return to its place as soon as the obstruction is passed. The shovel may also be reversed and moved down or up as may be required.

The Eyes of Railway Men.

The annual report of the State Board of Health of Connecticut gives the following statistics relative to the visual power and capacity of the railway men of the State, as determined by the official examiners, Dr. W. T. Bacon and Dr. W. H. Carmalt. Dr. Bacon reports that he examined 326 employes of the New York and New England road; 211 of the New York, New Haven, and Hartford road; 76 of the New London and Northern; 121 of the Norwich and Worcester; 98 of the Connecticut Western; 59 of the Connecticut Valley; 133 of the New York, Providence, and Boston; and 5 of the South Manchester road. Total, 1,029. Of these 160 were engineers, 157 firemen, 100 conductors, 327 brakemen, 90 switchmen, 97 station agents, 98 flagmen, and other signal men. Of the total number 35 were red or green blind, 13 defective in color perception, 78 less than normal vision. Total defective, 120. Dr. Carmalt examined 921 employes on the New York, New Haven, and Shore Line, Housatonic, Naugatuck, Northampton, Air Line, Danbury and Norwalk, Shepaug, New Haven and Derby, and New Canaan railroads. Of the engineers he examined 131, and found 23 with defective vision, and 5 dichromatic (two colors); of the 128 firemen, 6 had defective vision, and 2 dichromatic, of 102 conductors, 14 had defective vision and 3 dichromatic; of 308 brakemen, 38 had defective vision and 13 dichromatic; of 137 switchmen, 22 were defective in vision and 2 were dichromatic; of 115 station agents, 25 were defective in vision and 3 dichromatic.

THE last stone of the masonry of the Brooklyn approach to the East River Bridge was laid February 17. The first eight floor beams of the superstructure were laid the same day. About 400 tons of the 5,000 tons of the steel required in the superstructure have been delivered, or enough to construct about one hundred feet on each side of the Brooklyn tower where the work has been begun. The engineers believe that the superstructure will be completed by next fall, and the bridge opened for travel by January 1, 1883.

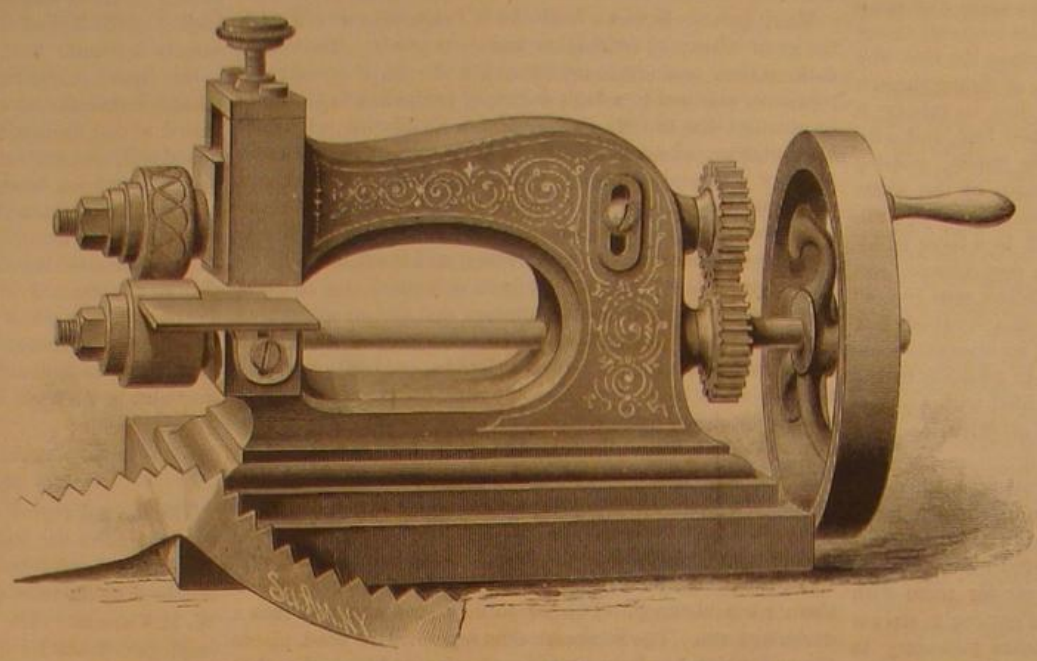
The Density of Snow.

According to Sig. G. Bignami Sormani, of Milan, the density of snow, and consequently the weight of it, which roofs, gasholders, etc., may have to carry, varies in a range of as much as eleven times the minimum. A cubic yard of snow from one snowstorm will sometimes weigh 814 pounds, while an equal bulk from another fall will only weigh 71 pounds. This indicates that any flat surface upon which snow may be drifted to the depth of only 3 feet may be called upon to sustain a weight of snow equal to a pressure of about $814 \div 9 = 90{\cdot}5$ pounds per square foot; or it may only be loaded under like conditions to the extent of $71 \div 9 = 7{\cdot}9$ pounds per square foot. The weight of a cubic foot of the densest snow recorded by Sig. Bignami Sormani being $30{\cdot}14$ pounds, while a cubic foot of water weighs $62{\cdot}5$ pounds, it therefore appears that, under certain conditions, the density of snow may be almost half that of water. Snow of this character will, however, in all probability be little different from ice, and would be rarely met with in this country, at least in any serious quantity, except on the ground or very near it. If it were otherwise, it is certain that much more destruction than is at all usual would be the consequence of a thick fall of snow on exposed lofty surfaces. The lowest named weight from new-fallen snow, only $2{\cdot}63$ pounds per cubic foot, is abnormally light, being only about one twenty-fourth of the density of water. It is usually assumed that the density of snow is ordinarily about one-eighth that of water, and this allowance, therefore, falls well within the range of Sig. Bignami Sormani's figures.

PINKING MACHINE.

The annexed engraving represents a simple machine for pinking the edges of cloth, silk, velvet, leather, etc., and is designed to replace the punch used at present. The invention consists essentially of two rollers, one of which has the design in relief, the other having it cut in, the two rollers being in contact. They are made of hardened steel, and are mounted on parallel shafts, one of which is provided with a hand wheel for rotating it. The other shaft is rotated by means of a pair of gear wheels mounted on the shafts. The upper shaft can be raised or lowered according to the thickness of the material by means of an adjusting screw.

The relief of the pattern roller is not sharp, and does not really cut the fibers, but crushes them. As the various pattern rolls are not of the same diameter, the upper shaft is made adjustable in height, and can be locked in any position by means of a screw passing through the side of the frame. This machine is the invention of H. Schmidt, Berlin.—*Deutsche Industrie Zeitung.*



PINKING MACHINE.

New Use for Sawdust.

The *Lumberman* says: We have been shown a model of a car wheel consisting of an iron rim of seven inches outward diameter by one-half inch thick, fitted with a well proportioned hub, the space between the hub and rim filled with pine sawdust, pressed in so solidly that we are ready to believe the assertion that resting the iron rim upon bearings, a pressure equal to 23 tons applied to the hub failed to develop any signs of weakness. We hesitate in these days of progress to assert that anything is impossible, and we begin to think that even sawdust possesses elements of value hitherto unsuspected, and that the day may come when the filled grounds adjacent to all sawmills may be seen to have a great value in the mechanical development and utilization of the now useless *débris* placed upon them to get it out of the way. Sawdust car wheels, sawdust brick, sawdust fence posts, railroad ties, and even sawdust window and door frames, wainscoting and mouldings, begin to appear among the possibilities of the immediate future.

AMATEUR MECHANICS.

WOOD-WORKING.

It is not the intention of the writer to enter largely into the subject of wood-working, but simply to suggest a few handy attachments to the foot lathe which will greatly facilitate the operations of the amateur wood-worker and will be found very useful by almost any one working in wood. It is not an easy matter to split even thin lumber into strips of uniform width by means of a handsaw, but by using the circular saw attachment, shown in Fig. 1, the operation becomes rapid and easy, and the stuff may be sawed or slit at any desired angle or bevel. The attachment consists of a saw mandrel of the usual form, and a wooden table supported by a right angled piece, A, of round iron fitted to the tool post and clamped by a wooden cleat, B, which is secured to the under side of the table, split from the aperture to one end, and provided with a thumb-screw for drawing the parts together. By means of this arrangement the table may be inclined to a limited angle in either direction, the slot through which the saw projects being enlarged below to admit of this adjustment.

The back of the table is steadied by a screw which rests upon the back end of the tool rest support, and enters a block attached to the under side of the table. The gauge at the top of the table is used in slitting and for other purposes which will be presently mentioned, and it is adjusted by aid of lines made across the table parallel with the saw.

For the purpose of cross-cutting or cutting on a bevel a thin sliding table is fitted to slide upon the main table, and is provided with a gauge which is capable of being adjusted at any desired angle. For cutting slots for panels, etc., thick saws may be used, or the saw may be made to wabble by placing it between two beveled washers, as shown in Fig. 2.

The saw table has an inserted portion, C, held in place by two screws, which may be removed when it is desired to use the saw mandrel for carrying a sticker head for planing small strips of moulding or reeding. The head for holding the moulding knives is best made of good tough brass or steam metal. The knives can be made of good saw steel about one-eighth inch thick. They may be filed into shape and afterward tempered. They are slotted and held to their places on the head by means of quarter-inch machine screws. It is not absolutely necessary to use two knives, but when only one is employed a counterbalance should be fastened to the head in place of the other. All kinds of moulding, beading, tonguing, and grooving may be done with this attachment, the gauge being used to guide the edge of the stuff. If the boards are too thin to support themselves against the action of the knives they must be backed up by a thick strip of wood planed true. The speed for this cutter head should be as great as possible.

Fig. 5 shows an attachment to be used in connection with the cutter head and saw table for cutting straight, spiral, or irregular flutes on turned work. It consists of a bar, D, carrying a central fixed arm, and at either end an adjustable arm, the purpose of the latter being to adapt the device to work of different lengths. The arm projecting from the center of the bar, D, supports an arbor having at one end a socket for receiving the twisted iron bar, E, and at the other end a center and a short finger or pin. A metal disk having three spurs, a central aperture, and a series of holes equally distant from the center and from each other, is attached by its spurs to the end of the cylinder to be fluted, and the center of the arbor in the arm, D, enters the central hole in the disk while its finger enters one of the other holes. The opposite end of the cylinder is supported by a center screw. A fork attached to the back of the table embraces the twisted iron, E, so that as the wooden cylinder is moved diagonally over the cutter it is slowly rotated, making a spiral cut. After the first cut is made the finger of the arbor is removed from the disk and placed in an adjoining hole, when the second cut is made, and so on.

Figs. 6 and 7 show a convenient and easily made attachment for moulding the edges of irregular work, such as brackets, frames, parts of patterns, etc. It consists of a brass frame, F, supporting a small mandrel turning at the top in a conical bearing in the frame, and at the bottom upon a conical screw. A very small grooved pulley is fastened to the mandrel and surrounded by a rubber ring which bears against the face plate of the lathe, as shown in the engraving. The frame, F, is let into a wooden table supported by an iron rod which is received by the tool rest holder of the lathe. The cutter, G, is made by turning upon a piece of steel the reverse of the required moulding, and slotting it transversely to form cutting edges. The shank of the cutter is fitted to a hole in the mandrel and secured in place by a small set screw. The edge of the work is permitted to bear against the shank of the cutter. Should the face plate of the lathe be too small to give the required speed, a wooden disk may be attached to it by means of screws and turned off.

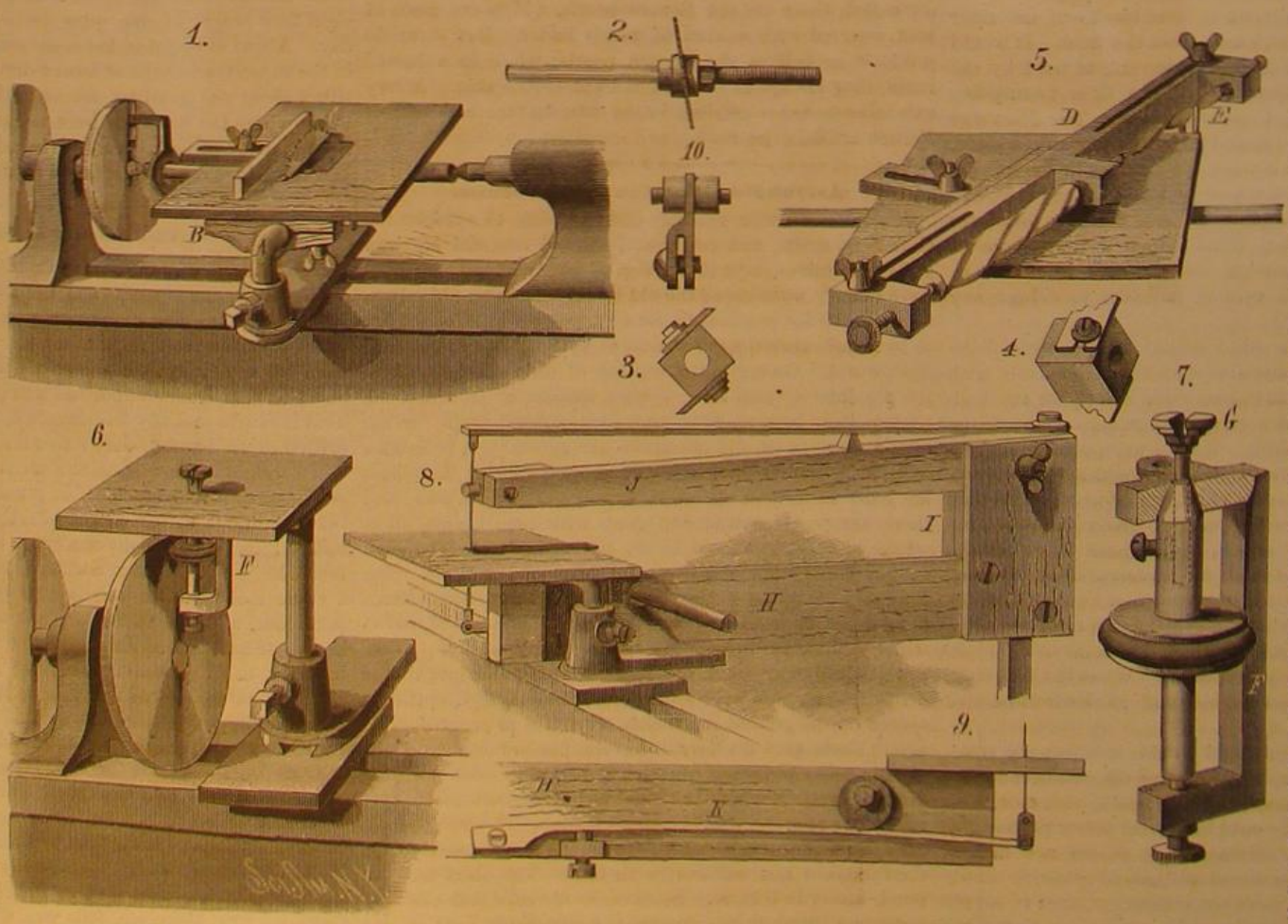
Figs. 8, 9, and 10 represent a cheaply and easily made scroll saw attachment for the foot lathe. It is made entirely of wood and is practically noiseless. The board, H, supports two uprights, I, between which is pivoted the arm, J, whose under side is parallel with the edge of the board. A block is placed between the uprights, I, to limit the downward movement of the arm, and the arm is clamped by a bolt which passes through it and through the two uprights and is provided with a wing nut.

A wooden table, secured to the upper edge of the board, H, is perforated to allow the saw to pass through, and is provided with an inserted hardwood strip which supports the back of the saw, and which may be moved forward from time to time and cut off as it becomes worn. The upper guide of the saw consists of a round piece of hard wood inserted in a hole bored in the end of the arm, J. The upper end of the saw is secured in a small steel clamp pivoted in a slot in the end of a wooden spring secured to the top of the arm, J, and the lower end of the saw is secured in a similar clamp pivoted to the end of the wooden spring, K. Fig. 10 is an enlarged view showing the construction of clamp.

The relation of the spring, K, to the board, H, and to the other part is shown in Fig. 9. It is attached to the side of the board and is pressed upward by an adjusting screw near its fixed end.

The saw is driven by a wooden eccentric placed on the saw mandrel shown in Figs. 1 and 2, and the spring, K, always pressed upward against the eccentric by its own elasticity, and it is also drawn in an upward direction by the upper spring. This arrangement insures a continuous contact between the spring, K, and the eccentric, and consequently avoids noise. The friction surfaces of the eccentric and spring may be lubricated with tallow and plumbago. The eccentric may, with advantage, be made of metal.

The tension of the upper spring may be



WOOD-WORKING ATTACHMENTS FOR THE FOOT LATHE.

varied by putting under it blocks of different heights, or the screw which holds the back end may be used for this purpose.

The saw is attached to the lathe by means of an iron bent twice at right angles, attached to the board, H, and fitted to the tool rest support. The rear end of the sawing apparatus may be supported by a brace running to the lower part of the lathe or to the floor.

The simple attachments above described will enable the possessor to make many small articles of furniture which he would not undertake without them, and for making models of small patterns they are almost invaluable.

M.

THE OSPREY.*

One of the most interesting of the predaceous birds which belong to Great Britain is the celebrated osprey or fishing hawk. This fine bird was formerly very common in England, but is now but rarely seen within the confines of the British Isles, although isolated species are now and then seen.

As the bird is a fish eater, it is generally observed on the sea coast or on the banks of some large river, but has occasionally been observed in some comparatively waterless situation, where it has probably been driven by stress of weather. In some parts of Scotland the osprey still holds its own, and breeds year after year on the same spot, generally choosing the summit of an old ruined building or the top of a large tree for that purpose. The nest is a very large one, composed almost wholly of sticks, and contains two or three whitish eggs, largely blotched with reddish-brown, the dark patches being collected toward the large end of the egg. As in the case with the eagles, the osprey is monogamous; but on the death of either of the pair, the survivor soon finds another mate, and is straightway consoled by a new alliance. From all accounts it is an affectionate and domestic bird, paying the greatest attention to its mate and home, and displaying a constancy which is not to be surpassed by that of the turtle-dove, so celebrated for matrimonial felicity.

The flight of the osprey is peculiarly easy and elegant, as might be expected from a bird the length of whose body is only twenty-two inches, and the expanse of wing nearly five feet and a half. Living almost wholly on fish, the osprey sails in wide undulating circles, hovering over the water and intently watching for its prey. No sooner does a fish come into view than the osprey shoots through the air like a meteor, descends upon the luckless fish with such force that it drives a shower of spray in every direction, and soon emerging, flies away to its nest, bearing its prey in its grasp. In order to enable it to seize and retain so slippery a creature as a fish, the claws of the osprey are long, curved, and very sharp, the soles of the feet are rough, and the outer toe is capable of great versatility. When the bird has settled upon its nest, or upon any spot where it intends to eat its prey, it does not relinquish its hold, but, as if fearful that the fish should escape, continues its grasp, and daintily picks away the flesh from between its toes. Sometimes in making its swoop it arrests itself for a second or two, as if to watch some change of position on the part of its intended prey.

The singular beauty of the osprey's flight attracted the attention of M. de Quatrefages, who remarked that the bird was able with outstretched and immovable wings, not only to withstand the power of a "squall" that would have flung a man to the ground, but even to work its way against the wind. How this feat was performed he confesses to be a mystery to him, and that the so-called scientific theories of "acquired velocity" or "tremulous movement" of the wings could not at all account for the phenomenon which he observed.

Harmless though the osprey be—except to the fish—it is a most persecuted bird, being not only annoyed by rooks and crows, but robbed by the more powerful white-headed eagle, who strikes the osprey on the wing and snatches from the poor bird the results of its morning's labors.

There is but one species of osprey, although it has been thought that the American bird ought to be reckoned as a different species. The general color of the osprey is dark brown, but it is pleasingly variegated with various shades of black, gray, and white. The crown of the head and the nape of the neck are covered with long gray-white feathers, streaked with dark brown. The under surface of the body is white, with the exception of a light brown band which extends across the chest. The primaries are brown tipped with black, and the tail is barred above with a light and a deep brown, and below with brown and white. The legs, toes, and cere are blue, the eyes golden yellow, and the beak and claws black.

THE OSPREY.—(*Pandion haliatus.*)

*For our beautiful cut of the osprey we are indebted to "Brehm's Animal Life." We extract the description from "Wood's Natural History."

A Wasp Attacks a Spider.

Mr. Seth Green, writing to the New York *World*, says that one morning when he was watching a spider's nest a wasp alighted within an inch or two of the nest, on the side opposite the opening. Creeping noiselessly around toward the entrance of the nest the wasp stopped a little short of it and for a moment remained perfectly quiet; then reaching out one of his antennæ he wiggled it before the opening and withdrew it. This overture had the desired effect, for the boss of the nest, as large a spider as one ordinarily sees, came out to see what was wrong and to set it to rights. No sooner had the spider emerged to that point at which he was at the worst disadvantage, than the wasp with a quick movement thrust his sting into the body of his foe, killing him easily and almost instantly. The experiment was repeated on the part of the wasp, and when there was no response from the inside he became satisfied probably that he held the fort. At all events he proceeded to enter the nest and slaughter the young spiders, which he afterward carried off one at a time.

IMPROVED FERTILIZER.—In Biedermann's C. Bl. Mr. W. Pochin describes a new fertilizer obtained from slags produced by dephosphorizing iron with lime. The slags are powdered, are treated with muriatic acid for removing part of the iron and lime, and are finally transformed into superphosphates by means of sulphuric acid.

Peculiar Reddening of Salted Codfish.

During the hot and damp weather of summer a peculiar redness often makes its appearance on salted codfish, rendering them unfit for the market and causing them to putrefy comparatively quickly. The loss suffered by dealers from this cause during some years is considerable. Prof. W. G. Farlow, of Harvard University, having been requested to investigate the matter, has rendered a report, which appears as an appendix to the recently issued report of the U. S. Fish Commission for 1878.

Prof. Farlow finds, on microscopic examination, that the redness is due to a minute alga known to botanists as *Clathrocystis roseo-persicina*. The plant consists simply of very minute cells filled with red coloring matter and embedded in a mass of slime. Its development has been studied by several botanists, who agree in considering it closely allied to *C. æruginosa*, a common species growing in fresh-water ponds, and which has lately come into public notice in consequence of the so-called "pig-pen" odor which it exhales when decaying. The species found on the codfish is also known in dissecting-rooms, where it grows in tubs in which bones are macerating. Wherever found it does not flourish nor increase very rapidly at a temperature below 65° F. Although the plant may be introduced into the fish-packing houses from the marshes in the vicinity of Gloucester, Prof. Farlow is inclined to believe that its origin is to be looked for from another source. The two kinds of salt most used by the fishermen of Gloucester are the Cadiz and Trepani. The former has a rosy tinge, while the latter is pure white. An examination with the microscope revealed the fact that the rosy color of the Cadiz salt was due to the presence of considerable quantities of precisely the same minute plant which is found in the red fish. What must happen then is plain. When the latter salt is sprinkled in large quantites upon the fish as they are packed in the hold of the vessel, the plants, if the weather is sufficiently warm, begin their growth, and the fish are soon affected during the voyage. As a preventive of the evil, Prof. Farlow recommends that every part of the woodwork of the packing houses be painted, so it may frequently be washed clean and the lodgment of the plant be prevented. He also suggests that Trepani salt be used instead of Cadiz in curing the fish, although the cost may be greater.

Descent of Man.

Two French savants have for the last twelve months been keeping nine pigs in a state of habitual drunkenness, with a view to testing the effects of different kinds of alcoholic liquors; the Prefect of the Seine having kindly put some sties in the yard of the municipal slaughter-houses at the disposal of the savants, in order that they might conduct their interesting experiment at the smallest cost to themselves. Pigs were chosen for the experiment because of the close resemblance of their digestive apparatus to that of man. The pig who takes absinthe is first gay, then excitable, irritable, combative, and finally drowsy; the pig who has brandy mixed with his food is cheerful all through till he falls to sleep; the rum swilling pig becomes sad and somnolent almost at once; while the pig who takes gin conducts himself in eccentric ways; grunting, squealing, tilting his head against the sty door, and rising on his hind legs as if to sniff the wind. Dr. Decaisne, describing these experiments with intoxicated swine, remarks in the *France* that they are none the worse for their year's tippling.

These experiments, taken in conjunction with the pig's well known personal peculiarities in feeding and his obstinate refusal to travel the correct path, go far to show that man was evolved from the hog rather than from the monkey, as some have surmised.

FOREIGN COMMERCE TO THE UNITED STATES.—The Secretary of the Treasury reports that the value of merchandise exported from the United States for the single month of December, 1880, was ninety-eight million eight hundred and fifty-six thousand six hundred and thirty-two dollars ($98,856,632), being the largest monthly export ever made in the history of the country. The total exports for the year 1880 were $889,049,840. Imports during same period, $696,803,433.

RECENT INVENTIONS.

Mr. Robert Hutton, of Holyoke, Mass., has patented a tension regulator for paper drying and other machines, such as printing presses, wall paper, printing machines, calico calendering machines, cloth-stretching machines, etc., whereby the tension on the material is kept uniform. The invention consists in a loose driving pulley, having its hub formed with inclines, and loose collars drawn to the hub by springs, combined with a winding shaft having fixed collars pressed to the loose collars by a screw, whereby the shaft is turned by the pulley, the friction being equalized by the equalization of the strain between the springs and the material being wound.

Mr. George W. Kaufman, of London, Ohio, has patented an improved wrench for use in screwing on or off the nuts of bolts in carriage wheels. The invention consists in a frame carrying a socketed shaft for receiving the wrench head, and a second shaft formed to receive a brace or crank, the shafts being connected by gearing, and the frame fitted with clamps for its attachment to the wheel.

Mr. Robert A. Bendall, of Cohoes, N. Y., has patented a machine for making three-ply roofing felt, which operates to insert a layer of plastic slate between two layers of paper, pressing the three-plies or thicknesses into a compact felt, and winding the felt into a roll. The material so prepared can be laid upon a roof, all that is necessary to finish the work being an exterior coating or layer of plastic slate.

Mr. John Butler, of New York city, has patented an electro-magnetic apparatus for medical use. The apparatus has one or both electrodes fitted as a roller or rollers for use in the manipulation of the muscles, so that magnetic and mechanical treatment can be combined in a single operation. The roller is hung on the permanent magnet and geared to give revolution. The armature and the permanent magnet serve as a handle by which the apparatus can be operated.

Mr. Jacob Pluess, of Prairie du Sac, Wis., has patented an improved boot and shoe constructed to prevent its running over to one side, and to prevent the ripping of seams caused by bending the boot or shoe at the shank. The boot or shoe is provided with a strengthening strip of leather interposed between the outer edge portion of the inner sole and the upper, which overlaps the stiffening strip, and is fastened to the inner sole, thereby forming a support for the heel ball and shank portions.

Mr. Robert K. Slaughter, of New York city, has patented an improvement in window shades which is designed to secure all the useful effects of opaque shades with the advantages of semi-transparent shades. He combines the two classes of materials, inserting the semi-transparent material into the opaque, and ornamenting the semi-transparent material, whereby the ornamentation is visible whether the room be exteriorly or interiorly illuminated, and also securing both cheapness and artistic effect.

A Simple Photophone.

The photophone has been reproduced in an exceedingly simple form by Mr. Shelford Bidwell. The transmitter is a disk of thin microscopic glass silvered on its anterior surface, and placed in front of a tube by which the voice is conveyed to it so as to excite vibration. The lime, or electric light, is reflected from this mirror through a convex lens, so as to render the rays parallel; these being received on a second lens at some distance, and again concentrated on a selenium receiver. This is the most important part of the apparatus. It consists of a slip of mica, two and a quarter inches long and three-quarters inch broad, round which is wound No. 40 copper wire in the form of a flat screw, with a pitch of one-sixteenth of an inch. The ends are fixed through holes drilled in the mica. A second wire is then wound beside but not touching the first. A few grains of vitreous selenium are melted and dropped on the surface of the mica, being afterward evenly spread by means of another slip of mica. The temperature should be just above the fusing point of selenium. It is then allowed to cool. It is next annealed for several hours and allowed to cool very slowly. The terminals of this cell are joined up with a battery of eleven Leclanché elements and a pair of Bell telephones wound with finer wire than usual, in larger quantity than that required for ordinary telephonic communication. The voice is very fairly conveyed across a space of ten feet and into a neighboring room by this simple form of apparatus.

The Evening Sky.

The Providence *Journal*, in a recent issue, says: The planetary aspect of the evening sky has not been so beautiful for many years, and the show is now approaching its culmination. The heavens were glorious to behold during the evenings of the last week. The moon, commencing with the 2d, paid her respects on successive evenings to Venus, Jupiter, and Mars, and, excepting on one evening, there were no clouds to mar the exceptional beauty of the scene. No observers could lift their eyes to the golden mysteries enshrined above without being impressed with the exceeding loveliness of the shining throng. Sunday evening, however, carried off the palm for the remarkable clearness of the sky, the purity of the atmosphere, and the unruffled serenity of the elemental conditions. The night was one dear to the heart of astronomers. At 6:30 the celestial arch presented a charming picture, the trio of planets glowing in the west; the moon, one day past the first quarter, shining from the zenith with the clustering Pleiades not far away, Orion with his glittering brilliants filling the eastern sky with sparkling light, and the matchless Sirius shining in the southeast. The telescopic view of separate portions of the picture was superb beyond expression. Venus, when the far-seeing eye of the instrument was turned upon her, was an object of dazzling brightness, nearly the size of the moon, her disk half enlightened, as our luminary looks at her last quarter. Jupiter was splendidly brilliant, his belts radiant in prismatic hues, his great red spot visible, and his moons attending their giant chief, two on one side and two on the other. Saturn's peerless ringed orb, with his belts and three moons, was the next study. The telescope was then turned to the moon, a portion of the terminator or boundary between the bright and shaded portions being brought into the field. With a high power she seemed so near that one by reaching out might almost touch her surface. There is nothing in astronomy more impressive than the utter desolation and death that reign on the chalk-like surface of this dead planet. There are no clouds to diversify the sky, no twilight to prolong the day, no sound to break the eternal silence. Immense craters, deep fissures, rounded hillocks, and the scars of mighty commotions, are all that remain of regions that were probably habitable like the earth in times gone by. The view on the terminator was the most interesting. Instead of the unbroken line of light that marks its appearance to the naked eye, the moon's rough edge was formed of branching horns of radiant light, like the antlers of a stag or huge formations of coral. These were the summits of lunar mountains, lighted up by the sun, which was just rising to this part of the moon. The bright mountain peaks were weird and wonderful, as well as beautiful, though their only admirers were observers 240,000 miles away.

A Sacrifice in a Study.

Commenting on the recent death and attributes of Dr. Edward Washburn, one of New York's most distinguished scholars and able divines, the Philadelphia *Ledger* thus alludes to the probable cause of his death:

In the midst of his studies for the help of humanity—in his study room itself, it is said, was the poisonous malaria that struck down the scholar and the student of human problems. His wasting disease of many weeks' duration is set down to malaria from imperfect sewerage under the room in which he spent many hours of work daily. It seems like a grim satire on human limitations that, while the saving sciences and humanity were his especial study, the neglect, the ignorance, or the gross stupidity of housebuilders was preparing a poison which sent him to the grave. Here, then, in the midst of the knowledge and cultivation and wealth of New York, were conditions, it seems, equal in effect to that of any squalid tenement house or fever-plagued town in the East, where Dr. Washburn traveled years ago. There was the subtle poison in the very atmosphere when this active organizer was planning to purify the plague places of the city. Whatever there was of latent weakness or constitutional defect, this wretched sewer stuff acts promptly or slowly, but always surely to bring out, and strike down with it just as surely the scientist as the simple little child. How many other students, it might be well to ask, are burning the midnight oil or spending the daylight over dark and hidden poison traps? How many sermons are written, or legal arguments laid out, or scientific discoveries worked out, or even disease studied out, in the midst of surroundings that are sarcastic enough commentaries upon the ignorance of all these workers and scholars and scientific inquirers? When a man's foes are those of his own household, in pipe and drain, it is time to begin to look at home. In these days "black care" does not ride behind the successful man, but black death may sit behind the desk or lie in wait in the wainscoting to confound all wealth and knowledge with the problem of the sewer.

New Remedy for Pruritus.

Physicians are often sorely puzzled to give relief to the symptom of itching which so frequently forms a prominent feature in certain skin diseases, and the most varied local measures are often used with the result of aggravating the local irritation. The list of internal remedies used for allaying this distressing condition is a limited one, and from it chloral and bromide of potassium stand out almost alone; but the objections to the continued use of these are too obvious to require mention. In searching for a vegetable neurotic which would probably have the desired effect, Dr. L. D. Bulkley says, in the New York *Medical Journal*, that he concluded that gelsemium, from the relief that it affords in certain cases of neuralgia, etc., might possibly act as a nervous sedative to the skin. This, on experiment, turned out to be true, and now, after prescribing it with considerable success for two or three years, mainly on adults suffering from eczema, he feels prepared to advise it as an adjuvant for the relief of itching in certain cases. He has used the tincture of the drug only, giving it in ten drop doses to begin with, and, when no relief was obtained, repeating the remedy in twelve or fifteen drop doses at intervals of half an hour, until results were obtained or until a drachm or so had been taken in two hours.

Paper and Paper Pulp from Salt Hay.

It has probably not been generally known among paper-makers, remarks the *Paper World*, that the grass ordinarily growing upon the low, marshy lands bordering upon salt water, and frequently overflowed by it, furnishes a most excellent material for paper. This grass grows in great plenty, and can be had for a comparatively low price, and contains nearly as much useful fiber to a ton as straw. It is very easily digested, and can be reduced in a very short time, two hours being quite sufficient. The brown pulp as discharged from the digester makes a very superior quality of hardware paper, and a trifling expense only is incurred in bringing the brown pulp up to a manila color, and even a fair quality of white paper may be produced from it. This stock when made into paper board produces an article of superior strength and rigidity, and one not liable to fracture in bending. The yield of useful pulp from a ton of hay is about nine hundred pounds, and the cost for caustic, we learn from the same authority, is very moderate.

The Contagiousness of Glanders.

Glanders is now so prevalent throughout the country, and exists to such an alarming extent in London, that any additional evidence we can obtain as to the manner in which it is propagated must be of value. It is not, perhaps, going beyond the mark to assert that not one-half of the cases of this horrible and fatal disorder are reported to the government; nor is it the less true that proper sanitary measures are very seldom adopted for its suppression. And it is greatly to be feared that the malady is mistaken for other diseased conditions, especially pyæmia, and that sick animals are allowed to live for weeks or months among others, to the great danger of not only these, but their human attendants. It has long been known that glanders is an inoculable disease, and that it could also be produced by transfusing blood from a diseased to a healthy horse or ass, as well as by introducing the virus contained in the nasal discharge into the stomach. It is possible that all the secretions and excretions are more or less infective, the peculiar muco-purulent fluid thrown off by the Schneiderian membrane probably being most active. This discharge has been blamed as rendering the public watering troughs a source of danger, the fluid passing into the water when glandered horses are allowed to quench their thirst at these valuable conveniences. It has been objected to this notion, that the discharge, being heavier than water, falls to the bottom of the trough, and, not being readily diffusible, is not likely to be swallowed by other horses watered there. This argument had a certain amount of plausibility, and the friends of the public water trough movement availed themselves of it when the troughs were accused of being largely instrumental in disseminating the disease.

From a note presented to the Académie des Sciences by Professor Galtier, of the Lyons Veterinary School, it appears that he has been successful in transmitting the disease to an ass, by the hypodermic injection of saliva from a glandered horse. We know that the virulent germs find admission not only through a wound or abrasion, or a thin mucous membrane, such as the conjunctiva, but also by the digestive organs. Saliva readily mixes with water, and those who have watched horses drinking will have remarked that some of the water taken into the mouth escapes by the commissures of the lips and falls back into the trough or bucket; and when drinking has been completed, a certain quantity which has not been swallowed is also returned; so that a glandered horse may largely contaminate the water in a trough with his saliva. Not only this, but when horses drink greedily, it often happens that a portion of the water is returned through the nostrils; so that the nasal, as well as the salivary secretion, may find its way into the mass of water which healthy horses subsequently swallow.

Galtier's experiments also go to show that the glander virus loses its activity when the matters which contain it, whether liquids or tissues, have been completely desiccated for fifteen days. Thorough ventilation of buildings which have been tenanted by glandered horses is, therefore, a very effective means of purifying them.

The diagnosis of glanders is sometimes very difficult, if not impossible, without having recourse to test inoculation; and the animal usually inoculated is the ass, that creature being not only less costly for this purpose, but also more easily infected than the equine species. It is still costly, however, and being large and somewhat expensive to keep during the experiment, other more convenient animals have been proposed for substitution. The rabbit is one of these, but, as M. Colin has shown in the experiments which we described a fortnight ago, it cannot be relied upon as a test animal.—*Lancet.*

Corn Stalk Sugar.

At a recent meeting of the American Agricultural Association in this city, Dr. Peter Collier, chemist of the Department of Agriculture at Washington, stated that during the past year there have been examinations made of 38 varieties of sorghum grown in and received from 14 different States, and from 9 varieties of Indian corn. The results of analyses made, 1,318 in all of the sorghums, showed them to yield, on an average, 1,662 pounds of available sugar. From 4 of these varieties the sugar was extracted in quantity and at a rate of fully 2,000 pounds per acre. As to the corn stalks the results were most satisfactory, but the experiments were not so numerous as with sorghum. An average of 26 analyses of the 9 varieties examined showed them to contain in their juice an amount of sugar greater in quantity than the average of the best 30 specimens of the 60 specimens of sugar beets grown in different parts of the country. After a large crop of ripe corn had been gathered, the stalks yielded at the rate of over 900 pounds of sugar to the acre, and there appears no reason to doubt that this result could be obtained upon a large scale.

A DUCKING BATTERY AND HOW TO MAKE IT.

This ingenious device, employed by the duck shooters of Chesapeake Bay, is well shown in use by the accompanying engraving, while below we show a sectional view of a battery drawn to a scale, which will prove of assistance to those of our readers who would like to make and try this method of circumventing the ducks which swarm in some sections of this country.

The battery is so constructed that when loaded with the guns and ammunition of the shooter, with a proper amount of iron for ballast that the water is on a level with the deck of the box, the shooter lying on his back is entirely concealed from view; in fact, when well ballasted and surrounded by the decoys it is impossible to distinguish this strange boat even at a short distance. The gunner remains on his back till the ducks are well over his decoys, when he rises to a sitting position and gives them a volley with his first gun, and, picking up his second, is ready to kill any cripples before they can dive and escape. With beginners it is difficult to judge distances across the water, and ducks will look much nearer to the box than they really are. If a large flock comes to the decoys, by permitting the first arrivals to light before sitting up in the box, and shooting at those first which have not settled, a person will frequently have an opportunity of doing execution to the first comers with his second gun before they get out of range; but under no circumstances should the shooter attempt to rise before the ducks drop their legs as though in the act of settling.

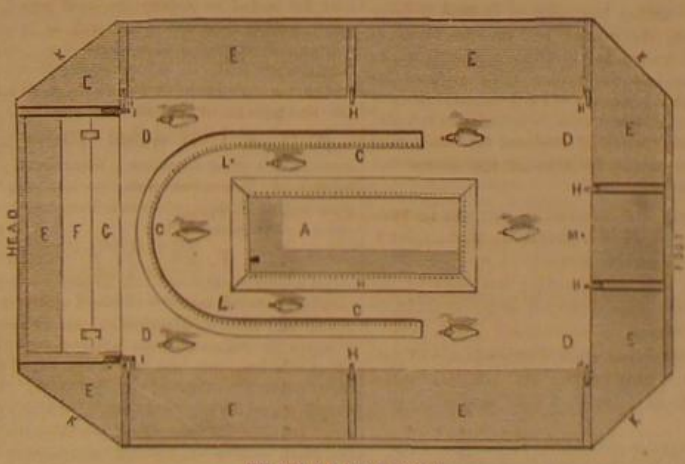
A battery should be accompanied by a small sail-boat, whose duty it is to pick up the dead birds as they drift to leeward, and to stir up and keep moving any flocks which may alight in the vicinity.

BATTERY OR SINK BOX.

Fig. 2 shows a skeleton view of a battery: A, box in which the shooter lies; B, rim of sheet lead tacked down on inner edge so as to turn up in rough weather to prevent the water washing over; C C, an outer strip of lead; D D is the deck supported by beams, which should be of oak one and a half inches thick, five inches wide in the center, and reduced at the ends to half an inch, and well secured by bolts; E shows canvas sheeting or gunny bagging tacked on light wooden frame; F is a board attached to G, which is a similar board secured to the deck by strong iron hinges; H shows leather hinges securing frames to the deck; I I represents hinges so made as to allow the end wing to fold over the side wings, which should be first drawn upon the deck when the battery is to be moved from its position; K shows ropes running from the frame ends, to which the canvas is attached, permitting the wings to be folded more readily; L L, points at which ropes pass through the frame, supporting deck to middle or bight, to which the head anchor is attached; M is the point at which the foot anchor is attached by a knot, the rope running through a hole made through the deck and a supporting beam or frame.

Use one inch pine for construction, except for head or foot board of box, which should be of oak or some more lasting wood and two inches thick. The bottom and side boards of the box are attached to the head and foot, so to a great extent the strength of the entire box depends on them. For use by a person of ordinary size a battery of the following dimensions will answer: Length of box, 6 feet 3 inches; depth of box, 1 foot 1½ inches; width of box at bottom, 1 foot 8 inches; width of box at top, 2 feet; length of deck, 12 feet; width of deck, 7 feet; width of lead rims, 4 inches; width of frames for canvas, 2 feet; width of boards, F and G, each, 8 inches; width of canvas at head, 9 inches.

The deck declines off on each side about an inch and prevents much wash, which would occur if it was made on a dead level. The edge of the box should be a quarter of an inch above level of the deck. The rim of sheet lead can be turned up in launching the battery, or when there is much ripple it prevents water from getting into the box. The outside rim only extends around the head, which is always anchored to the breeze, and consequently gets more the force of the waves, which are broken in their shock by the boards, F G, at the head.



PLAN OF BATTERY.

It is of great importance that the battery should be anchored properly to insure comfort to the shooter. The head of the platform, by fastening the anchor rope, L L, as described, is in a measure free from restraint, which permits it to rise and fall with the swell in an easy manner, and prevents the waves from breaking over into the box, which would be the result if anchored to the extreme end of the platform. The foot anchor rope, by running through a hole and fastened by a knot, can be reached and pulled up by the shooter in case a sudden change of wind makes it necessary to let it shift its position. A false bottom or drain board takes up about an inch of the depth and adds to the comfort. An old robe to lie upon, a couple of guns stowed away, cartridge box between his feet, and the shooter is ready for action.

The amount of ballast necessary depends on the weather, size of the person, etc. Pieces of railway iron are good, and eight or ten decoys made of cast iron and properly painted will be found handy to use for ballast by placing on the deck around the box, and can be shifted in case of change of wind. The deck and canvas should be painted a sedge color. The boat or tender which assists in setting the battery and picking up the birds should always keep in sight, ready to come to assistance of the shooter if necessary.

A Scientific Railway Car.

There arrived at our depot, yesterday afternoon, a passenger car the like of which is not to be found anywhere in the world. It is the property of Mr. P. H. Dudley, inspector of the tracks and apparatus of railroads, and this gentleman and his wife live in this car. A reporter of the *Sun* called on the occupants yesterday afternoon, and was entertained for nearly an hour with the explanations of and experiments made with the large piece of machinery by which the gentleman accomplishes his work. It is of the most complicated and delicate nature, and the amount of work done by it is marvelous. A description of it would be wearisome, with its systems of cogs, switches, wires, pens, etc., etc., and would be almost unintelligible, but an idea of its extraordinary work may be gained from the following summary of its accomplishments:

A band of plain paper, about twenty inches wide, is fed from a roll into the machine, passing under a complex set of everflowing pens. For every fifty feet of track passed over by the car this paper band moves one inch, thereby taking eight and a fraction feet for a mile of road. By carefully constructed and adjusted machinery, connected with the wheels of the car, the operator obtains upon the paper a perfect chart of every foot, yes, every inch, of the road. The instrument shows: first, the power required to draw the train; second, a pen marks on the paper the seconds of time in transit; third, another pen marks every tenth second in the same way; fourth, still another pen marks each minute. Then comes a schedule showing the distribution of coal used by the engine; the amount of water used by the engine; a perfect diagram of the track is delineated, showing all curves, grades, etc.; the number of revolutions which the driving wheels of the engine make in a minute or mile, or parts of these two; the location of the mile posts are shown, as also the bridges; the work done by the engine, so given that the foot-pounds of work can be readily ascertained by multiplying the ratios; the velocity and resistance of the wind. All these are plainly and accurately shown upon the diagram. When used to inspect the track, the machine shows the surface of each rail, giving the condition of each joint, frog, etc., and shows at a glance whether the rails are fitted perfectly true, or the least tittle out of place, or if one is a hair's breadth higher than another. The elevation of the rail on a curve is shown, and a machine has just been added, which Mr. Dudley invented, giving the exact amount in feet and inches that the rails are depressed from a true line. Another section of the chart gives the exact movements of the engineer when the brakes are applied, when steam is put on, and the power required to start and stop the train. Mr. Dudley examines a road in this way, hands his chart to the superintendent, and that gentleman knows at once just where to make repairs and all other needful particulars. The machine is the invention of Mr. Dudley, he having spent eight years perfecting it, and, save one which he made and sent to Australia, his is the only one in existence.

Besides this workroom there are a nicely furnished library and parlor, containing cabinets and a fine piano, a dining-room, kitchen, bedroom, and storeroom. All this is a common size passenger coach, and in it Mr. and Mrs. Dudley have lived for the last four years, traveling all over the United States. The lady says the life is a very pleasing one, and she enjoys it much. Both the lady and gentleman are finely educated and entertaining people, and an hour spent in their company is a very profitable one.—*Pittsfield (Mass.) Sun.*

MISCELLANEOUS INVENTIONS.

Mr. Theodule Michaut, of St. Paul, Minn., has patented an improved mill for grinding wheat, middlings, and other grains, so constructed as to produce more middlings and consequently more and better flour than mills constructed in the ordinary manner, which is so thoroughly ventilated that the surfaces do not become heated, which does not require frequent cracking and furrowing to keep it in order, and which may be run with a comparatively small amount of power.

Mr. Frederick Meyer, of Philadelphia, Pa., has patented an improved heat regulator for incubators for automatically controlling the temperature of incubating chambers. It is an improvement on a heat regulator patented by Mr. Meyer, April 29, 1879, which consisted in a lever or balance carrying a tube, with reservoirs at each end containing ether and mercury. The mercury being shifted by the expansion or contraction of the ether, the lever is thereby moved to open or close a damper. In the use of this invention it was found that high winds tended to drive a portion of the heat through the radiating tubes and thus raise the temperature of the water. The present improvement obviates this disadvantage.

Mr. Friedrich W. F. Kistner, of North Attleborough, Vt., has patented an improved bracelet, simply constructed, which locks itself automatically by means of a spring, and can be put on or taken off without requiring the hand to be passed through it. The bracelet is formed of a stiff hollow semicircular part, to the ends of which two hollow quadrants are pivoted in such manner that they can swing in a plane at right angles to the plane of the bracelet, these quadrants being drawn inward or closed, when released, by a torsion-spring wire passing through the rigid and hinged parts of the bracelet.

Mr. Frederic A. Lane, of New Haven, Conn., has patented a clock of more compact construction than those ordinarily used, the purpose being to reduce a clock to the smallest dimensions possible without the use of fine and complicated gearing.

Mr. Jepthah G. Dunlap, of Cedarville, Ohio, has invented an improvement in breech-loading firearms. A novel construction, arrangement, and operation of a bolt for locking the barrel in place, when the breech is closed, is supplied, and also devices for operating the bolt, together with means for preventing the accidental discharge of the gun before the barrel is locked in place, and preventing the accidental unshipping of the barrel from the stock.

Mr. Joel Heacock, of Marlborough, Ohio, has patented a portable fence constructed partly of wire, which is claimed to obviate the objections to portable fences constructed wholly of either material. The fence comprises enough wood to enable it to be seen and avoided by cattle even in the night time, and at the same time presents so little surface to the wind that it is not liable to be blown down.

Mr. John J. Angus, of Cascade, Wis., has patented a blind for windows in which the slats rest upon pins driven into the rabbet of the frame of the blind, and are held by pins driven into the blind rod, which is hinged to the cross pieces of the frame on the top and bottom, and the upper end of which fits into a recess in the upper cross piece of the blind. The slats are therefore devoid of tenons and are not attached to the central rod by staples as in ordinary blinds.

Mr. Alvin O. Hall, of Cincinnati, Ohio, has patented a game which requires the player to acquire a knowledge of the census reports and of the outlines of States and countries. One or two outline maps of a country or a number of States, and a series of blocks having the names of the corresponding States or countries or counties printed thereon, with another series of blocks having the number of inhabitants of each State, country, or county printed thereon, constitute the apparatus. The accurate placing of the blocks upon the outline map, with reference to the outline or to the population, constitutes the game, in which two players may join.

Mr. John S. Van Eps, of Mammoth City, Cal., has patented an improved adjustable standard or stake for wagons, cars, or sleds, which is designed to afford convenience in loading or unloading such vehicles. Instead of inserting the stake or standard in a mortise or socket, after the usual fashion, the standard is provided with a horizontal metal socket or thimble, into which the end of the bolster is fitted, and is provided with means for holding it in an inclined or vertical position as desired.

Mr. William W. Giles, of Chicago, Ill., has patented a velocipede which embodies various improvements on the class of such vehicles that embraces three or four wheels operated by the united action of the hands and feet.

Mr. Henry T. Case, of Green Spring, Ohio, has patented a middlings purifier. A cone-shaped or tapering reel is used in connection with a fan and feed rig. The stock is carried up the incline of the reel by a light draught of air from the head to the tail, or small portion of the reel.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

MATERIALS AND CONSTRUCTION. By Francis Campin, C.E. London: Crosby, Lockwood & Co.

The aim of the author has been to produce a brief yet comprehensive, theoretical, and practical treatise on the strains, designing, and erection of massive works of construction, and to do it thoroughly without introducing the higher branches of mathematical investigation. Great stress is laid upon simplicity of calculation, the work being specially designed for those who wish to master the subject for practical application and not as a mathematical exercise.

FOUR LECTURES ON STATIC ELECTRIC INDUCTION. By J. E. H. Gordon, B.A. New York: D. Van Nostraud.

These lectures, by the Assistant Secretary of the British Association, were delivered at the Royal Institution two years ago.

ELEMENTARY PROJECTION DRAWING. THEORY AND PRACTICE. By S. Edward Warren, C.E. New York: John Wiley & Sons.

The fifth edition of a text book of industrial science drawing which has been for many years a classic. Improvements have been introduced in each division, and an entirely new division, on the elements of machines, has been added.

MODERN ARCHITECTURAL DESIGNS AND DETAILS. New York: Bicknell & Comstock. Part 5. Plates 33–40.

The fifth part of this series of designs and details of low-priced dwellings is devoted to details of cornices, belt courses, etc., doors, windows, mantels, in wood, and other construction elements. Plate 38 gives a perspective view of a handsome suburban residence, with elevations, plans, etc. The publishers have prepared a portfolio which serves the present purpose of holding the loose sheets, and will answer also for a permanent cover when the series is completed.

A STUDY OF SAVAGE WEAPONS AT THE CENTENNIAL EXHIBITION. By Edward H. Knight. Washington: Government Printing Office. 1880.

This reprint from the Smithsonian annual report of 1879 puts in convenient form Mr. Knight's valuable study of the savage weapons exhibited at Philadelphia. The 144 engravings show the forms of two or three hundred primitive clubs, axes, knives and swords, spears, shields, bows and arrows, etc. The text describes the construction and modes of using not only the weapons figured, but a multitude of related forms.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) F. G. asks how to protect apple trees from the borer. A. In the first place, be careful to remove all sprouts, suckers, and grass from the roots of the tree. Secondly, keep the bark near the surface smooth and clean by frequent scouring or rubbing with the naked hand. This should be done at least once a week during the months of May and June. This will brush off the eggs. Another remedy, and perhaps a more effectual one, is to take one pint of sulphur, add to it one gallon of soft soap, and tobacco water sufficient to make it of the consistency of common paint. Apply it with a brush in May or June on the body of the tree at the surface, and two or three inches below.

(2) R. E. H. asks how to join lead plates. A. The edges are brought together, hammered down into a channel cut out of wood and secured with a few tacks. The hollow is then scraped clean with a scraper, rubbed over with tallow, and a stream of hot lead is poured into it, the surface being afterward smoothed with a hot plumber's iron.

(3) M. M. asks: 1. Can you give me the composition of the perfume known as West End? A. 1 pint of each of the following extracts: Cassie, violet, tuberose, and jasmine; esprit de rose, triple, 3 pints; extract of musk and of ambergris, each half a pint; otto of bergamot, 1 oz. 2. How is aromatic vinegar made? A. Concentrated acetic acid, 8 oz.; otto of English lavender, 2 drachms; otto of English rosemary, 1 drachm; otto of cloves, 1 drachm; otto of camphor, 1 oz. First dissolve the bruised camphor in the acetic acid, then add the perfumes; after remaining together for a few days, with occasional agitation, filter. Vinaigre a la rose is made by shaking together 1 oz. of concentrated acetic acid with half a drachm of otto of roses. All concentrated vinegars are used by pouring three or four drachms into an ornamental smelling bottle previously filled with crystals of sulphate of potash.

(4) E. C. H. writes: 1. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 133, a article on how to build a "working phonograph," will you please explain what is meant by the diaphragm being "damped by two or three pieces of elastic tubing?" Does it mean that short pieces of gum tubing or hose are cut off and fastened to the diaphragm; if so, what size hose and how thick cut the pieces? A. Any elastic pressure will answer to damp the diaphragm; all that is necessary is to make the damping adjustable, so that the pressure may be varied to secure the best effect. Pieces of elastic rubber tube are mentioned as being the most convenient, as pieces of various sizes may be used to vary the pressure. 2. What became of the large Corliss engine used at the Centennial? A. It is running the new Pullman car shops near Chicago.

(5) D. W. C. D. writes: I have a desire to learn to be a good engineer. Where and how shall I begin? A. You should make personal application to a good engine building shop as a first step, and afterward extend your experience.

(6) W. I. T. asks for a cement that will mend a broken oil stone. A. Dissolve isinglass in the smallest possible quantity of proof spirit by the aid of gentle heat (over a water bath). In two ounces of this dissolve 10 grains of gum ammoniacum; triturate to effect solution, then add half a drachm of gum mastic dissolved in 3 drachms of rectified spirit. Stir well and keep stoppered when not in use. Liquefy by gentle heat when required for use. Clean the stone with hot potash lye, rinse thoroughly, and dry before cementing.

(7) W. F. S. writes: A friend was telling me of some coke being dumped between two large walnut trees and left there for some time, causing the trees to die, and it affected other trees in the same way some 15 or 16 feet away. Have you ever heard of a similar circumstance? His theory was that the rain washed something out of the coke which affected the trees injuriously. A. The cause assigned may have been the correct one, as gas coke from the front of the retort and imperfectly exhausted sometimes retains various hydrocarbons which are very destructive to vegetation.

(8) E. W. S. asks. Is there any practical way of making animal fat soluble in water? A. A sufficient quantity of caustic potash or soda added to a hot mixture of grease and water renders the grease soluble by saponifying it.

(9) W. W. S. asks: 1. Can electric lighting be adapted to a single dwelling conveniently and profitably? A. No. 2. What kind of a telephonic arrangement would be best and cheapest for communication throughout a two or three story house, and could one be adapted to such use without a battery, and language be conveyed so that none could hear but the one at the instrument (receiving end of course); and could or would a switch fixture be possible or advantageous? A. Speaking tubes are cheaper than telephones, and are preferable for your purpose.

(10) W. McG. asks how to recover saltpeter from damaged gunpowder. A. Dissolve the powder in warm water, filter the solution through fine linen bags, and then evaporate the water by boiling until the solution is of sufficient strength to crystallize.

(11) W. R. M. asks how to oxidize silver plated articles. A. Dissolve sulphate of copper, 2 dwts.; nitrate of potash, 1 dwt.; muriate of ammonia, 2 dwts.; in a little acetic acid. Warm the article and apply the solution with a camel-hair pencil and expose to the fumes of sulphur in a closed box. Parts not to be colored must be coated with wax.

(12) C. D. asks how to draw in gold on japanned work. A. The ornaments are formed by a camel-hair pencil with japanner's gold size, made by boiling linseed oil with gum animi and a little vermilion. When the size is nearly dry, gold powder or gold leaf is applied. In all cases where gold is fixed on by means of linseed oil, it will bear being washed.

(13) H. & B. ask how to refill a mercurial barometer so as to avoid the presence of air in the top of the tube. The bottom of the tube dips in a small jar of mercury. A. Invert the tube, and place in it a small quantity of mercury, say enough to fill the tube for six inches, then carefully heat the tube until the mercury boils. Add more mercury and boil again, and so on until it is full, then invert it in the cistern. Great care should be taken to not inhale the fumes of the mercury. If the tube is perfectly clean and the mercury pure it generally answers well enough to pour the mercury into the tube and cause the air to escape by gently jarring it.

(14) C. P. says: I have some valuable papers which were so thoroughly baked in a fireproof safe as to fall to pieces upon handling, and wish to know if there is any method of restoring strength to the paper by saturation or otherwise. A. The most sucessful method that we call to mind is to coat the charred sheets with collodion.

(15) C. E. F. asks: 1. Will an intensity current induce a quantity current? For example, I send a battery current through the primary coil of an inductorium, and produce an induced current in the secondary coil. Now, if I send that current through the secondary coil of a precisely similar inductorium, will it induce a quantity current, like the original battery current, in the primary coil? A. No. 2. Is an induced current always of greater intensity and less quantity than the inducing current? A. Yes. 3. In the first case above, which current would overcome the most resistance in flowing through a circuit, the galvanic or the induced current? A. The induced. 4. Which would overcome the most resistance, the induced current in the secondary coil, or the "extra currents" in the primary coil? Supposing the "extra currents" and the galvanic current to meet the resistance, which would be stopped and which pass through the resistance? A. They are of much the same nature, and, under like conditions, we think there would be no difference. 5. Where can I purchase Faraday's 158 philosophical papers called "Experimental Researches on Electricity," and what is the cost? A. Write the industrial publishers who advertise in our columns. 6. Have you published an index to contents of SUPPLEMENT before the half year ending December 31, 1880? A. Yes. 7. The SUPPLEMENT is a very valuable paper, but the lack of an index has been a great drawback heretofore. In how many volumes back have they had the index? A. Every volume is indexed.

(16) J. G. writes: If a machine run at a speed of 50 revolutions, and then the speed is increased to 100, will it require twice the amount of power? Three-fourths of the power is consumed in friction. What proportion of power will it require to maintain the above speed? A. The power required to overcome the friction will increase as the speed; if the work done by the machine in a given time is doubled, the power must be doubled.

(17) W. T. D. writes: 1. I am making an induction coil (for shocking) according to directions in SUPPLEMENT, No. 160. My coil measures 4½ inches between the heads, with a center core of No. 18 iron wire five-eighths inch diameter. Primary coil consists of two layers of No 18 cotton covered and well insulated from each other. The secondary coil consists of 1,000 feet of No. 32 cotton covered copper wire well insulated from the primary coil, and with one Grove cell I do not get a current strong enough to feel above the elbows. The secondary was wound in a continuous coil from end to end, but has been unwound, and I will try winding in halves with an insulating medium in the center according to directions. Where is the fault with my coil—I do not use a condenser? A. Your secondary wire is too large and not long enough. Use No. 36 or No. 40, and double the length. It would be an improvement if you were to use three layers of primary wire instead of two. 2. How can I govern the current given out of this coil by sliding a cylinder over the coil? A. The cylinder is a simple brass cover sliding over the coil. You can make a greater variation by soldering together the iron wires of your core and allowing them to slide with the cylinder.

(18) M. C. writes: I have a house built on the bank of a small stream. The bank is about 30 feet high, and the house is distant from the water about 100 feet. I cannot easily get water by digging near the house. The soil is sandy. What would be the best, cheapest, and easiest way of getting the water from the stream to the house? If by damming the stream to 3 or 4 feet of a head could it be made to send the water that height by means of a small endless chain or copper wire carrying very small buckets? A. By damming the stream so as to get 4 to 6 feet head, you can use a hydraulic ram to elevate water to your house.

(19) Z. M. L. asks if there is any process of toughening pressed glass (say pieces 2 inches square, one-eighth inch thick) so that they would bend slightly and not break. Could they be colored black? A. We know of no satisfactory way of toughening the glass after pressing. The glass may be colored in the pot by introducing a suitable quantity of a soft glass highly charged with strongly calcined umber and reduced to powder. It may be superficially stained by coating the

surface with a mixture of 1 part highly calcined umber and 2 parts of borax ground to a fine powder, and then heating the glass in an oven until the coating becomes vitrified. Consult "A Treatise on the Origin, Progressive Improvement, and Present State of the Manufacture of Porcelain and Glass." Address the bookdealers who advertise in this paper.

(20) S. A. H. writes: I have for some time been using a gasoline gas machine which I have made, but I find it rather unsatisfactory, as the gas when burning in a close room gives an unpleasant odor causing headache. A. The cause of the bad odor is doubtless due to the supersaturation of the air with the vapor of gasoline, so that the combustion is imperfect, certain hydrocarbons mixed with much carbonic oxide escaping unconsumed. 2. I cannot get from a gallon of gasoline 88°, more than 100 feet of gas, or the equivalent in light of 100 feet of good coal gas. How much should I get from a gallon? A. About 118 feet under favorable circumstances. 3. My blower is of peculiar construction, and the air when entering it has to pass through a fine spray of water, and thus become saturated with watery vapor. May the odor not be caused by a partial decomposition of this vapor while passing through the flame? I am led to think so from the fact that during intense cold the gas burns without odor, in which case I think the watery vapor is retained in the pipes by freezing. A. The odor is not due to the water. See article on gas machines, page 1, vol. xliii.

(21) "Subscriber" asks: Can you tell of anything that can be worn or used to destroy body odors that daily bathing will not accomplish? Also a deodorizer for bedrooms and bedding? A. Add a little soda to the water used for bathing, and bathe frequently. Frequent changes of bed-linen and plenty of airing are the most practical means.

(22) W. S. asks for a method of hard soldering solid gold set rings such as amethyst, cameo, garnet, etc., which will not crack or change the color. Please let me know what mixture, or what would be best. A. Jeweler's solder with gold of a somewhat lower title than article to be soldered—borax, flux, and blow pipe, enveloping the other parts with tissue paper and whitening or plaster of Paris.

(23) A. M. G. asks for a receipt for making a blue colored fire, same as used in fireworks. I have tried receipts with only sulphur, nitrate of potassa, and antimony, but they are not satisfactory. I think that realgar (red arsenic) or orpiment (yellow arsenic) are used, but what proportions of each I do not know. Please give me some receipts which you may know to be good and not be very expensive. A. 1. (For theatrical fires, etc.)—Sulphur, sulphate of potassa, and ammonio-sulphate of copper, each 15 parts; niter, 27; chlorate of potassa, 28. 2. Sulphate of copper, 7 parts; sulphur, 24; chlorate of potassa, 69. 3. (For pyrotechnic mixtures)—Chloride of potash, 9 parts; sulphur and carbonate of copper, each 3 parts. 4. (For lances)—Chlorate of potassa, 6 parts; Chertier's copper, 1; calomel, 5; sugar, 4.

(24) E. F. H. asks for information as to curing, removal of fat, and the fishy odor of bird skins, especially salt water birds. I do a great deal of gunning, and should like to prepare some good skins. A. Scrape off as much of the flesh and fat as possible with a blunt knife, and immerse them for 48 hours or more in the following solution: Salt, 4 lb.; alum, 1 lb; water, just sufficient to dissolve. On removing wash in a weak solution of soda and water.

(25) H. M. P. asks: 1. How much power is required to drive the dynamo-electric machine described in No. 161 of the SCIENTIFIC AMERICAN SUPPLEMENT? A. About one-sixth of a horse power. One man power will drive it. 2. Will a piece of wrought iron pipe 8 inches in diameter do for the shell of a small boiler? What pressure would it stand? A. Yes; it would probably stand 300 lb. per square inch safely, but should be tested to 400 lb. before being put in use.

(26) E. E. T. asks: 1. Could I obtain good results by constructing a dynamo-electric machine with electro-magnets consisting of a piece of gas pipe (wrought iron) of extra thickness, split lengthwise so as to form the two poles, and wound circumferentially with wire? Also, would the armature made of a cross-shaped section be any better than if made according to Dr. Siemens' plan? I constructed a machine, as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, and am much pleased with it. A. A dynamo machine constructed according to your plan would prove a failure. 2. I am working in a sugar house with a view of learning the business. Do you consider the analysis of sugar a special branch of chemistry, and how long would it take a man of average intelligence to learn it? A. Yes. To become expert in the use of the saccharometer under favorable circumstances does not require many weeks' study. To become thoroughly acquainted with sugar chemistry may require a year of application. 3. Will sponge platinum become luminous in ordinary coal gas? A. Yes, when freshly prepared. 4. In making phosphorescent sulphides, as described in SCIENTIFIC AMERICAN of February 5, 1881, is it necessary to heat red hot? A. Yes.

(27) W. T. asks: 1. What is meant by electroplaters' machines, and is any apparatus necessary for silver plating besides Bunsen's battery? A. Dynamo-machines, used in large electroplating establishments in place of batteries. 2. Can I obtain any publication with the latest methods for electroplating? A. See pp. 81, 116, 3, and 33 current volume, and 153, vol. xliii., SCIENTIFIC AMERICAN. 3. How is aqua-ammonia, as sold in the drug stores, prepared, and can I prepare it for my own use and how? A. Usually by decomposing the ammonia salts such as the chloride (sal-ammoniac) by means of lime, with the aid of heat, and passing the ammonia (gas) evolved into water which absorbs it and becomes aqua-ammonia (ammonia water).

(28) W. C. asks for a receipt for a good black polish for leather suitable for cartridge boxes and belts. I want a polish that will not wash off, and make a good appearance at inspection. A. Shellac, 12 parts; white turpentine, 5; gum sandarac, 2; lampblack, 1; spirit of turpentine, 4; alcohol, 96. Stir and digest in a covered vessel until solution is complete. 2. What is the cause of center punches and cold chisels becoming magnetized when used for a short time? I think it is caused from the friction of the center punch on the iron. A. The magnetism is derived by induction from the earth. Articles of steel when held in certain positions and repeatedly struck become magnetic.

(29) D. A. S. asks: Is there any known substance that, if placed between a magnet and steel, will prevent attraction? A. No.

(30) C. M. E. asks: 1. To what height will an ordinary steam suction pump lift (not force) water and work successfully? A. About 26 feet. 2. In ascertaining such height in the winter, when the river is frozen over, would you measure from the top or under side of the ice? A. Underside.

(31) J. R. K. writes: In your January number of SCIENTIFIC AMERICAN, in answer to J. R. S. No. 35, you give following receipt for making those pads, etc.: "Water, 130 parts; sulphate of baryta, 75 parts; sugar, 20 parts; gelatine, 30 parts; glycerine, 180 parts." Wanting one of the articles badly, I took your paper to a chemist in this city, to have the articles prepared, and he informed me that sulphate of baryta was insoluble in water, and he advised me to send East (there being none of the article in this town) for a pound of sulphide of barium. Will you in next issue of your paper let me know about correctness of the above, also whether sulphide of barium will answer for sulphate of baryta, as stated in receipt? A. The sulphate of baryta is simply mixed, not dissolved; it gives consistence and color to the composition. The sulphide cannot be used instead.

(32) G. A. N. asks: What is the best way to remove white paint from the surface of white pine house stair steps? A. Moisten the paint well with naphtha or good benzole, repeating as often as necessary. As soon as the paint becomes soft remove by means of a rag, aided by a scratch knife and stiff brush, moistened with the naphtha or benzole. A strong aqueous solution of caustic potash is sometimes used to destroy such paint, but it is apt to stain the wood or unfit its surface for receiving a fresh coat at once.

COMMUNICATIONS RECEIVED.

On a Meteor. By C. P. K.
On Extraordinary Parhelia of the Sun and Venus.
On Remarkable Parhelia. By M. B.

[OFFICIAL.]

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Letters Patent of the United States were Granted in the Week Ending

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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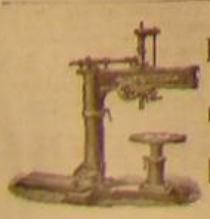

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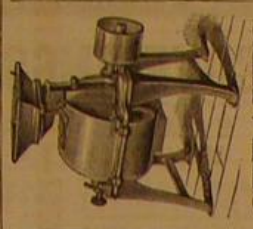

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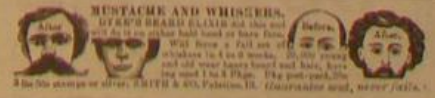

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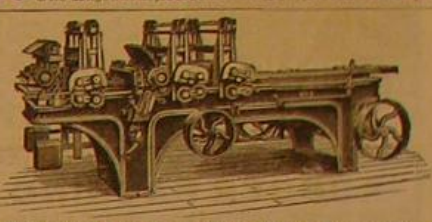

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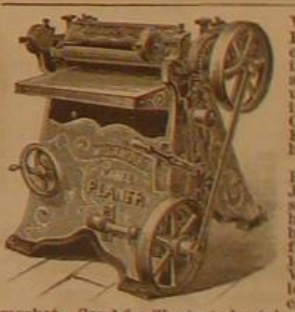

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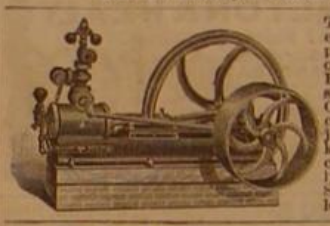

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Vol. XLIV.—No. 11. [NEW SERIES.] NEW YORK, MARCH 12, 1881. $3.20 per Annum. [POSTAGE PREPAID.

GARBAGE DESTRUCTOR AND CARBONIZER.

The matter of disposing of garbage and various kinds of refuse, in our large cities, is becoming a serious one, and is beginning to receive the attention its importance demands. Some experiments have been tried in this direction in the city of New York, in Chicago, and elsewhere in this country, but with indifferent success.

In England, however, the case is different, a number of furnaces for this purpose being in successful operation, consuming all refuse without nuisance. The furnaces were designed by Mr. Fryer, of Nottingham, and are thus described in an address delivered by Mr. Alfred W. Morant to the Association of Municipal and Sanitary Engineers, and published in the *Engineering*:

The destructor consists of six compartments or cells, formed of brickwork lined with firebricks, and tied with iron rods; it occupies a space of 22 feet by 24 feet, and 12 feet in height, and is so arranged that there is an inclined road leading to a platform over the top of it, on to which the refuse is carted; and there is also another incline from the level of the firing floor to the adjoining road, by means of which the mortar, charcoal, old iron, and other matters which resist the action of the fire, are carted away.

Each of the six cells is capable of destroying 7 tons of refuse in 24 hours, and consists of a sloping furnace with hearth and fire grate covered in by a reverberatory arch of firebrick, with one opening for the admission of the refuse, another for the gases to escape into the flue, and a furnace frame and doors for the withdrawal of the clinkers. The brick arch above concentrating the radiant heat upon it. The opening for the entry of refuse is divided from the opening for exit of gases by a wall, a bridge preventing the refuse, which is heaped up immediately below, from finding its way into the flue also. At intervals of about two hours the clinkers are withdrawn through the furnace doors, and a further charge of refuse shoveled in at the top. The result of the process is that everything is consumed, or converted either into clinkers or a fine ash. Every two cells are also provided with an opening for the introduction of infected mattresses, diseased meat, etc., on to the fire, where everything is readily consumed without causing a smell.

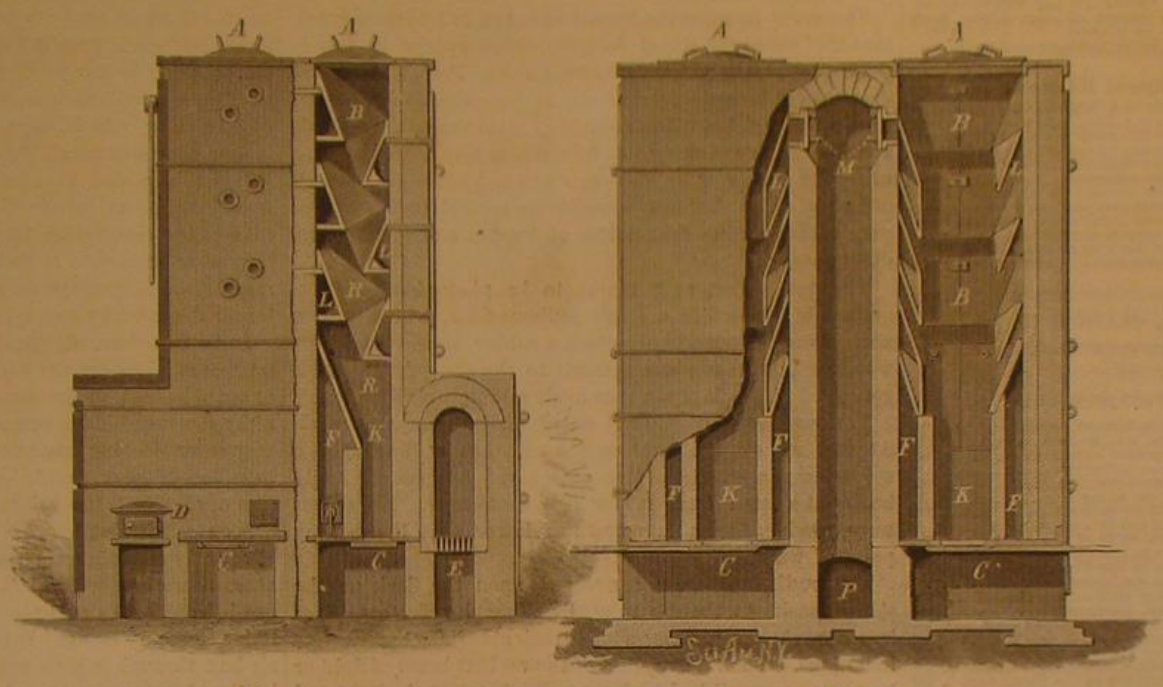

Fig. 1. Fig. 2.

CARBONIZER FURNACE.

FIGS. 1 AND 2.—A, feeding hole, with covers; B, cast iron plates; C, discharge door; D, fire door; E, fire grate; F, F, F, flues; K, hot chamber; L, flue behind cast iron plates; M, damper; P, flue to chimney.

The gases from the furnaces on the way to the chimney shaft pass through a multitubular boiler, 6 feet in diameter, 10 feet in length, and make steam to drive a horizontal engine with 12 inches cylinder and 2 feet stroke, which works the two mortar mills with pans 8 feet in diameter. In these the clinkers made in the destructor are mixed with lime, and ground into an exceedingly strong mortar, which is readily sold at 5s. per load. No fuel of any kind is required, the ashes mixed with the refuse being amply sufficient. The old tins and iron which have passed through the furnace are sold for old metal. During the year 1879 the following quanti-

[*Continued on page* 165.]

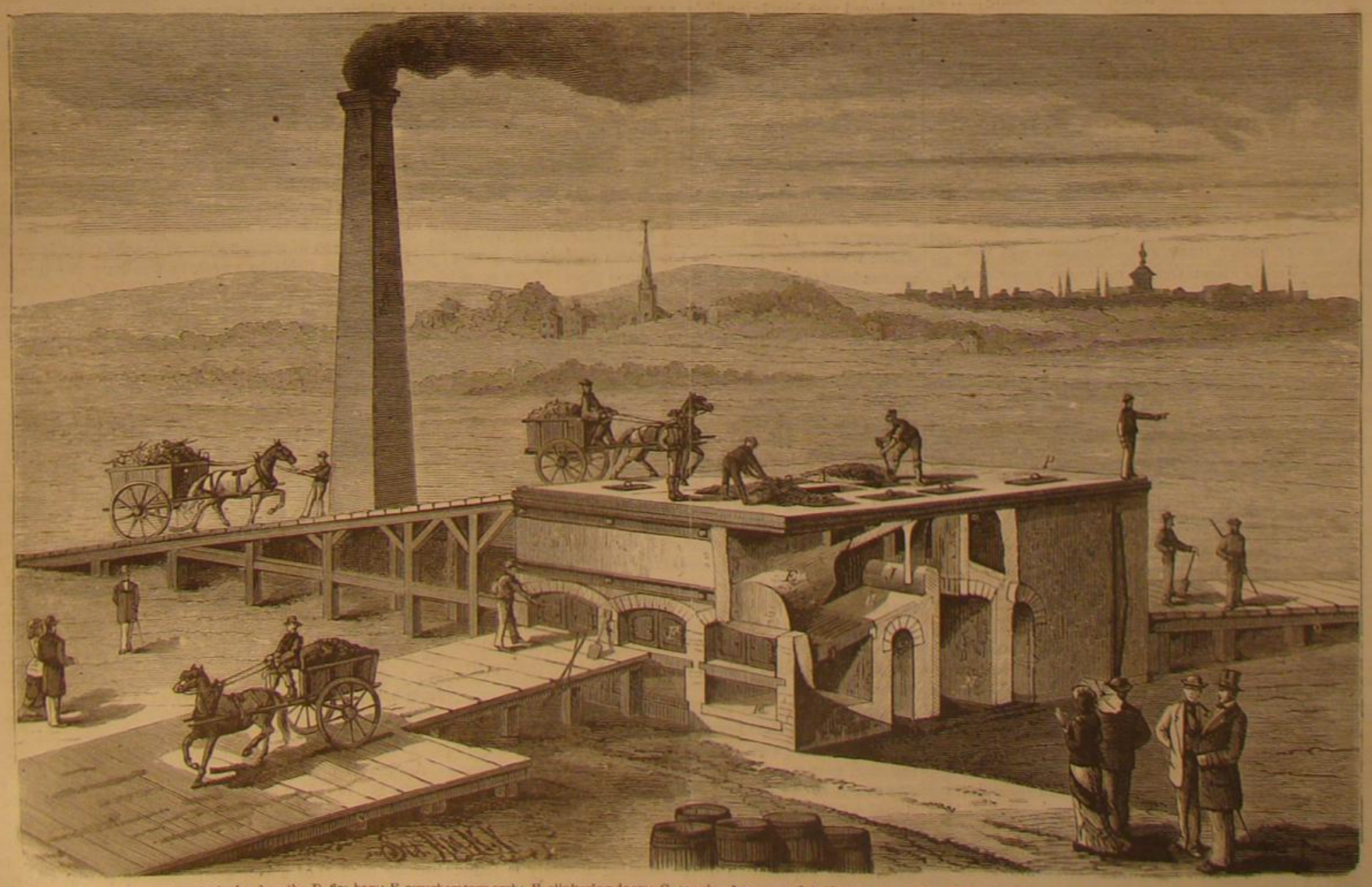

FIG. 3.—A, refuse feed opening; C, drying hearth; D, fire bars; E, reverberatory arch; F, clinkering doors; G, opening for gases; J, bridge to keep refuse out of the flue; M, ash pits; N, flue to chimney; P, mattress opening.

Fig. 3. FURNACES FOR TREATING GARBAGE AND OTHER REFUSE MATTERS.

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NEW YORK, SATURDAY, MARCH 12, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 271.

For the Week ending March 12, 1881.

Price 10 cents. For sale by all newsdealers.

THE SOUNDS OF VAPORS AND GASES.—THE PHOTOPHONE AS AN INSTRUMENT OF PHYSICAL INVESTIGATION.

Mr. Graham Bell's recent discovery, that musical sounds are produced when an intermittent beam of light falls upon a solid, at once suggested to Prof. Tyndall the idea of testing by the same means the relative capacity of gases and vapors to absorb radiant energy.

The theory is that the sounds observed by Mr. Bell are caused by rapid changes of temperature in the body impinged upon by the light, such variations of temperature producing changes of shape and volume, giving rise to sound waves.

From the superior mobility of gases and vapors, Prof. Tyndall reasoned that the absorption of radiant energy by them would in like manner produce sounds, and louder sounds than are possible with solids. He reasoned further, that the loudness of the sounds would furnish an unmistakable measure of the relative capacity of gases to absorb radiant heat or light; and, if so, the photophonic method of investigating such substances would be likely to afford a satisfactory solution to certain experimental problems hitherto involving such delicate and difficult tests that competent observers have not been able to agree upon the interpretation of the results indicated.

The event justified the hypothesis; and in two recent communications to the Royal Society, which appear in full in the SCIENTIFIC AMERICAN SUPPLEMENT, Prof. Tyndall has described at length several series of investigations, opening up a novel and beautiful method of experimental research, and not only confirming in a remarkable way the correctness of results arrived at by him years ago by less simple methods of investigation, but also clearing up several points of dispute with regard to the relation of vapors and gases to radiant energy.

The gas, vapor, or perfume to be photophonically examined is inclosed in a small bulbous flask, with a narrow neck, from the outside of which a rubber tube with a boxwood or ivory ear piece extends to the ear. Any sounds generated in the flask are thus made minutely audible.

Various sources of radiant energy have been employed. At first an electric light was used, then a lime light, a spirit lamp, a candle, a live coal, a red hot poker, finally bodies at a lower temperature than a red heat. No effects were produced with temperatures lower than the boiling point of water.

The radiations were converged upon the flask on the side opposite to the ear tube, by silvered reflectors, glass lenses proving unsuitable owing to their absorbing the effective radiations. The interruption of the radiant beam of light or heat was accomplished by interposing between the light and the flask a disk of sheet zinc carrying radial slits or teeth with interspaces. When revolved in the beam the disk interrupted the radiations at any rate that might be desired, converting any sound produced into a musical tone.

At first vapors known to be highly absorbent of radiant energy were tested—sulphuric ether, formic ether, acetic ether, etc.—a loud musical tone being obtained. When the flask was filled with the vapor of chloroform, or bisulphide of carbon, and placed in the intermittent beam, the sound produced was barely audible, as was anticipated from the known feebleness of the absorptive power of these vapors. With other vapors, whose behavior toward radiant energy had been previously established, the musical tone produced corresponded in loudness to the ability of the vapor to absorb radiant heat.

The investigation was then carried to gases and vapors whose absorptive power is in dispute. Dry air emitted a note that could be heard only with close attention. Dry oxygen and dry hydrogen behaved like dry air. Carbonic acid gas gave a louder note than was obtained with any elementary gas. A still louder note was produced with nitrous oxide, while under favorable conditions olefiant gas gave a note as loud as that of an ordinary organ pipe. Water vapor, whose deportment toward radiant energy as determined by Prof. Tyndall's earlier experiments had been strenuously disputed, testified in his behalf with a voice distinctly audible.

The next step was to determine beyond question what portion of the intermittent beam—the luminous or the dark rays—produced the sounds. Among the many test experiments was this: a liquid layer of formic ether, sulphuric ether, or acetic ether, one-eighth of an inch thick, was placed in the path of the interrupted beam. The musical sound was stilled. As these liquids are transparent to light it was inferred that the sound-producing rays which they intercepted must have been those of obscure heat. The correctness of this inference was strongly sustained by the result of another test in which the light was cut off and the invisible rays allowed practically free transmission. This was accomplished by interposing a thick layer of bisulphide of carbon rendered opaque by dissolved iodine, under which conditions there was hardly any diminution of the sounds of the more active vapors.

Equally curious and significant were the results obtained when the intermittent beam was converged upon bulbs containing colored gases. The brown vapor of bromine, for instance, gave a somewhat forcible sound, though its capacity to absorb radiant heat is low. Indeed the tones continued when the heat radiations had been entirely cut off, and were stilled when the luminous rays were shut off leaving the obscure radiations an uninterrupted passage to the flask. The explanation of the seeming anomaly is found in the capacity of the brown vapor to arrest the rays of light and convert its motion into that of heat.

With a very rude photophonic arrangement Prof. Tyndall has been able to hear the sounds of the more active vapors at a distance of one hundred feet from the source of the interrupted rays. He is confident that the vapors of all compound liquids will be found sonorous in the intermittent beam, and thinks it probable that even the vapors of elementary bodies, including the elementary gases, when more strictly examined, will be found capable of producing sounds.

It may be that, in connection with the electric sonometer, the photophonic method of investigation will ultimately give us also a new, simple, and efficient method of chemical analysis, as far reaching in its results as spectrum analysis has proved. At any rate it is a valuable addition to the outfit of the physical investigator.

MIDWINTER MALARIA.

From some cause or combination of causes the present winter has been remarkable for a widely extended and marked increase in diphtheria and scarlet fever, which have invaded homes in which the highest attainable skill has been exercised and the most approved appliances have been employed to render them as healthy as possible. In some cases the immediate causes of these disorders are undiscoverable, but in the light of sanitary science the class of agents which either initiate or greatly increase the virulence of these complaints is no longer problematical. Decaying organic matters, more particularly animal excretions, give rise to a subtle blood poison, which, though it yet evades chemical analysis, is now conceded on all hands to be a positive deadly fact. When this poison invades a dwelling, no matter whether from exterior or interior sources, in sufficient quantity, the lives of the inmates are jeopardized as positively as though they were compelled to breathe a mephitic gas. The effect may not be so prompt or fatal, but the danger is a fact no longer disputed by any intelligent physician.

It is, therefore, not sufficient to guard against interior sources of diseases; the peril may be in a neighbor's house or outbuildings, in the emanations of a compost heap or a filthy street or hidden cesspool, which if they find an avenue may enter sleeping apartments, find a *nidus* in clothing, carpets, and drapery, and bring in their train the swift destruction of all that is most cherished.

A case in point has occurred in a neighboring village. Five cases of diphtheria appeared in a household where the utmost care had been taken with the plumbing. The obvious inference was that the causes of the complaint were exterior to the dwelling. It was found that the mouth of the air-box through which exterior air entered to supply the heating furnaces was on a level with the top of a cemented pit on the adjoining premises, in which accumulations of kitchen refuse, animal and vegetable, and barn manure were promiscuously stored and allowed to rot for fertilizing purposes. The foul air from this pit was drawn into the house through this one avenue, and the poisoning of its unfortunate inhabitants, four of whom died in quick succession, was the result. It seems that disease may pervade a house with deadly result where the cause is least suspected; it therefore devolves upon every housekeeper, whether resident of the city, village, or on a farm, to be constantly watchful, not only of his own, but also of his neighbor's premises, that none of the obvious causes of disease be permitted.

RICE CULTURE IN THE SOUTHWEST.

Before the war our rice crop came chiefly from the Carolinas. During the past ten years the rice industry has been extended to Louisiana, where over 50,000 acres are now devoted to it, and the annual crop of the country has been doubled. In the meantime great improvements have been made in the methods of thrashing and cleaning the grain by the introduction of machinery. When the grain is cut it is stacked in the fields to sweat, to facilitate the thrashing, after which the rice is sent to special mills for hulling and polishing. There are seven mills of this sort which have been built in New Orleans during the past decade. Each mill employs from twenty to forty hands, and all are busy. The rough rice is received in large bins, from which it is taken by elevators to the upper floor, where it is winnowed and sifted to remove sticks and rubbish. To remove the beard the rice is passed through a revolving "hoodlum," from which it is carried to the "stones," which crack off the hulls. Then the dark-colored grains are polished for market. The polisher consists of sheepskin, tanned, stretched over sheep wool on revolving cylinders, the space between the sheepskins and wire gauze being just sufficient to allow the rice grains to find their way by degrees to the bottom. The grains are highly polished by the friction against the skins, which rubs off the bran and leaves the grain clean and white. The bran amounts to eight barrels for every hundred barrels of clean rice. It is sometimes used to adulterate spices. The waste in hulling averages about 5 or 6 per cent, but sometimes reaches 20 per cent. The hullers receive from half a cent to three-quarters of a cent per pound for hulling.

Dangers of Aniline Reds.

A number of the aniline colors, especially the red pigments, are, in the course of their manufacture, oxidized by the use of arsenical acid, and some of the arsenic is retained in the finished coloring matter. When such colors are used for dyeing, for wall papers, for artificial flowers, etc., they become carriers of a dangerous poison, whereby sickness and suffering are extensively occasioned. The only real safety is in the use of good cochineal for red colors.

COMPRESSED LIGNITE AS FUEL.

An important, if not a vital, question in Texas, especially with respect to the industrial development of the State, is how to utilize the extensive beds of lignite which abound there. Indeed, in the lack of true coal, the State can hardly accomplish much in the manufacturing line without first solving this problem.

We are informed that Mr E. T. Dumble, of Houston, has devised a process of coking the lignite, which works well on a small scale and is likely to prove valuable in larger operations, particularly in smelting iron, there being an abundance of iron ore in the neighborhood of the lignite deposits. For other than smelting purposes, however, it is desirable to retain in the fuel the volatile fuel elements which are wasted in coking, and which amount to about two-fifths of the total weight of the lignite.

A sample of this fossil fuel, from a seam ten feet thick, in Robertson County, Texas, may be taken as a representative specimen. Analyzed by Prof. E. T. Cox, of the Indiana Geological Survey, it showed—fixed carbon, 45 per cent; gas, 39½ per cent; water, 11 per cent; white ash, 4½ per cent. It furnished nearly 50 per cent of lusterless coke, closely resembling wood charcoal. As taken from the bed the lignite is dull brown in color, and is apt to shrink, crack, and fall to pieces on exposure to the air, a property unfitting it for transportation.

Judging from the success achieved in New England in compressing peat, and in Pennsylvania in compacting coal dust by pressure, Mr. N. A. Taylor, of Palestine, Texas, is confident that by similar mechanical treatment the soft and watery lignite might be converted into a fuel that would rival cannel coal. The solidity and high specific gravity of true coal being due to the pressure to which it has been subjected by overlying rocks, mechanical pressure, he argues, would do the same for lignite. Such pressure would expel the water, and by compacting the fuel would make it more durable in combustion and add greatly to its heating power. "Nature does it: why can't we?"

It is purely a question of economy of power. If the lignite can be squeezed into true coal, or something like it, for less than it will cost to bring coal from the coal fields of the north, the advantage to Texas will be obvious and great. As the lignite beds are easily accessible, and can probably be made to furnish the power required for converting the lignite into a more useful fuel, there would seem to be no theoretical obstacle to the accomplishment of the end at which Mr. Taylor aims. At any rate it is a good opening for invention, and one that Texan inventors will probably follow to profitable solution as soon as they discover its importance. And the value of a successful process of compacting lignite so as to fit it for transportation and the ordinary uses of soft coal would not be confined to Texas. There are in many parts of the West, and in other countries, extensive beds of lignite, the utility of which would be vastly increased by the invention called for by Mr. Taylor.

SMOKELESS FUEL FROM COAL.

Mr. W. D. Scott-Moncrieff, in a paper read before the Society of Arts, has recently brought to the attention of that body an important project for not only hereafter preventing, but also for rendering commercially available the dense stratum of smoke that has so long hung like a pall over the city of London, obscuring the light and rendering the atmosphere dangerous to the whole community. He proposes to substitute for the bituminous coal now in universal use for domestic and industrial purposes, a modified form of this coal from which the gas has been partially extracted. Experiments made by him as long as ten years ago showed that a semi-coke, resulting from a short distillation of coal, furnishes a fuel that is practically smokeless; and he has since discovered that, by treating this coke with water when hot, renders it still more smokeless and makes it the most perfect fuel imaginable, as it has all the cheerfulness and heat-giving properties of the unprepared coal with none of the disadvantages arising from its use. To produce this fuel in quantities suitable for public use he proposes to take advantage of the existing plant of the gas companies, finding that they are amply sufficient for the purpose. Instead of taking 10,000 cubic feet of gas per ton from the coal, he would take 3,333 cubic feet, or any other convenient proportion, and pass three times the quantity through the retorts. In this manner the gas would be coming away from the retorts all day long, just as formerly, with a slight loss of time to be allowed for the additional frequency of the charging. The supply at the end of the twenty-four hours would be in excess of that which is obtained from the long extraction, and in this way less and not more plant would be necessary to give the same quantity in a given time, while the gas itself would be of better quality. The author claims, from his investigations and experiments, that the results of the application of his scheme would prove startling. The gas companies would have double the quantity of by-products, in the shape of tar and ammoniacal products, that they have at present; the community would have 24-candle instead of 16-candle gas; the fuel resulting from the process would be of a nature to ignite readily, make a cheerful fire that gives out 20 per cent more heat than common coal; and London would become a smokeless city. The only extra expense to the companies would be that of the additional workmen employed in charging the retorts and interest upon the additional capital required for transit appliances; but, as an offset, the companies would receive an increased quantity of valuable by-products and a supply of fuel that would be in universal demand; and the profits from the sale of this at prices much below that of coal would be such that the companies would be actually getting their coal for nothing.

THE SILK INDUSTRY OF THE UNITED STATES.

The preliminary report of Mr. Wm. C. Wyckoff, Special Census Agent on Silk Manufacture, shows that this industry gives employment to something over 34,400 hands, and that the finished goods turned out are worth about $34,400,000, or a thousand dollars net to each worker.

The product of the census year ending June 30, 1880, is divided as follows:

Sewing silk	$776,120
Machine twist	6,000,265
Floss silk	219,250
Dress goods	4,115,305
Satins	1,101,875
Tie silks and scarfs	606,675
Millinery silks	891,955
Other broad goods	627,595
Handkerchiefs	3,862,550
Ribbons	5,955,005
Laces	437,000
Braids and bindings	999,685
Fringes and dress trimmings	4,950,275
Cords, tassels, passementeries, and millinery trimmings	1,866,575
Upholstery and military trimmings	1,302,355
Coach laces and carriage trimmings	37,510
Undertakers', hatters', and fur trimmings	59,805
Mixed goods and silk values therein	510,763

Reports were received from 383 factories, with 8,467 looms, representing an investment of $18,899,500. Connecticut has 28 factories; Massachusetts, 22; Pennsylvania, 49; New Jersey, 108; and New York, 150. The Connecticut factories give employment to 3,766 hands; those of Massachusetts to 2,068; Pennsylvania, 3,360; New Jersey, 13,932; New York, 10,484. The chief centers of the silk industry are Hartford County, Conn., with 549 looms; Hudson County, N. J., with 1,060 looms; Passaic County, N. J., with 3,238 looms; New York city, 1,820 looms; Philadelphia, Pa., 769. Nearly half the silk operatives are women. The wages paid during the census year footed up $9,107,853, of which Paterson, N. J., had $3,335,045, and New York city, $2,196,660. The gross value of materials and supplies was $22,371,300, and the gross value of manufactured product was $40,975,285, which includes the returns from those who do not make finished goods—throwsters, makers of fringe silks, spoolers, winders, dyers, etc.

SUPPRESSION OF ONE CLASS OF INTERFERENCES.

An important modification of the practice of the Patent Office in the matter of trade mark interferences has been ordered by the Secretary of the Interior.

Since the decision of the Supreme Court affirming the unconstitutionality of the United States statutes relating to trade marks, the Office has continued to register the applications of such persons only as, with knowledge of the decision, voluntarily paid the fee previously required. The Office has also continued the practice of deciding between conflicting or interfering applications for certificates of registration.

This practice is now discontinued, the Secretary of the Interior having decided, in the case of Braun & Co. vs. Blackwell, that it is not within the province of the Commissioner to decide questions of priority of right between applicants or those who have already received certificates of registration. All interferences pending in trade mark cases have accordingly been dissolved. Hereafter, on receipt of an application for the registration of a trade mark, notice will be given the applicant of the decision of the Supreme Court, as heretofore, and if the applicant still desires registration, and the matter is proper therefor, the application will be considered without reference to any pending application or to any registered trade mark.

Thus the function of the Patent Office in relation to trade marks becomes purely one of registration and certification. The question as to the applicant's legal claim to the mark so registered is left for decision where it properly belongs, that is, with the courts, to which appeal must ultimately be made in case of dispute.

It may be seriously questioned whether the function of the Office with respect to patent rights should not be similarly limited. With its present force and the vast multitude of applications to be considered it is physically and morally impossible for the Office to give more than a few minutes, on the average, to the determination of the questions of originality, novelty, and the rest. For this reason not only are improper applications granted—the existing practice of the Office only being considered—but worse, really proper and deserving applications are denied. And yet, after all, the property right of the patentee must be passed upon by the courts before it has more than a presumptive value.

To the popular mind the possession of letters patent bearing the broad seal of the United States, is a guarantee that the owner's right to the invention claimed has been officially examined and decision rendered in his favor; and on this presumption not a little money has been paid for patents which could not stand legal investigation. The knowledge that the Patent Office simply registered and certified claims to property rights, leaving them, as in the case of trade marks, to be adjudicated by the courts, would in no wise lessen the legal value of letters patent, while it would greatly simplify and expedite the work of the Office, and at the same time put an end to a vast amount of expensive and vexatious litigation, which, even when successful, merely establishes a claim.

For when an inventor has been subjected to a costly trial to prove his freedom from interference, and has obtained the patent applied for, he has gained nothing which the Patent Office could not justly have given him at the outset, namely, a certificate that he claims the invention described. The decision of the Commissioner that there is no interference is worth nothing in the courts if the claim is contested there. The entire case must be retried on its merits.

The simple and efficient working of the law with respect to copyright should relieve any apprehension that may exist as to a possible injury to patent rights in case the suggested change in the practice of the Patent Office should be made.

The value of copyright property is very great; yet the litigation with respect to copyrights is relatively small, though the government entertains registers and certifies claims to copyright, as it hereafter will trade-mark claims, without pretending to determine their legitimacy. That is the business of the courts. And the courts would probably have fewer patent cases to try if it were generally understood that the decision of the Patent Office in granting letters patent gives only a presumptive title to the invention claimed, and that the proper function of the office is clerical rather than judicial.

Failure of Another Railway Viaduct.

Following the destruction of the Tay bridge now comes intelligence of the destruction, on Feb. 6, by ice, of a section of the Solway Viaduct, the most important part of the Solway Junction Railway, and until this week, a connecting link between England and Scotland. In former years the thaw has been accompanied by high winds, breaking up the ice and saving the Viaduct; but this season no wind has arisen, and the packs have been carried down in unbroken masses, hurling themselves against the piers, carrying everything before them. The accident has been unattended by any loss of life, owing to the vigilance of the railway authorities, who had watchmen stationed, who gave timely warning.

The structure is very similar to the Tay bridge in construction and size. The viaduct is about a mile and a quarter in length, and about 40 ft. in height; the spans are in groups of seventeen of 30 ft., each group being connected by a span of 5 ft.

Some idea of the force of the floating ice may be formed from the narrative of the fishermen, that for some days the channel was covered with fields of ice acres in extent from 6 ft. to 12 ft. in thickness. The crashing of the ice as it swept along, borne by the current at the rate of twelve knots an hour, was heard two or three miles off, they said, and even half a mile away from the viaduct the noise was audible, although the wind was blowing in the opposite direction.

A New Electrical Society.

A new organization styled the New York Electrical Society has lately been organized in this city, having for its object the advancement of the knowledge and uses of electricity.

The following officers were elected for the ensuing year: President, F. W. Jones; vice-presidents, George B. Scott, Professor Vander Weyde, Gerritt Smith, W. J. Dealey, George A. Hamilton, and G. G. Ward; secretary, John W. Moreland; treasurer, M. Brick. The membership is already quite large and comprises many of the foremost electricians residing in this vicinity.

A Meteoric Stone.

A meteoric stone fell at Wiener Neustadt, a few days ago, near the telegraph office, and penetrated deeply into the gravel-covered road. The phenomenon was witnessed by several persons, who all declare that the meteor showed a brilliant light. Upon inspection a triangular hole was discovered of five centimeters width; the ground was frozen at the time. The meteoric stone was excavated in the presence of Dr. Schober, director of the Wiener Neustadt High School. It weighs 375 grammes, is triangular in shape, its exterior is crystalline, with curious blackish, grayish, and yellow reddish patches. Here and there metallic parts give a brilliant luster. Its specific weight is very high, its hardness about 9. An analysis is now being made.

Fifteen Hundred Miles a Minute.

The cable message to Australia respecting the Hanlan-Trickett match was an extraordinary achievement in telegraphy—in fact, it has never been excelled. The total extent of lines—namely, 12,000 miles—was traveled in one hour and twenty minutes. The greater portion of this time was occupied in transmitting the message through India. From Singapore to Sydney, 5,070 miles, the message occupied only thirty-five seconds in transmission. This message was repeated fourteen times, from station to station, between London and Sydney.—*Sydney Mail.*

The American Institute of Mining Engineers.

The annual meeting of the American Institute of Mining Engineers was held in Philadelphia the third week in February. The attendance was unusually large, and many important papers were read and discussed. The following officers were elected:

President: William Metcalf, Pittsburg, Pa. Vice-Presidents: J. P. Kimball, Bethlehem, Pa.; W. H. Pettee, Ann Arbor, Mich.; C. O. Thompson, Worcester, Mass. Managers: J. S. Alexander, Philadelphia; H. S. Munroe, New York; J. C. F. Randolph, New York. Treasurer: Theodore D. Rand, Philadelphia. Secretary: Thomas M. Drown, Easton, Pa.

It is probable that the next meeting of the Institute will be held at Staunton, Va., in June next.

NEW INVENTIONS.

Mr. George T. Manley, of Canton, N. Y., has patented a vessel for containing viscous substances, simply constructed and so arranged that any desired quantity can be drawn off conveniently without opening the lid of the can, and which also prevents the formation of a skin or crust on the top of the substance, and excludes dirt therefrom. The can has a delivery aperture at its lower part which is closed by a slide or gate. A follower or piston is placed in the upper part of the can, and a rod passing therefrom through the lid is provided with a knob. The slide being opened, pressure on the knob causes the viscous substance to flow out. The can is well adapted to holding printer's ink and analogous substances or mixtures.

Mr. Charles de Vauréal, of Paris, France, has patented a process for extracting gold and silver from their ores, more especially ores containing sulphur, arsenic, and antimony, by which the extraction can be performed at low cost, and the difficulties heretofore pertaining to the reduction of this class of ores are claimed to be so far overcome that the quantities of gold and silver extracted are equal to, or even greater than, those obtained by fire assay. The arsenic is first eliminated by treating the ore at a dull red heat with hydrogen. The ore is next roasted to oxidize the copper, which is removed by sulphuric acid. Lastly, the antimony is removed in the form of a chloride by the action of hydrochloric acid.

Mr. William W. Mallory, of Holland Patent, N. Y., has patented a hand force pump for sprinkling plants, washing windows and carriages, and other uses, and so constructed that it carries the overflow back to the reservoir. It is a very simple, ingenious, and convenient device.

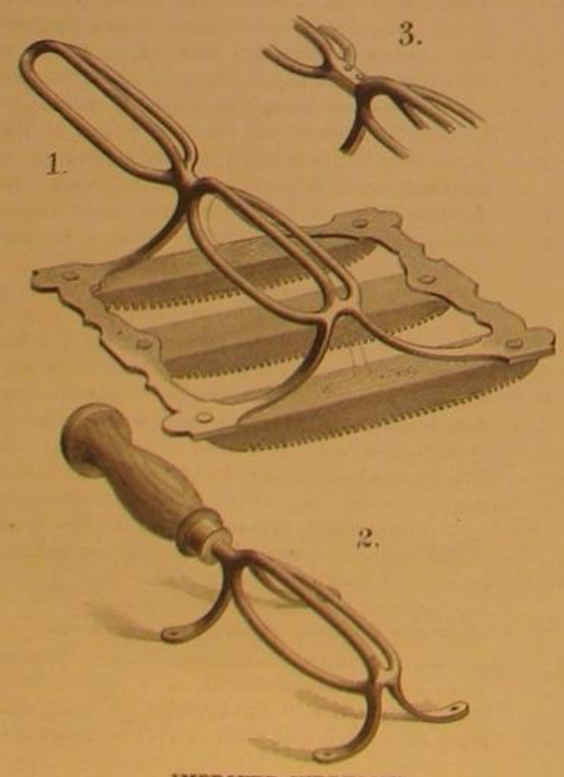
Mr. Dwight Burdge, of Battle Creek, Mich., has patented a folding writing desk which is simple in construction and can be folded very compactly. The invention consists in the novel construction and combination of parts whereby a hinged case or paper and envelope receptacle is held in an upright position on a folding table top when the latter is adjusted horizontally on the two pairs of crossed and pivoted legs, to one pair of which the table-top is itself hinged so that it may fold between the legs when the desk is closed.

Messrs. Rafael Martinez and John Petry, of New York city, have patented an extension bath tub, which is simply constructed, occupies little space, and can be easily extended. It is contained in a box provided with an extensible part which can be drawn out to lengthen the tub when required, and pushed back when the tub is not in use. It is also provided with a pump which can be used for transferring the water to a bucket in emptying the tub.

IMPROVEMENT IN CURRYCOMBS.

The improvement shown in the engraving relates mainly to the handle, which is made wholly or in part of malleable iron, and is formed so as to afford two places for the hand, one immediately over the back of the brush, and the other projecting over the side of the brush.

The handle, although of a single casting, has the appearance of being made of wires curved so as to form a light yet very strong handle. The handle shown in Fig. 1 is made of a single piece, that shown in Fig. 2 is made partly of wood, and Fig. 3 shows the iron handle made in two parts, fastened together with rivets.



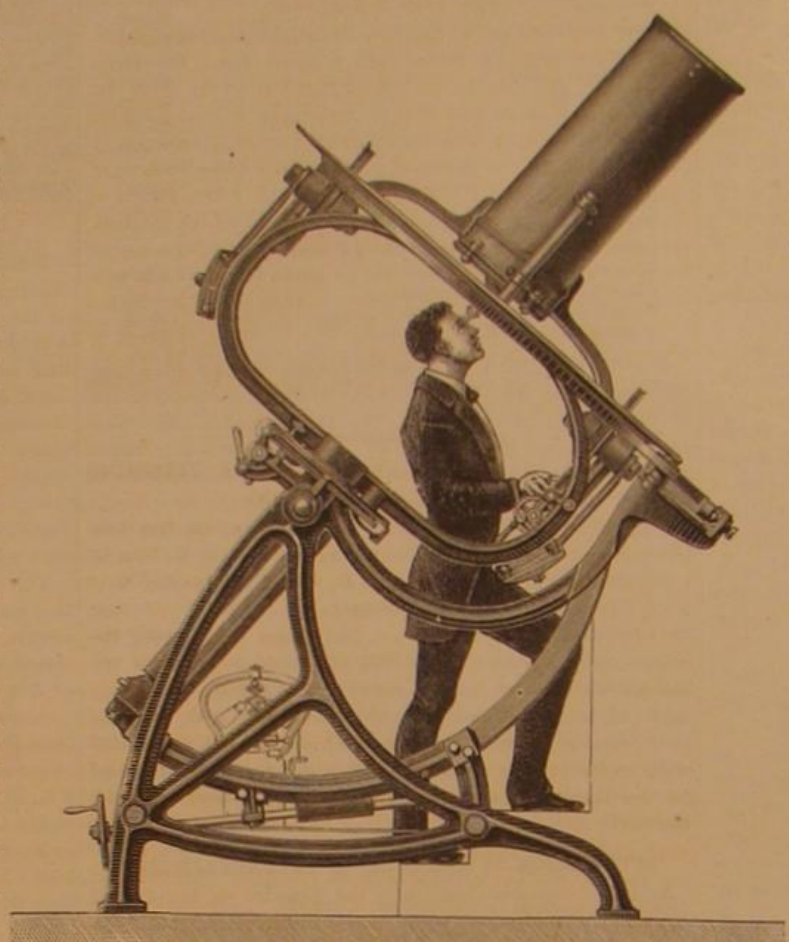
IMPROVED CURRYCOMB.

This device is the invention of Mr. W. P. Kellogg, of Troy, N. Y.

NEW TELESCOPE OF SHORT FOCUS.

We represent herewith a new telescope devised by M. Leon Jobert, the able director of the Popular Observatory at the Trocadero, Paris.

This instrument is like the Cassegrainian telescope in form, and is of short focus, its parabolic reflector being only half the focal length of those of Foucault. It is of variable latitude, or, in other words, may serve for all points of the globe. In order that the observer may, without changing his position, be able to sweep the whole heavens above the horizon, the ocular is located at the intersection of the polar axis with the axis of declination. The sides of the tube are furnished with two supports, which are jointed around the horary axis, and pass through two other large supports that form a part of the last-named axis, and that are connected with each other by a turned circle moving over two large rollers. This circle is made very solid by a wide open-work backing, and both the latter and the circle are open in such a way as to allow the body of the telescope to pass when the instrument is directed toward stars which are at the celestial equator or near the southern horizon. The body of the telescope is balanced by two weights whose supports are fastened to the axis of declination. The polar axis passes through a journal box, whose two extremities are held in the upper ends of the two large cast iron sides forming the main frame. The cast iron cross-stays which connect the two sides of the frame are provided with a couple of projections which carry an arc, against which the large arc may slide with slight friction. The latter is firmly united at one of its extremities with an arm which descends from the journal box and supports the bed plate, on which rests the lower end of the polar axis; and its other extremity is connected with another arm which likewise starts from the journal box and forms, by branching laterally, the bearings which carry the two rollers on which the turned circle revolves through the action of the clock which causes the diurnal motion. The clock is regulated by a regulator which is plainly visible in the annexed figure.



M. JOBERT'S NEW TELESCOPE OF SHORT FOCUS.

By means of a hand wheel the instrument may be fixed at the latitude of the locality where it happens to be placed, in such a way that the prolonged polar axis is parallel with the axis of the earth and points to the celestial pole. The instrument is furnished with a polar circle and a circle of declination with verniers that are moved by endless screws. In the figure the observer is represented with his hand on the hand wheel, which actuates at the operator's will, either rapidly or very slowly, the axis of declination. The clockwork movement is transmitted by bevel wheels and an axle, to a wheel which revolves loosely on the axis of latitude formed by the bearings of the large arc; and from this point motion is transmitted to the axis of the endless screw, and from thence to the endless screw which actuates the polar axis. With this instrument the observer can sweep every point in the heavens without changing his position, the only change he makes in the latter being that of moving with the instrument, which makes one complete revolution every twenty-four hours.—*La Nature.*

By adding phosphorescent material to printer's ink, it is said that books and papers can be made legible in the dark. A luminous newspaper is proposed at Turin.

A Project for the Year 2000.

Lake Mackenzie is one of those "possibilities of North America" recently suggested. The lake would result from a proposed closing of the northerly outlet of the valley of the Mackenzie River, at the line 68° north, and storing up the water of 1,260,000 square miles. And to this could be added the water of other large areas. It would be a lake of about 2,000 miles in length by about 200 of average width. Its surface would have an altitude of about 650 feet above sea level. It would cover with one continuous surface the labyrinth of streams and lakes which now occupy the Mackenzie Valley. It would be a never failing feeder for the Mississippi. It would connect with Hudson Bay and with the "great lakes," and also with the interior of Alaska by connecting with the Yukon and its affluents. By concurrent results and other "possibilities" it would become, during some months of each year, a navigable water, adding not less than 12,000 miles of communication to the Mississippi. It would complete the interior lines of river courses by connecting them. Cutting the "divide" which now exists between the Mississippi and Mackenzie would do this. This work is small when measured by its results, and it becomes easy of accomplishment under the methods proposed. The connecting of the Upper Mississippi with the proposed Lake Mackenzie would be easily made if that lake had a surface at the proposed altitude of 650 feet above the sea. The outflow from such a lake, having a length of more than 2,000 miles from south to north, and draining a very wide range of altitudes and latitudes, would be a timely and enduring one. This lake would make possible and easy the straightening of the Lower Mississippi. It would also contribute to the proposed ship channel from Cairo, Ill., to the Gulf of St. Lawrence, by the almost straight line which cuts the Wabash Valley, the Lakes Erie and Ontario, and the Lower St. Lawrence. This commercial channel, receiving all the waters converging at Cairo, would complete the demand for a constantly open ship channel from the St. Lawrence to the sea by way of the Strait of Belle Isle. That demand can be complied with, and the shortest and best line of communication can be thus opened between the interior and the seaboard.—*St. Louis Republican.*

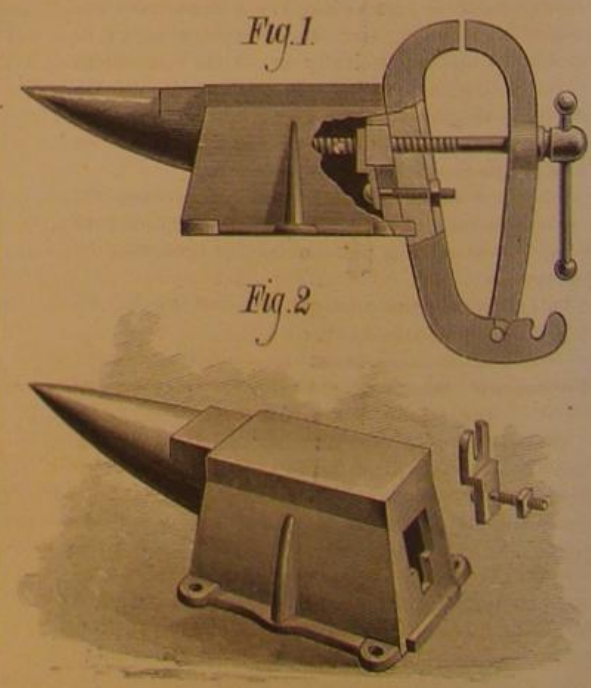
Opium in San Francisco.

There are said to be 400 places in San Francisco where opium is sold, and many of them are said to average $75 a day. If such is the fact the sale of this fatal drug in the United States must be enormous, and with the influx of Chinese to this country, it would seem that before long some national legislation will be necessary to control the sale of this delusive drug.

COMBINED ANVIL AND VISE.

A handy tool for the use of blacksmiths and other mechanics, as well as for farmers and others who occasionally require conveniences for working in iron, is shown in the annexed engraving. It consists of a combined anvil and vise, the former forming a very solid foundation for the latter.

Fig. 1 shows the combined tool complete, and Figs. 2 and 3 represent the anvil and the clamp which retains the vise. The anvil is recessed to receive the nut of the vise and the clamp which retains it. The nut is allowed to remain in the anvil when the vise is removed.



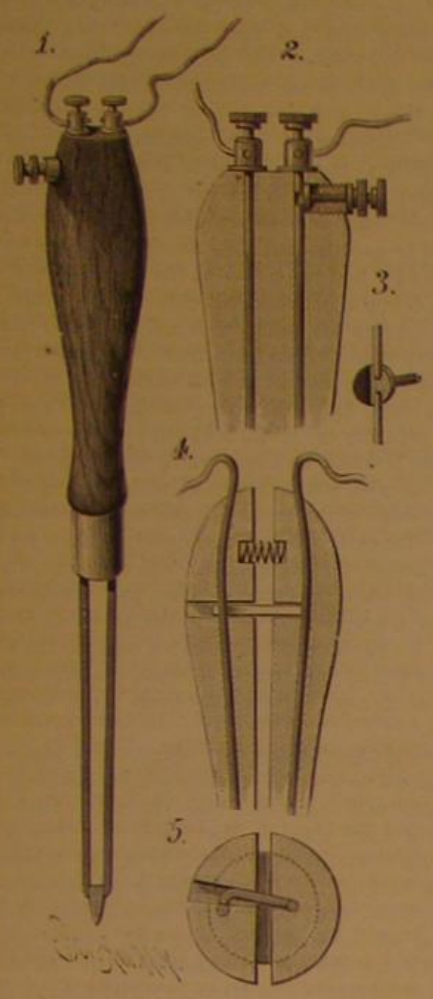
COMBINED ANVIL AND VISE.

The vise is of improved construction, which permits of quickly adjusting the movable jaw so that the two jaws are parallel. This is accomplished by means of notches opening outwardly and upwardly in the forked lower end of the fixed jaw, the movable jaw having a pivot adapted to the notches.

This invention was recently patented by Mr. A. L. Adams, of Cedar Rapids, Iowa.

SOLDERING BY ELECTRICITY.

The engraving shows a soldering iron heated by the electric current, and capable of melting all kinds of solders, such as gold and silver solder, which have heretofore required a blowpipe to melt them. It may also be used for the more fusible solders employed in making tin ware. Now that the electric current is distributed so generally and is used



ELECTRIC SOLDERING IRON.

for all manner of purposes it seems quite practicable to employ it for soldering.

Figs. 1, 2, and 3 show one form of electric soldering iron, Fig. 1 being a perspective view, Fig 2 a section showing the switch for controlling the current, and Fig. 3 a detail view of the switch button. Figs. 4 and 5 are views of a modified form of the device. In Figs. 1 and 2 the electric conductors extend through and project beyond the handle, and embrace a piece of platinum or other material offering sufficient resistance to the passage of the electric current to become heated more or less according to the strength of the current. One of the conductors is separated near the upper end of the handle, and bridged by a button made partly of electrical conducting material and partly of insulating material, so that by turning the button the circuit may be completed or broken as circumstances may require. The device shown in Figs. 4 and 5 is on the same general principle, the only difference being that the handle is split lengthwise and the two portions are pressed apart by a spring. When apart to their fullest extent a hook attached to one of the conductors touches the other conductor and short circuits the current in the handle. When the two halves of the handle are pressed together the current passes through the refractory point.

When the point is heated to incandescence the tool may be used for melting either silver or gold solder. For melting soft solder the heat may be less intense.

This invention was recently patented by Mr. C. E. Ball, of Philadelphia, Pa.

Marketable Weight of Fish—Amendment of the Game Laws Suggested.

At a recent meeting of the Long Island Sportsmen's Association, held in this city, certain amendments of the New York State game laws, pertaining to the capture and sale of fishes, were suggested.

In the close season, if a box of trout should be sent to a dealer and he should open it on his stand in the presence of a citizen he might be heavily fined, although he had not sent for the trout, and did not know what the box contained.

Mr. Eugene Blackford said that he had a lot of trout once sent to him on which he might have been fined $40,000. He thought the laws should be amended in such manner that only the guilty should be punished.

The marketable weight of fishes was also thought a proper subject for legislation. The following weights and sizes for different fishes were agreed upon: Bluefish, not under three-quarters of a pound; weakfish, not less than half a pound; sea bass, half a pound; porgies, half a pound; black bass, half a pound; yellow perch, one-third pound; white perch, one-quarter pound; mullet, one-quarter pound; butter fish, one-quarter pound; flounders, half a pound; sunfish, one-quarter pound; Spanish mackerel, one pound; brook trout, not less than four ounces. It was decided that dressed eels should not be less than twelve inches long, while eels not dressed might be sold fifteen inches long.

A motion was carried that between the sundown of Friday and sundown of Saturday, shad fishing in the Hudson river should be suspended and nets hauled up on the shad poles. This was to let the shad run up the river and spawn.

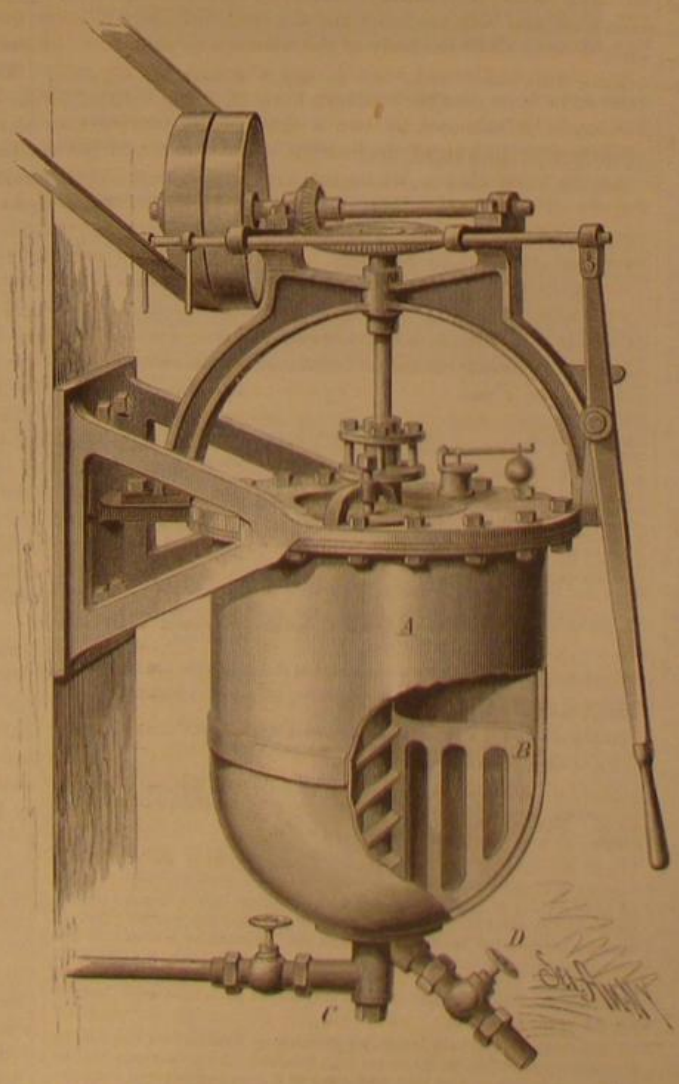
The Lick Telescope.

At a late meeting of the San Francisco Academy of Sciences, Professor Davidson read a letter from Dr. Hugo Schroeder, of Ober Ursel, near Frankfort-on-the-Main, intimating that he would like to undertake to make for the Lick Observatory a fifty-inch refractor upon a new principle, with single in place of double lens objectives. Dr. Schroeder has been very successful in the manufacture of lenses; but his proposal failed to interest the Lick trustees, for sufficient reason that a contract had already been signed with the Clarks, of Cambridge, to make for the Lick telescope an achromatic object glass having thirty-six inches clear aperture. The cost is to be $50,000. The glass is to be finished within two years after the rough disks are obtained, and it is expected that these disks will be had before November 1, 1883.

APPARATUS FOR PREPARING STARCH FOR FINISHING LINEN AND COTTON GOODS.

Starch used for finishing linen and cotton goods has usually been prepared in open boilers with a double bottom by the action of direct or indirect heat, and alum was added to give the starch the desired quality.

Mr. F. A. Hempel, of Plauen, in Saxony, has greatly improved on this method by boiling the starch in a closed vessel under a pressure of five atmospheres, while continually agitating it. The apparatus, which is shown in the annexed cut, consists of a copper kettle, A, the lid of which is covered with copper on the underside. A vertical shaft is journaled in the lid, and is rotated by a horizontal shaft through beveled gear wheels. Wings, B, are attached to the vertical shaft and agitate the contents of the kettle. The lower end of the vertical shaft is bored axially, and diagonal channels lead from the central longitudinal channel. Through these channels steam, at a pressure of five or more atmospheres, can be admitted into the kettle, the pressure being regulated by the valve. The starch is passed into the kettle through the opening in the lid, and can be drawn from the kettle through the pipe, D. Steam is admitted through the pipe, C, and the kettle is provided with a pressure gauge safety valve. The operation requires three-quarters of an hour, and the starch is as clear as water. The starch thus obtained is of excellent quality and does not require alum.

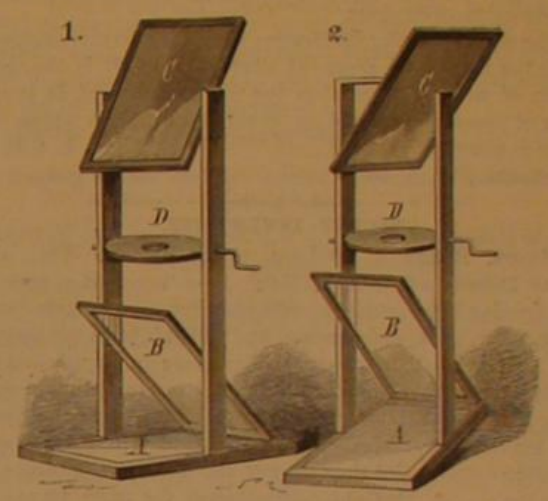


APPARATUS FOR PREPARING STARCH FOR FINISHING LINEN AND COTTON GOODS.

A SIMPLE EXPERIMENT WITH POLARIZED LIGHT.

Scientific toys sometimes awaken a love for further investigation, and experiments in optics often prove more fascinating than was expected. Few of our young readers, we presume, are aware that by the exercise of a little ingenuity and patience they may construct for themselves, without the expenditure of a cent, and from materials to be found in every old garret or store room, a very pretty scientific toy that will afford profit and pleasure for many an idle hour. Many who have seen or read of the Noremberg apparatus have no idea of how easy it is to make one of tolerable excellence. Two pieces of good window glass, a small piece of looking-glass, some strips of wood, and a jack-knife are the principal articles required in its construction.

The principle employed in this form of apparatus is simply the fact that when a ray of light is reflected from a piece of unsilvered glass, making an angle of 35½° with the glass (or 54½° with a perpendicular to the glass), it becomes polarized. Such a ray of polarized light will not bear reflection from a second plate of glass turned at right angles to the first, if it strikes it too at an angle of 54½°. But if a thin plate of mica or other biaxial mineral is placed in the path of this ray it will not only be rendered visible, but be beautifully colored, the color depending upon the thickness of the mica and its position.



POLARIZING APPARATUS

It is evident, then, that we need, first of all, some means of measuring and constructing an angle of 35½° and 54½°. If a circular protractor or scale of chords be not at hand, the following will give sufficiently accurate results:

Take a large sheet of paper or cardboard having a right angle at one corner, and measure off 10 inches in one direction and 14 inches in the other. Join the point thus formed by a straight line, and you will have a right angled triangle, one angle of which is 54½° (that opposite the longer side) and the other angle is 35½°. An ordinary business card is cut so as to have the same sized angles and used in constructing the apparatus. Procure a piece of thin wood 3 inches square for a base, two strips of wood ½ by ¾ inch, and 9 and 10 inches long, respectively, for uprights. From a broken mirror cut a piece 2¼ inches square. A piece of quartz or very sharp steel will answer instead of a diamond to scratch the glass if care is used in breaking it. Also two pieces of clear window glass, each 2¼ by 4 inches. One of these is covered on one side with dull black paper, over which is laid a piece of cardboard, and the whole bound together with a strip of black paper. A circle is also cut from cardboard, and a hole cut in it as large as a nickel five cent piece. A groove is cut in each of the uprights about two inches from the lower end in a slanting direction, so as to have an angle of 35½° with the upright, and 54½° with the base. At a height of about 8 inches are two similar grooves, at the same angle, but in the opposite direction to the lower ones instead of parallel to them. This groove is made wide enough to receive the glass backed with cardboard. Two uprights are now attached to the base, by tacks or otherwise, at such a distance apart as to allow the strips of clear glass to slide tightly in the grooves, while the mirror, placed flat upon the base, is received in notches at the foot of the uprights. The blackened glass is slipped into the upper pair of grooves face downward, the transparent one is slid into the lower grooves, and at a point midway between them the circle of black cardboard is held in position by short pins passed through the uprights on either side. Place the apparatus thus arranged before a window so that the upper edge of the upper glass is about on the level of the eye, or a little below it. On looking into this upper glass a bright circle will be seen reflected in it. Take some pieces of clear mica, and place them one, two, or three at a time, in various positions on the pasteboard disk, which can also be turned at various angles. In certain positions the circle, as viewed in the upper plate of glass,

will acquire beautiful colors which change with every movement of the mica. Other biaxial minerals in thin sections do the same.

By a slight modification of the apparatus it can be made to prove the other peculiar property of polarized light. (See figure 2). Remove the upper plate of glass, and attach to its reverse the oblique surface of a large cork cut at an angle of 35½°. The cork may be tacked or glued to a thin piece of wood by its large end, and this strip of wood fastened to the top of the longer upright, after the manner of a gibbet. This will suspend the strip of glass at the same angle as before, but at right angles to the lower one, and the observer, in order to see the disk, must stand with his side to the window and look just over the top of the shorter upright. Instead of seeing a bright spot as before, the center will be comparatively dark. But on replacing the mica on the revolving stage, rich colors again appear. Beautiful effects can be obtained by combining and overlapping strips of mica of different thicknesses.

A thin section of a crystal of quartz cut perpendicular to the axis also produces a very pretty series of colors, depending upon the thickness and the angle of the plain glass plates.

Instead of wooden uprights the plates of glass may be mounted on wire apparatus, as described by Hopkins in the SCIENTIFIC AMERICAN of December 4, 1880, page 354, making use of the principles illustrated in Figs. 16 and 20, with necessary modifications.

The accompanying illustration shows the second position. A is the horizontal piece of silvered glass, B is the clear piece of window glass, C is the blackened glass, D is the disk of black pasteboard or revolving stage on which the mica is placed.

E. J. H.

Atlanta, Feb. 5, 1881.

RECENT INVENTIONS.

Messrs. Robert F. Dobson, of Darlington, Wis., and Isaac Dobson, of Lincoln, Neb., have invented a process for tanning hides which is claimed to involve comparatively little labor, time, and expense, and which injures the fiber of the leather less than processes heretofore employed, and by which the leather produced is made stronger and more durable than that heretofore produced. They place the hides for ten days, or thereabout, in a bath of strong brine and tanning extract, and then subject the hides to the fumes of sulphur in an air-tight compartment for from twelve to twenty-four hours or more.

A steam-supplying apparatus, patented by Milton W. Hazelton, of New York city, combines with a heating tank appliances for supplying steam either for power or heating purposes. A central heater is employed to heat a mass of water to a prescribed temperature higher than the boiling point. This hot water is carried through pipes to local steam generators, in which the pressure upon the heated water being reduced steam is generated. The water in these generators, cooled by the generation of steam therefrom, is led back to the central heating tank for reheating.

Mr. David S. Thomas, of North Platte, Neb., has patented a windmill which supplies an improved device for controlling or adjusting the sails or vanes. A clutch wheel or spider and a spirally grooved loose sleeve, to which is attached a small vane, are fixed on the axle of the wheel. The sleeve engages with a stud, and, when turned in one direction, draws the wind wheel into clutch with the spider, whereby the vanes are set to the wind. The vane on the loose sleeve also acts to adjust or throw the vanes flat in a high wind.

Mr. John T. Stoll, of Sacramento, Cal., has patented a horse collar pad for collars of the kind which open at the top, and which supplies an upper pad of such form and material as will securely keep the collar in its proper shape, prevent the strap which holds the hames together from pressing through the top of the collar, and which is supplied with a hook or holding iron, that prevents the hame strap from slipping forward, and keeps the hames in their place on the collar.

Mr. John W. McKee, of Moselle, Mo., has patented a drag-sawing machine which may not only be used for sawing down trees, but which may also be advantageously used for cutting the trees into logs when felled. It may conveniently be moved from place to place.

Mr. Tom Owen Memery, of Key West, Fla., has patented a sewing machine shuttle provided with a hinged spindle for receiving the spool and a friction nut and screw, which also sustains the moving end of the spindle when in position for use, thus permitting the ready application and removal of the spool.

Mr. Elihu Quimby, of Hanover, N. H., has patented an automatic time register and alarm, which acts to cause an alarm at any desired place in case of failure of the watchman to perform his duty, obtains a permanent record indicating the time of any dereliction, permits the watchman to operate the distant signal at any time independently of the ordinary working of the apparatus, permits a person at such distant point to distinguish regular from unusual signals, and which cannot be tampered with. A novel combination of electrical devices and clockwork effect the results stated.

Mr. Frank W. Mix, of Terryville, Conn., has patented an indicator lock which prevents the opening of the lock and the subsequent restoration of the indicator dials to their former positions by turning the key back. A peculiar construction and arrangement of an obscuring disk closes the openings in the face plate to prevent the entrance of dirt, rain, etc.

Mr. Edwin L. Barber, of Henrietta, Texas, has patented a water cooler wherein the vessel holding the water is surrounded with felt attached to the inner side of a casing for the vessel. The casing has apertures formed therein for the escape of vapor arising from the felt which is wetted in use, and troughs are provided to convey away the drip.

An extension straw stacker has been patented by Mr. William Holmes, of Ashland, Ohio, which is so constructed that it may be extended or contracted without affecting the tension of the endless belt carrier or of the adjusting chains.

Elementary Physics.

BY L. J. OSBUN.

A teacup with a little water; a small sponge; a sheet of blotting paper six inches square, folded twice, so that all the corners shall come together; pin three of the corners together, press the others away, thus forming a little pocket or filter; a mixture of pulverized chalk, or ashes and water; a bowl of water; two blocks of wood; two pieces of sole leather; if possible, a magnifying glass; a narrow bottle or test tube; some alcohol or naphtha or kerosene; some cotton; a glass tube one fourth inch inside diameter, one foot long, closed at one end; a test tube; a shingle or strip of pasteboard; a knitting needle; a brick; a short candle; a bottle or test tube filled with colored liquid; a piece of pipe stem or glass tube; a lamp; a dry bottle fitted with cork, and glass tube or tobacco pipe.

EXPERIMENT.	OBSERVATION.	INFERENCE.
Into a teacup containing two tablespoonfuls of water thrust a dry sponge, and then lift the sponge from the cup.	No water left in the cup.	The water in the cup entered spaces in the sponge.
Squeeze the sponge.	Water drops out.	
Into a little bag of unsized paper pour a mixture of powdered chalk and water.	The water passes through, and the chalk remains upon the paper.	Between the fibers of the paper there are spaces large enough to allow the molecules of water to pass through, but too small for the particles of chalk.
Into a bowl of water put a little block of unpainted pine wood, and a little piece of sole leather, set aside for a day, then take the wood and leather from the water, and compare their weight with equal-sized pieces of dry wood and leather, by lightly tossing them in the hand.	The wet pieces are much heavier than the dry.	Water has entered spaces in the wood and leather.
Look carefully at the sponge, paper, wood, and leather, if possible, with a microscope.	Little spaces between the fibers of the different bodies.	In many bodies there are little spaces, visible to the naked eye or by the aid of a microscope, called pores.
Into a bottle, or test-tube, *full* of alcohol, naphtha, or kerosene, attempt to thrust some cotton from a roll of batting.	A great quantity of cotton may be put into the bottle while the liquid does not overflow.	Between the molecules of the liquid are spaces for the molecules of cotton to enter, and between the molecules of cotton there are spaces for the liquid to enter.
Half fill a long, narrow glass tube with water; upon this pour alcohol until it is full. Close the tube with the thumb, invert it, and shake so as to mix the liquids.	The tube is no longer full, while none of the liquid has escaped.	The molecules of water must have entered into little spaces between the molecules of alcohol, and *vice versa*.
Heat to boiling in a test tube half a teaspoonful of strong ammonia.	A penetrating odor of ammonia about the mouth of the tube.	The tube must be full of ammonia gas.
Quickly invert the tube full of ammonia gas over some water. Shake the tube, but keep its mouth under water.	Water rises and fills tube.	There must be spaces between the molecules of the ammonia gas.
Examine the cotton, liquid, and gas.	There are no spaces visible.	Between the molecules of solids, liquids, and gases there are invisible spaces or pores.

Definition.—Pores that are visible are called *sensible pores*, and pores that are invisible are called *physical pores*.

Notes.—Matter is made up of molecules, and these in turn are made up of atoms. Between the atoms and between molecules there are spaces.

Lean a shingle against a knitting needle for a brace, and heat the needle.	The shingle falls because of the expansion of the needle.	The molecules of iron have been separated. In hot iron the spaces between the molecules are larger than in cold iron.
*Carefully heat a bottle or test tube with colored water, and fitted with a cork through which passes a narrow glass tube, or a pipe stem.	The water rises in the tube, and overflows.	The molecules of water have been separated. In warm water the spaces between molecules are larger than in cold water.
Cool the bottle.	The liquid lowers in the tube.	When water is cooled the molecules come together.
†Carefully heat a bottle or test tube, filled with air, and fitted with a narrow, bent glass tube, or a tobacco pipe, holding the end of the tube or pipe stem under water in a tumbler.	Bubbles of air escape from the tube and rise through the water.	The molecules of air have been separated. In warm air the spaces between the molecules are larger than in cold air.
Cool the bottle.	Water rises through the tube and enters the bottle.	When air is cooled the molecules come near together.

When solids, liquids, and gases are heated the molecules are separated.

Note.—A change of temperature in matter is attended with a change of position in its molecules.

Examples.—In the parts of a stove when a fire is built. In the mercury of a thermometer. In the earth and air when the sun rises. In the walls of a cold room when a person enters it.

Regard all the objects of matter about us, solids, liquids, and gases.	They are constantly changing in temperature, from warm to cold, or cold to warm.	The molecules must be constantly in motion.

—*Journal of Education.*

* Heat a piece of glass tubing, and when the glass is soft, remove it from the flame and quickly draw the hands apart. A tapering, narrow tube will thus be formed, the large end of which may be fitted to a cork that has been pierced and neatly filed with a slender, round file. The bottle should be so full of water that when the cork is pushed in, the liquid, which is colored with violet ink, shall rise half way up the glass tube, or entirely to the top of the pipe stem.

† The narrow glass tube is bent by warming, so that its free end may be conveniently held under the water in a tumbler. A tobacco pipe may be fitted to a bottle or test tube by means of a common tapered cork, the large end of which shall tightly fit the pipe bowl, while the small end fits the neck of the bottle. The cork, of course, must have a hole punched through it.

Making Iron Columns Secure.

So many accidents have occurred at fires to life and property by the sudden giving away of iron columns used for supports to the various floors of buildings, that such columns are looked upon with distrust by firemen, and their use discouraged. When they become heated by fire they warp and twist, and if water is thrown upon them they are apt to break entirely, thus letting the upper floors fall. It was in consequence of the giving away of the iron columns at the Broadway fire, some time ago, that the floors from cellar to roof fell in, and two firemen who were on the roof were hurled to a terrible death in the seething furnace within the building. All large cities are full of buildings whose several floors are supported on iron columns, and, in case of fire, they are quite as likely to collapse as did the one we refer to. Our building laws, which are yet crude and imperfect, permit their use, and, as they are cheaper than most anything that could be used instead, they are still favorites with builders. The very best thing to take the place of iron columns would be columns of brick, but objection is made to them that they take up too much room and are not ornamental.

Many experiments have been tried with a view to making iron columns fireproof, or at least sufficiently so to be able to stand a small fire in their neighborhood without bending, and thus bringing the entire building to the ground in ruins, long before it would be destroyed by the fire alone. Casing the columns with wood, asbestos, brickwork, etc., has been tried, and some of the methods have been described in the *Journal*. Recently two more suggestions have been made. One is to inclose the columns in rings of terra cotta, put on over the top when the column is set up. These would act as a shield to keep off the heat till the fire could be subdued. The plan is simple and inexpensive, and has the added advantage of giving opportunity to make the columns highly ornamental, as terra cotta readily lends itself to decorative treatment.

The second plan is to fill the columns with water. To do this the plates or castings, usually placed between the columns where they stand one over the other, have holes or openings of some kind, so that there is a free communication from column to column, from the bottom to the top of the building. Where columns are already erected, short pipes are used to connect them at each floor. The uppermost column is also provided with a small escape-pipe, passing through the roof to the open air. At the base of each tier of columns a pipe is connected with the street mains, so that all the columns may be filled with water, either permantly or on emergency. When thus filled with water and provided with an escape for the expansion of the water or steam, the columns would stand unharmed until every floor was burned out. Were the girders also hollow and filled with water in the same manner, both girders and columns would undoubtedly stand intact, even after all the floors and the roof had fallen in, and they could be used again in rebuilding. The system has the merit of cheapness and ease of application, and is patented in this country. We have little confidence, however, in iron columns under the conditions incident to a great fire, and the sooner their use is prohibited by law the better it will be for the public.—*Fireman's Journal.*

Salicylic Acid in Foot-and-Mouth Disease of Cattle.

The Duke of Brunswick has of late successfully combated the ravages of this much dreaded enemy on his estate at Stampen, near Oels, in Prussian Silesia, by treatment with salicylic acid, the well-known antiseptic. Instead of several weeks being required to effect a cure with the remedies hitherto employed, truly surprising results have been brought about within a few days by this new treatment. A solution of the acid is prepared by pouring some hot water on about three tablespoonfuls of salicylic acid in an earthen vessel, and adding lukewarm water to make up a gallon. The mouth and feet of the diseased animal should be carefully washed three times a day with this liquid, and the tops of the hoofs well powdered with the dry acid after each ablution. The effect will, moreover, be greatly increased by salicylating the drinking water of the beasts by the addition of two tablespoonfuls of the acid dissolved in hot water. During the above treatment great attention must be paid to the perfect cleanliness of the stables or sheds. The dung must be saturated with salicylic acid solution to prevent further infection, for it is chiefly in the dung that the germs of the disease are to be found.

Changes in the Relative Elevation of Land and Sea.

The impression that the northeastern coast of the American continent is slowly rising, and Professor Shaler's estimate of the rate of emergence in progress as being over a foot, and perhaps as much as three feet in a century, has been recently denied (*American Journal of Science and Arts*) by Mr. Henry Mitchel, who states, in the Coast Survey Report for 1877, that the salt marshes are still, as they were in the time of the early explorers, at ordinary high water level, and that the rocks upon our coast, long notorious as dangerous to navigation, have not risen since they were first discovered. In his statements ancient maps and documents are cited, and the conditions of the various rocks are considered in detail. He claims that no tilt in either direction has taken place in the Gulf of Maine. But eastward of longitude 64° 13', and especially in Newfoundland, great changes present themselves in the comparison of charts, the depths appearing to be at some points less and at other points greater now than formerly.

FRYER'S DESTRUCTOR AND CARBONIZER.

[*Continued from first page.*]

ties of materials were consumed in the destructor: 14,000 tons of rubbish, 59 beds, 131 mattresses, 264 carcasses of pigs which had suffered from swine fever, 1 cow, 8 sheep, 2 lambs, 28 quarters of bad meat, 13 cwt. of bad meat.

The total quantity of rubbish consumed in 2½ years in the Burmantofts destructor was 30,041 tons.

For each depot the following men are required: One foreman, who also acts as engine-driver; four furnacemen, one laborer, who also attends to two mortar mills; and the same for night duty.

The carbonizer is used to convert the refuse obtained from the sweepings of the paved streets and the markets, and other vegetable refuse, into a carbon very useful as a manure and deodorizer, and which finds a sale at the rate of 30s. per ton.

The carbonizer consists of a group of brickwork cells and furnaces, each cell having its own distinct furnace alongside of it. It is 26 feet long, 12 feet wide, and 15 feet 6 inches high, tied together with iron rods and angle-irons.

The refuse to be carbonized is fed into the apparatus at the top, the loose cover of the cell being removed for that purpose and immediately replaced; within the brickwork cells are hung, by means of cast iron plates fixed in its walls, a series of cast iron plates or eaves, touching the walls along their top edges, but standing free from the walls some inches along their lower edges. These plates are arranged to overlap one another, and form a continuous sloping ledge or eave, winding round and round the cell in a kind of spiral. Near the bottom of the cell the spiral eave finishes with a fire-block eave, the lower edge of which rests on a wall dividing the contents of the cell on one side from the hot gases of the fire which are admitted to it on the other side.

The refuse is fed into the cell until it forms a solid mass within the well of the spiral eave, being withdrawn at the bottom as it gets sufficiently charred, but it is not mobile enough in its nature to rise up again either underneath or behind the eaves, so that a space is there left forming a continuous flue in connection with the chamber behind the fire-block at the bottom of the cell, and up this flue pass the hot gases from the fire, heating the contents of the cell. At the top of the cell these gases pass through the damper frame into the vertical flue, and so into the main flue and thence to the chimney. The process undergone by the refuse is as follows: After being thrown in at the top of the cell it sinks gradually as it becomes closer packed, and as the finished charcoal is withdrawn at the bottom it sinks, and continually comes in contact with hotter and still hotter plates, until at the bottom of the cell it enters a chamber of nearly redhot firebrick.

No air is admitted during the process, except a slight amount which reaches it from the flue behind the eaves, so that instead of being consumed it is charred. The cell terminates about 2 feet from the ground in a strong cast iron plate, in which is an opening closed on the underside by a sliding door; this is opened at certain intervals (about three hours) by letting out a charge of charcoal into a small truck which is run in below the plate ready to receive it. The furnace with firegrate and door is of ordinary construction, and within it a thick, dull fire is kept up. Sight or peep boxes are provided to enable the flues nearest the fire to be cleansed, and similar peep boxes higher up allow a view on to the backs of certain of the cast iron plates for the purpose of seeing that they do not become overheated.

Though the cast iron plates are bolted to the walls, or through the walls to one another, they are removable if need be without pulling down any of the brickwork.

The charcoal, which comes out of the carbonizer redhot, is cooled in a char cooler, by passing through a revolving cylinder, over which cold water is continuously streaming, and is sifted as it issues from the outer end. This cooler is also driven by the steam engine which works the mortar pans.

Each cell deals with about 50 cwt. of refuse in every twenty-four hours, and the fuel required for the furnaces is sifted from the contents of the dry ashpits, it not being necessary to purchase any.

The cost of an establishment with one six-celled destructor, a carbonizer with eight cells, boiler, steam engine, two mortar pans, cooler, chimney shaft, and buildings, is about £4,500.

No nuisance of any kind is experienced in the vicinity of the depots, and this system of dealing with the refuse of towns appears to be gaining ground; the apparatus has been adopted in Kralingen, near Rotterdam, Leeds, Heckmondwike, Blackburn, Bradford, Warrington, and Derby, and is, I hear, about to be adopted in Bolton, Dewsbury, and Rotherham.

Prize from the Belgian King.

In December, 1874, the King of the Belgians offered a yearly prize of 25,000 francs "for the encouragement of intellectual effort." The prize for the year 1881, which is open to the competition of citizens of all nations, will be awarded to the best work on the means of improving ports established on low and sandy coasts, like those of Belgium." The conditions of the competition and award are as follows: 1. Foreigners desiring to compete will be required to send their works, either printed or in manuscript, to the Minister of the Interior at Brussels before March 31, 1881. 2. A manuscript work obtaining the prize must be published in the course of the year following that in which the prize shall have been awarded. 3. The award will be made by a jury appointed by His Majesty the King of the Belgians. The jury will be composed of seven members, three of whom are to be Belgians, and four foreigners of different nationalities. General Eaton, Commissioner of Education, in a circular calling the attention of American scientists, engineers, and educators to the subject, says: "Competitors in the United States are advised that they should forward their articles through the Department of State."

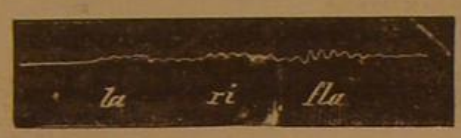
RECORDING TELEPHONIC RECEIVER.

Doctor Boudet has published a very interesting volume upon the application of the telephone and microphone to physiological and clinical uses. The book is made up entirely of details of the researches and experiments which he has made in his laboratory.

We extract some passages relative to the electrical recording of speech.

The automatic recording of telephonic messages is the first step towards the solution of a problem which has been declared insoluble. In order to arrive at a result which so many scientists have considered paradoxical, Dr. Boudet modified the telephone receiver in the following manner: Removing the diaphragm of the Bell telephone, he screwed

to the wood one end of a steel spring, the other end being opposite the pole of the magnet. To the free end he soldered a small piece of soft iron weighing a tenth of a gramme. Attached to this piece and in the prolongation of the axis of the spring he fixed a light bamboo arm ten centimeters long and terminated by a needle of whalebone. In fact the diaphragm is replaced by a movable armature resembling the interrupter of an induction coil. By means of this instrument, the tracings shown in the annexed engravings were obtained These tracings were made upon smoked



paper, and transferred to glass to be studied with a microscope.

As will be seen in the examples given, there are some remarkable points of difference between the several tracings as well as some points of resemblance, which make it probable that tracings of *this* character may be deciphered. These tracings, though far from being perfect, seem to contain the germs of success.

Dr. Boudet has made practical use of some of these experiments. He expects to enable deaf mutes to hear singing by means of a microphone, in cases where the auditory nerve is not entirely lacking, but where some defect in organization renders speech impossible.

The musical sounds are inscribed upon a smoked cylinder, which permits of the comparison of the visual record with the audible sounds which have been heard. It remains to be seen whether the reversal of this process will reproduce the voice as in the phonograph.

Cultivation of and Trade in Peanuts.

The trade in peanuts, already large, is annually increasing. Because the unreflecting public sees it mostly as conducted by petty retailers on stands at street corners, it is generally inferred that the peanuts are at best an unimportant article of commerce, but this, as is usually the case with conclusions derived from superficial observations, is erroneous. The trade extends in a similar way to not only all our large cities, but also to inferior towns and villages.

The *Confectioner's Journal* has compiled some statistics of the trade which are worthy of attention. By those who have entertained false impressions regarding the value of this crop it will scarcely be credited that it amounted last year to 2,220,000 bushels, which, at prices realized to first hands, reaches an aggregate of $2,150,000. The crop is principally raised in Virginia, which last year produced 60 per cent of the entire consumption. The crop is generally harvested in October, beginning a little earlier in Virginia. Tennessee produces about 35 per cent of the crop annually sold, and North Carolina about 5 per cent. Peanuts are elsewhere raised for home consumption, the amount so produced being difficult to estimate. "The nuts marketed in New York and hereabouts come chiefly from Virginia, while those from other Southern States find a market in the West. When peanuts are scarce and high, the African nut is imported, but with the present supply and low prices, foreign nuts have no place in the market. Peanuts are sold by dry measure by jobbers, but retailers sell by wine measure, making forty quarts to the bushel.

RECENT DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

FLETCHER, APPELLANT, *vs.* BLAKE.

Mr. Justice Harlan delivered the opinion of the court.

This is an appeal from a decree in the Circuit Court of the United States for the Southern District of New York, dismissing a bill in equity based upon an alleged infringement of letters patent issued to the plaintiff in error on the 8th of June, 1869, for an improvement in stamps used for revenue and other puposes.

Held:—An invention consisting of a postage or revenue stamp having a portion of its surface composed of thin fragile paper or other suitable material loosely attached, and on which a portion of the design or other matter is printed, is not infringed by a stamp composed of one continuous piece of paper, of uniform thickness, upon the face of which is certain printed or engraved matter, with blank spaces, in which are inserted, at the appropriate time, certain figures and names required by law to appear upon revenue stamps, which blank spaces are prevented from adhering to the barrel by the interposition of a red slip of blank paper attached to the back and outside edges of the stamp.

Decree of Circuit Court sustained.

United States Circuit Court.—Southern District of New York.

BUCHAN *et al. vs.* MCKESSON *et al.* SAME *vs.* HENRY *et al.*—PATENT CARBOLIC ACID SOAP.

Blatchford, J.:

1. The first claim of reissued patent No. 5,007, to Isabella Eames and Charles A. Seely, July 30, 1872, being a claim for "a soap made by incorporating carbolic acid, or its equivalent, with ordinary soap, substantially as specified," *Held* to be anticipated by the English patent of Alexander McDougall, No. 2,510, of October 15, 1860, for "improvement in materials or composition for destroying vermin on sheep and other animals, and for protecting them therefrom."

2. If McDougall, by using with a fat and an alkali a crude carbolic acid or creosote which did not contain carbolic acid or cresylic acid as pure or as concentrated as it was afterward made, produced a true soap developing the properties of the acids referred to, there was no invention in subsequently using the purer article. The advance was only one of degree.

3. Although soaps made with the finer carbolic acid existing at the date of plaintiffs' patent may be applicable to purposes to which soaps made with the less pure carbolic acid could not be applied, that shows only a difference in degree and not invention.

4. The effect of an earlier invention upon the claim of a patent not avoided by a specific disclaimer in the specification when it appears that such disclaimer is based upon an unsound view of the invention to which it relates.

Malleable Castings.

Considerable pretense of mystery is assumed by manufacturers of malleable castings both in this and the old country, and doubtless there are some trade secrets of value to those in the trade relative to mixtures of different irons, etc., but the process is in itself simple, and a little experience should enable any foundryman to attain a creditable success in it. Nearly every founder has his own mixtures and methods, but they are all based upon the processes of Samuel Lucas, of Dronfield, which date back to 1811. The general features of the process, as carried out by the Birmingham (England) iron founders, is given in the *Ironmonger*, as follows:

"For the purpose of the casting pig of a fine quality is needed, and great care is used in the preparation of the moulds, so that there may be no flaw or imperfection in the casting. The latter, after cooling, is, of course, hard and brittle, and it is to remove this brittleness and give it the character of malleable iron that the special process is required. The casting is now placed in hermetically sealed pots or boxes surrounded by powdered ore, and subjected for several days to intense heat, which, by cementation, gradually softens it and renders it malleable to the core, when it may be bent or wound into any shape. The annealing process takes ordinarily about ten days. Thus a pot made up on Tuesday is got up to a white heat about Friday, and this heat is maintained for some twenty-four hours or more, according to the size or thickness of the article annealed. The fire is then allowed to die down, and when the mass is cool the castings are found to be thoroughly annealed and malleable. Scarcely a trade in Birmingham fails to use malleable castings for some purpose or another.

"The introduction of Bessemer steel has somewhat operated against the trade, but there is still a great field for malleable iron founders in catering for the requirements of the Birmingham gun, harness, and engineering trades."

The journal quoted thinks it much to be regretted there is not a more free interchange of ideas and experience among English iron founders, as in this only is there hope that the English trade can keep pace with German and French progress in the art.

Courage, Ingenuity, and Perils of Firemen.

The perils to which firemen are frequently subjected and the courage with which they are faced are scarcely inferior to the dangers met with and courage evinced by brave soldiers on the field of battle. If statistics were carefully compiled, we think the loss of life and personal injuries sustained by the trained corps that by day and night guards this city from conflagration would more nearly approach the proportion usually killed and wounded in active military campaigns than we could easily believe. They are a noble, though a small army, which yearly gains respect from our citizens; and they often perform heroic deeds that merit a higher reward than the praise bestowed by the chronicler who records the story.

A rare instance of the exercise of great ingenuity under circumstances of great personal danger occurred in a recent fire in this city, an account of which we transcribe from a leading daily:

A portly man was imprisoned by fire and smoke in the fifth story, and there were no ordinary means of reaching him. The adjoining house was smaller, its roof reaching about half way between the fourth and fifth story windows of the burning structure. A fireman reached this roof with a small ladder. He then slid down the ladder until he could get into the fourth-story window, but he found it impossible to ascend to the fifth floor. Then he put the short ladder on the window sill and held it flat against the building, so that it would reach to the story above, and on this support the man whose life was endangered descended. The men were now together, but not out of danger. The ladder was next put with one leg on the sill, but aslant, so that it would reach over to the roof of the adjoining house. Held in this position by the fireman at one end and volunteer assistants at the other, it formed a very dangerous but, as it proved, successful means of escape for the citizen whose life was endangered. The fireman was now left alone, but escaped by the same path, trusting entirely to the grip of the men at the top of the ladder. All this was done at the height of thirty or forty feet from the stone sidewalk, in the midst of excitement attending a great fire. The man who does such work with the necessary quickness of invention and cool bravery deserves something better than the mere wages necessary for his existence, with the chances that, if injured or disabled in the service, he will be discharged as useless.

SLATE PENCIL MACHINE.

It is easier for the schoolboy, with his innate inquisitiveness, to ask how slate pencils are made than it is for the boy of larger growth to answer; however, the machinery employed in making slate pencils is very simple, and the process will be readily understood by studying the annexed engraving.

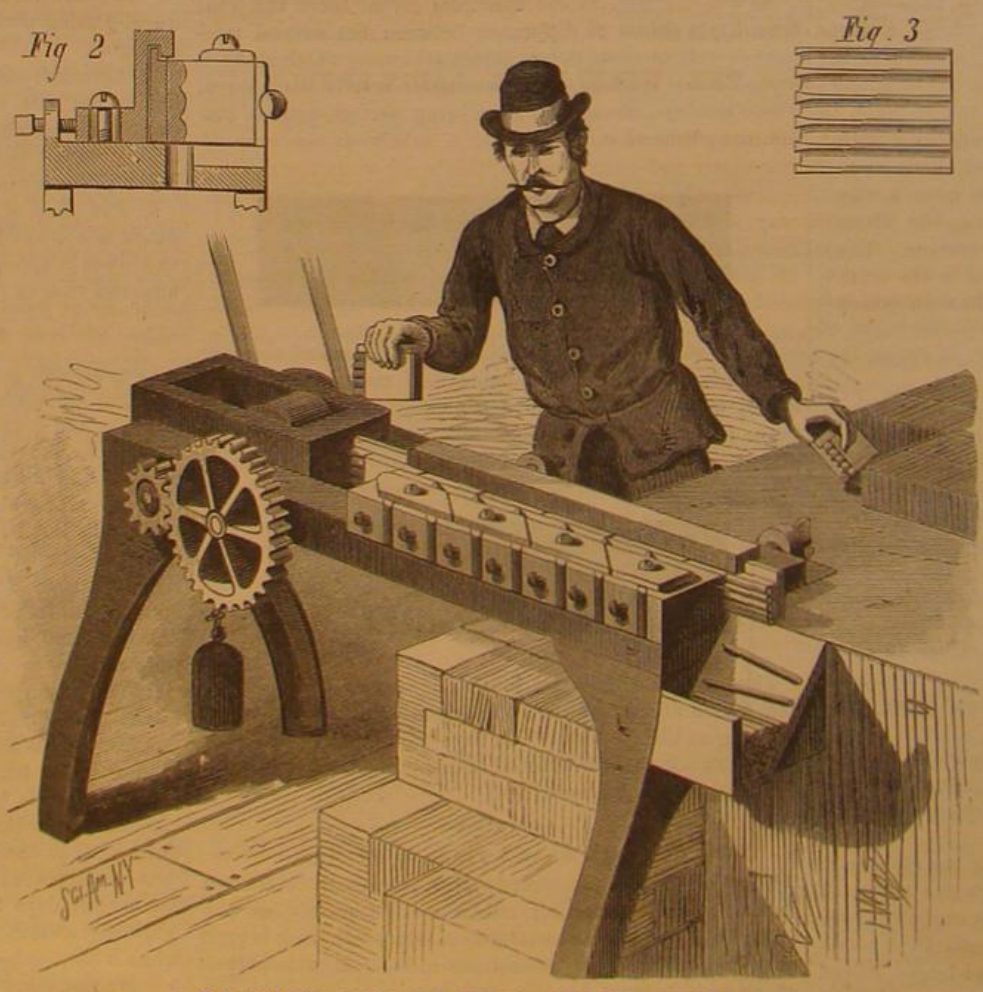
The bed of the machine has a series of diagonal slots, in which multiple knives, shown in Fig. 3, are clamped by set screws. These knives differ in form and in the size of their curved cutting edges, and the smaller knives succeed the larger ones in acting on the slate blanks.

Opposite the cutting edges of the knives there is a groove adapted to slides capable of carrying blanks, from which the pencils are made. At the receiving end of the machine a frame arranged to slide lengthwise of the main frame is pushed forward by a cam and drawn backward by a weight.

The slate blanks from which the pencils are made are brought to a uniform thickness and length, and are placed on the slides, and put in the machine, one at a time, as the sliding frame falls back.

When the cam pushes the frame forward the slate blank is pushed through the first set of knives. When the next blank is pushed forward in the machine the first one is pressed beyond the second set of knives, and so on. When the blanks emerge from the machine after the first cutting the pencils are half formed.

The blanks are reversed and again put through the machine, when they are separated, and the finished pencils are delivered in a receiver at the end of the machine. This machine is the invention of Mr. J. C. Richards, of Brooklyn, N. Y.



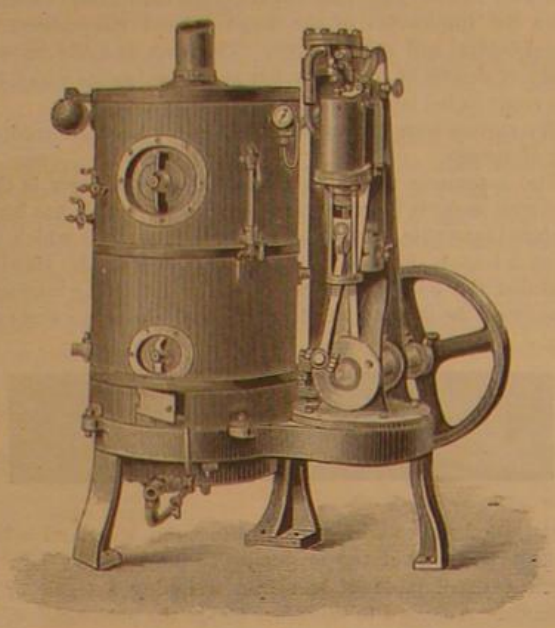
MACHINE FOR MAKING SLATE PENCILS.

Remarkable Locomotive Explosion.

On the night of the 23d of January, 1881, a freight engine on the Philadelphia and Reading road was sent out from Palo Alto, Pa., to bring in a train of loaded coal cars from a siding. An hour later the engine was found a mile beyond the siding with all the crew—engineer, conductor, and two brakemen—dead and terribly mutilated. The boiler had exploded, tearing the engine to pieces and killing all the men. As the explosion occurred in a very lonely place and all the men were killed, no details are known.—*Railway Gazette.*

ENGINE WITH GAS-FIRED BOILER.

The annexed engraving, which we take from *Iron*, illustrates a useful vertical engine combined with a gas-fired boiler, which was lately exhibited at the Agricultural Hall, Islington, for the first time, by its designer and manufacturer, Mr. E. S. Hindley, of Burton, Dorset, England. The engine is self-contained, occupies a very small space, and works without vibration, all the parts being strong and well proportioned. It can be supplied separately from the boiler, and either thus or in the combination which we illustrate is



ENGINE WITH GAS-FIRED BOILER.

reported to do excellent work. The boiler contains a large number of brass tubes running the entire depth from top to bottom. The gas is burned in a chamber below mixed with air, the burner being so constructed that any one or more can be lighted so as to vary the consumption to the power required. No attention is required besides occasionally regulating the feed-water cock; steam is raised in about thirty-five minutes, the boiler is neatly lagged with mahogany, and there is a feed-water heater supplying not only the boiler with water at over 200°, but supplying a large quantity of hot water besides for other purposes, and which costs nothing to heat. This renders it valuable for many trades requiring hot water, and also in stables. It is so safe from risk of fire that some of them are at work in the midst of hay and straw—cutting chaff, etc.

MISCELLANEOUS INVENTIONS.

Mr. Philip A. Palmer, of Chicago, Ill., has patented an improved means for treating teeth, and for preserving work done upon a tooth while permitting access to the pulp cavity for treatment. It consists of a hollow screw, into the outer extremity of which a smaller screw is inserted, which can be removed to permit access to the pulp cavity and replaced. Teeth may be filled or recrowned by the use of this device in cases where, without it, filling or recrowning would be impracticable. The patent covers broadly the use of hollow pivots with central removable stoppers for dental purposes.

Mr. Charles J. Schumaker, of Alleghany City, Pa., has patented a novel puzzle-game board, which consists in a sheet or board having twenty-one numbers arranged in the form of an octagon, which numbers are connected with each other by a series of rectangular and radial lines. Each number is provided with a pin, and to solve the puzzle all the pins must be taken out by one pin, by means of jumping over the others upon vacant numbers, and when the last pin is taken the player's pin must jump into a number that has been previously designated.

Mr. John F. Hoffman, of Cincinnati, Ohio, has patented a new paint for application to tinned roofs and other structures exposed to the weather. The ingredients are light dead-oil of coal tar obtained by distillation and treated with quicklime, rosin, and asphaltum, melted and mixed by heat in certain proportions.

Mr. Henry Textor, of Brooklyn, N. Y., has patented an improved sewer trap which will prevent the flow of back-water, and which cannot become clogged by sediments or floating matter. A hemispherical or cup-shaped vessel is connected with the sewer and provided with a cup-shaped strainer containing a hollow metal float which is raised by back-water and pressed against the lid of the vessel. The latter is provided with a central aperture and is covered by a strainer held down on the vessel by a removable screw clamp. An opening provided with a screw plug serves for cleaning the trap.

Mr. Henry B. Sherwood, of Westport, Conn., has patented a tool handle for hand-weeders, currycombs, and various other tools, which is firm, strong, and durable. The wood handle is formed with a transverse borehole and two grooves leading therefrom to the end, upon which is placed a ferrule. The wire shank is passed through the hole and bent down into the grooves, in which the ferrule holds it securely when applied. The ends of the wire are then spread apart and may be secured to the tool by riveting.

Mr. Henry D. Starr, of Texana, Texas, has patented an improved bale-tie buckle, so constructed that the bale can be easily and quickly tied, and it will hold securely. The buckle is made of a plate having four transverse slots formed therein, thus forming five crossbars, and having the second bar rounded or thickened to adapt the buckle to be hinged to one end of the tie, and also having its fourth bar stamped into a loop form to receive the other end of the band.

Mr. Edward P. Haff, of Brooklyn, N. Y., has patented a razor strop so constructed as to present on one side a fixed oval strop, and on the other a flexible strop the tension of which may be regulated.

Mr. John A. Moore, of Woodville, Tenn., has patented a combined cotton scraper, chopper, and cultivator, so constructed that the cotton will be scraped, chopped to a stand, and dirted at one passage along the row, and which can be adjusted to work closer to or further from the plants and at any desired depth in the ground.

Mr. Frederick W. Jackson, of Watkins, N. Y., has patented a wall paper exhibitor by means of which any number of samples can be exhibited rapidly and advantageously. An endless carrier is formed of a close series of slats movable in guide grooves. The slats to which the samples are attached are provided with studs which are engaged by a median spur wheel for turning the series. The samples are displayed upon an inclined apron.

Mr. Edward Barnard, of Rome, N. Y., has patented a quarter boot for horses, which, being an improvement on an invention for which he obtained letters patent No. 237,157, dated Feb. 1, 1881, causes the quarter boot to fit the heel of the hoof more closely and to keep in place better, and at the same time gives the article a neater appearance.

Mr. John B. Shaffer, of Kearney, Neb., has patented a well bucket so constructed that when lowered into the water it will readily fill, which holds the water securely while being raised and when standing in the spout, which can be readily emptied in part or wholly, and which is simple in construction and easily repaired.

Messrs. Charles Tyrell and Edward Kearns, of Norwalk, Conn., have invented an improvement in hat-pressing machines, which provides for more accurate and convenient adjustment and regulation of the pressure in machines for pressing hat-bodies, and which much increases the range of adjustment. The construction is simple and well calculated to secure the ends sought.

Mr. James Hill, of Providence, R. I., has patented a japanning oven, in which a novel construction and a blowing apparatus connected therewith secures a uniform temperature of the air throughout the oven while baking the articles to be japanned.

THE WINKLE, OR LADLE-SHELL.

BY A. W. ROBERTS.

It is impossible to walk on the seashore without being struck by the many strange objects that are cast up and left by the waves only to be swept away again by the next high tide, which, in its turn, brings new and varied forms. A week may pass by without new objects appearing, but, during the next, strange and grotesque forms will be scattered profusely at one's feet. I once commissioned a fisherman friend to procure for me all curious objects that might be cast on his immediate shore. In course of time a parcel arrived, having a promising marine odor; which, on being opened, was found to contain some very interesting objects. Among them was one that, at first glance, might have been taken for a dead sponge, it being eight inches in length, of a light olive green color, and hollow at one end as many sponges are. But on closer examination it proved to be a skeletonized cabbage-stalk, on which was growing a dense and velvety growth of *Ectocarpus*. This I still preserve as a specimen of my earliest ocean acquaintances.

One of the most puzzling and at the same time the most common objects to be met with on our shores are strings of egg cases or capsules of the winkle (Fig. 1). These strings vary from 12 to 20 inches in length, and contain from forty to seventy-five capsules; the first few capsules on the string are always small and barren, the others contain from fifty to one hundred eggs. The young winkles remain in the capsule till all of a jelly-like substance with which each capsule is charged is exhausted, and upon which the young winkles feed. They are now strong enough to eat their way out at the apex of the capsule, where is situated an exit covered with a tough membrane. The young winkles, so soon as out, bury themselves in the sand, all but the extreme end of their siphons, through which they breathe.

When newly laid the egg cases are of a light creamy color. The tough leathery substance of which they are composed is so translucent that by holding it up to the light the eggs are plainly visible. These egg cases are deposited by the winkle when buried under the sand. Several deposits of eggs are made from March till late into the fall.*

It is astonishing that one winkle is capable of producing such an enormous quantity of capsules and eggs, the bodily mass of which seems to far exceed that of the body of the snail itself. Extending along the under surface of the body of the winkle is a long corrugated disk, which is very tough and rubber like. On this the winkle moves, and it is known as his foot. When withdrawing into his shell the foot is the last part of his body that is taken in. Attached to the back part of the foot (see illustration) is an oblong and strongly grained operculum, a horny valve or door that closely fits the aperture of the shell and completely closes it up when the animal is within. The winkle is provided with a large and powerful "tongue" or lingual ribbon, which bristles with thousands of silicious teeth; all these sharp denticles point backward, so that the tongue acts not only as a rasp, but takes a firm hold upon the food.

THE WINKLE, OR LADLE-SHELL.

By many fishermen the winkle is said to be an enemy to the oyster and other bivalves; this is not so, as the winkle frequents only sandy and muddy bottoms, where traveling is easy, and small crustaceans and marine worms, on which it feeds, are plentiful.

In making the illustration of the winkle I purposely placed one in a rocky-bottomed tank, which I knew would cause him to elevate his shell as high as possible to avoid breakage. On no account does the winkle like a rough, rocky bottom, or one composed of sharp shells like an oyster bed.

On the Eastern coast the winkle is known as the "ladle shell," from the fact that the fishermen, when calking their boats, use an empty winkle shell to run the tar into the seams in lieu of a ladle.

The flesh of the winkle is the toughest of all marine food that I have ever eaten, still there is a colony of colored people back of Keyport N. J., known as "Winkle Town," from the fact that its inhabitants live largely on winkles, whose shells line the road side in large heaps. In Europe the winkle is known as the pear-shell, from a supposed resemblance of outline to that of a pear.

The winkle (*Sycotypus canaliculatus*, of Gill, and *Pyrula c.*, of De Kay) is one of the largest shells on the eastern coast of North America, sometimes measuring seven inches in length. It extends as far *north* as Cape Cod, and south as far as Mexico. It is found fossil in the post-Pliocene of Virginia, North and South Carolina, Pliocene of South Carolina, and Miocene of Maryland.

* During the summer season large quantities of winkle eggs come ashore on Coney Island, between Norton's Point and Brighton Beach.

EGG CAPSULES OF THE WINKLE.

Unappreciated Insects.

The *English Mechanic* reports a lecture on "Unappreciated Insects," delivered before the Chester Society of Natural Science, by the Rev. J. G. Wood.

With regard to the title of "Unappreciated Insects," it was a very wide one, said the lecturer, because he did not believe any insect was really appreciated. Appreciation depended almost entirely upon knowledge. Take, for example, the case of the silk-worm. A savage who wears no clothes does not appreciate the silk-worm at all, but looks upon it rather as a noxious insect because it destroys the mulberry tree, the fruit of which he wants for himself. The child saw a bee and grasped it, and the bee stung the child. The latter did not then appreciate the bee in any degree. But when the child came to know something about it, he learnt that the bee furnished the honey he liked so much, and accordingly began to appreciate it. So it was with the whole of the insect world; and he might state what he believed to be an absolute fact, that there was no insect, however insignificant it might appear, or however noxious we might seem to think it, which was not directly or indirectly a benefactor to mankind. He should choose one or two of these insects, which not only we do not appreciate, but which we fear or dislike, or even with the existence of which we are probably utterly ignorant. He would just mention an example of the mode in which insects benefit mankind. Insects were put into this world clearly for the purpose of preserving it and making it fit for creatures higher than themselves, and this they did by eating. It was clearly not likely that clothes-moths were created for the purpose of destroying young ladies' jackets. What was it then they were created for? It must be remembered that the clothes-moth existed in countries where the ladies did not wear any clothes at all, and existed on the earth long before there were any young ladies at all. It must be created for something, and

keeping in view the object of insect life, he found a clew to one reason for the existence of the clothes-moth. The caterpillar of the clothes-moth, fed on wool, which is hair; and hair, by the ordinary agencies of nature, is imperishable. In the Egyptian Room of the British Museum might be seen a wig—a lady's wig—which is as brilliant and as fresh as when it came from the hands of its maker 3,000 years ago. Wool is hair, and hair is wool. The clothes-moth never touches cloth garments while they are in use, and never while the wool was on the back of the sheep that furnished the cloth. Every sheep sheds its wool once a year, scratching it against trees. If the wool were not removed from the trees it would kill the trees, for they would not be able to breathe. The clothes-moth and its insect allies set to work when the wool was done with, and enabled the trees to shoot and grow. It was a curious but a positive fact that if it were not for the clothes-moth and its allies there would not be a tree on the earth, and no human creature could exist on it. So the insect was intended to render the world better for beings higher than itself. His most excellent and respected friend, the cockroach, was not appreciated. People did not like it. He did not know why, for it could not sting or bite. Some people objected to it on the ground that it had a disagreeable smell. The insect was not aware of that fact. Then, probably, human beings had a disagreeable smell to animals. A deer could smell a person a mile off, and as the deer got away as quickly as it could, it evidently thought the person had a disagreeable smell. It was all a matter of taste. As to the cockroach it was often called a black beetle. It was not a beetle, and it was not black. Its color was a ruddy, chestnut brown, which was now becoming quite a fashionable color. They would notice there were two very distinct shapes of the cockroach. There were the male and the female, and there was no possibility of doubting which was which, for they followed the universal law that the male was twice as handsome as the female. It was a fiction of poetry to state the reverse. Cockroaches were always found where there was wasted food. They were never found where food was not wasted, and belonged more to civilized than to savage life. They were never found in the wigwam of the savage. He went on to observe that the cockroach was capable of being tamed. Its use was that of a scavenger. There was one particular use in which it was directly beneficial. Cockroaches were considered noxious insects, but there were others quite as noxious. They were quite as flat, but happily not so large. A person historically inclined might speak of them as "Norfolk Howards," while a musician might designate them as "B flats." The cockroach consumed these insects. The lecturer went on to treat of the earwig, the lace-wing fly, and the goat, all of which he described and illustrated by sketches. Speaking of the gnat, he said it consumed in its life, in an aquatic state, certain animal and vegetable matter which, if not so consumed, would, with the warmth of the sun, produce gases productive of ague and asthma. The grand object of insect life was to eat, and render the earth fit for higher creatures to inhabit.

A Kentucky Robin Roost.

According to the *Times*, of Glasgow, Kentucky, there has been near that place the past month a robins' roost that equals the pigeon roost of olden times.

"A cedar thicket of about sixty acres furnishes the birds a lodging place. About sundown every evening constant streams from every direction pour into the grove, and almost obscure the heavens in their flight. Night finds almost every bush in the thicket bending with its red-breasted load. For the past few weeks lovers of sport for miles around have visited the place, and every night the thicket is illuminated with the torches of men with clubs and sacks gathering the feathery harvest. Mr. Smith has killed over 2,000, and hundreds are carried away every night, but they don't seem to decrease; there are millions of them. Large quantities of them have been sold in town. They are very fat, and make, when well cooked, a dish good enough for anybody."

Seeing that the robin is one of our most efficient destroyers of insect pests – a young robin requiring daily a bulk of such food equal to its own weight – it is probable that every bird killed at the "roost" will cost the country a dollar, perhaps ten times as much. In any case one of these birds "in the bush" is worth a score or more "in the hand" or in the frying pan.

The Gold Gravels of California.

Mr. W. S. Keyes, mining engineer, reviews at great length, in the San Francisco *Bulletin*, the advance sheets of an important work on the "Auriferous Gravels of the Sierra Nevada," by Professor Whitney, formerly State Geologist of California:

The gravels of California are of economic importance, because of the gold which they contain, and because they are so situated that they can be washed with profit. They present phenomena almost identical with those of Australia, and have the advantage of the latter in being better supplied with water and dumping ground. Professor Whitney reviews cursorily the few localities of gold-bearing gravel of the coast ranges in the northwestern part of the State, and then proceeds to consider the gravel region proper. This extends from Mariposa to Plumas, and is very nearly coterminus with the limits of the gold-bearing slates. The hydraulic interest increases in importance as we go north from Tuolumne to Amador county, and reaches its culmination in El Dorado, Placer, Nevada, and Sierra counties. He shows that all the placers must have sprung from the degradation of pre-existing quartz veins, which were probably richer than those we now see. He devotes considerable space to a description of the various mechanical appliances used for saving the gold, and credits Ed. E. Matteson, of Stirling, Connecticut, with the invention of the hydraulic method. The physical conditions necessary for an economical washing of the gravels are particularly favorable along the western flank of the Sierra. Water with a sufficient head is plentiful, and there is a gradual and easy slope from the mountains for a distance of about 70 miles, with a grade of about 100 feet to the mile. This sloping plateau is cut by deep gorges or cañons through which flow the present rivers, and into them the vast accumulation of tailings is dumped. The great depth of erosion may be inferred from a single example, viz.: at Spanish Peak, where the Pliocene gravel beds occur 3,800 above American Valley. The gravels vary in thickness up to two or three hundred feet. Usually, but not always, the lowest portions are the richest. They are found in channels of varying width up to 4,000 feet. Upon the gravels in many localities we find a capping of basalt or volcanic ash. The thickness of this cap, other conditions being equal, determines the method of working, whether by "piping off" or by "drifting."

The fossils of the gravels are divided into three classes: Microscopic organisms, plants, and animal remains. Professor Whitney devotes considerable space to the specimens of human handiwork, mortars, pestles, etc., found in several localities, and relates in detail all the facts attainable touching the fossil human skull found in a deep shaft in the Calaveras gravel measures. He gives two lithographic views of the skull. The finding of this fossil—for fossil it undoubtedly is, because the phosphate of lime has been changed to carbonate—has aroused much controversy, but in view of the proofs adduced we are constrained to accept its genuineness. And in so doing we acknowledge the existence of mankind contemporarily with the depositions of the gravels. Professor Whitney is of the opinion that there was no river or system of rivers running parallel with the present crest of the range. He believes that the whole mass of the chain was originally much higher than it now is. He attributes the formation of the gravel beds to running streams which, during the tertiary age, carried far more water than the present rivers. He denies the possibility of their marine origin, or that they were due to glacial action.

Contemporaneously with and subsequently to their deposition great outpourings of lava and volcanic ashes took place, whereby large areas of the gold regions were covered up. Through these formations the present rivers have cut their way and have formed the deep gorges which we now see.

Discussing the complicated questions touching the economical working of the gravels Prof. Whitney gives an example where a yield of 2·6 cents per cubic yard barely covered expenses. He concludes, however, that under favorable circumstances, a yield of 4·75 cents per cubic yard may be considered the mean minimum necessary for profit. He shows that about 20 cubic feet of water is, on the average, required to move one cubic foot of gravel. He closes with the opinion that hydraulic mining will continue for very many years, unless the injury from the *débris* shall be too great to be endured. "And," he says, impressively, "there is no part of the world where scientific oversight and judicious legislative interference is more desirable for the future welfare of the community than in the Sierra Nevada of California."

The Mineral Belts of the Great West.

The *Tribune*, of Denver, Colorado, is anxious that a National Mining Exposition shall be organized at that place. In an article setting forth the advantages of such an exhibition, it says: "There have already been ascertained to be four well defined longitudinal belts of silver mines between the eastern base of the Rocky Mountains and the shores of the Pacific. First, the Colorado and New Mexico belt; second, the Utah and New Mexico belt; third, the Nevada and Arizona belt; and fourth, the California and Old Mexico belt. According to Professor Rossiter W. Raymond, this latter belt extends along the east base of the Sierra. There are many transverse sections all through the mountain regions, but these great belts of mineral are sufficiently well defined. The attention of the floating capital of the country is attracted to the districts traversed by these mineral deposits.

"Railroad lines are penetrating into and through the mountains. Colorado is already handsomely provided for, and the great Southwest will be gridironed at no distant day by lines already projected. With these transportation facilities Denver will become, if she is not already, the center of the great mining industry, and an exhibition of the ores of the royal metals alone, and appliances for mining them, would be warranted. But aside from these, there are coal fields in Gunnison county, New Mexico, and the Southwest, whose importance will not be long in attracting attention, and such minerals as antimony, gypsum, quicksilver, zinc, graphite, and even cinnabar, exist in our mountains. The mining of all these mineral substances is important, and their display would have a growing interest in this community. Even such coarse material as slate, limestone, and building stone of all kinds would command no small attention among practical men, while the various crystals and fossils and rare petrifactions would prove an attractive artistic feature to a general mineralogical exhibit."

Correspondence.

Hearing Noises in the Sun.

To the Editor of the Scientific American:

For a couple of months past there have appeared in all the papers accounts of certain efforts on the part of Professor Bell to reproduce, by means of the photophone, the noises which accompany the solar disturbances. But I have looked in vain for any statement of the error in the assumptions on which these experiments are founded.

If we have a beam of light of varying intensity falling on the selenium cell of the photophone, the instrument will give out sound; but it by no means follows that this sound is a reproduction of any previously existing sound.

Suppose the light of a lamp to be thrown on the cell, and a screen be made to pass rapidly back and forth across the path of the rays. The alternate light and darkness thus produced would certainly give a sound in the instrument, yet the lamp may burn and the screen may move absolutely without noise.

It is only when the variations in the light are originally produced by the action of the pulses in the sound medium that the sound given out will be a reproduction of a previous one.

Furthermore, the intensity and character of the sounds in the photophone depend upon the degree and rapidity of the variations in the light.

Now, in the case of the sun we have no assurance that the requisite conditions exist to enable us either to reproduce the solar noises, on a small scale, or to originally produce anything similar to them. We certainly cannot say that the variations in its light come from the rays having been modified by sound waves in the solar atmosphere; nor is there any reason to believe that they are at all naturally proportional to any accompanying sound; and until one or the other of these conditions is shown to be a fact, it seems to me that the results of Prof. Bell's experiments will continue to be, as hitherto, "not wholly satisfactory."

W. V. BROWN.

Cambridge, Mass., February 19, 1881.

Sun Storms.

It is pitiful to witness the condition of the sun. The great fire-ball is in intense commotion. His surface is seamed and scarred in every direction, with black spots that indicate the disturbing elements at work in his chaotic mass. Occasionally, for a day or two, the blemishes disappear, and the glorious king of day shows a face like a shield of glowing gold. But the aspect quickly changes; spots come rushing in all directions and assuming all forms. They appear singly and in pairs, and again in groups and rows. Immense groups break up into small ones, and small ones unite to form great chasms, into which half a dozen worlds might be dropped and there would still be room for more. Sometimes the spots are visible to the naked eye, and at that time a good opera glass or a spy glass will make them easily perceptible. Hundreds of observers all over the world watch the sun's face every clear day, and keep a record of the number of spots, their size, and the direction in which they move, for as the sun turns on his axis they turn with him, some of them remaining for months without much change, some taking on new forms and some disappearing entirely. Very little is known of this mysterious sun or the spots that are visible more than ninety millions of miles away.

Once in about eleven years the sun takes on his present sun-spot phase, and we are approaching the maximum of disturbance. No one knows the cause. Some believe that it is planetary attraction, some that it is the fall of great masses of meteoric matter, and some that it is the result of internal commotion and the rush upward of gaseous explosions in comparison with which our fiercest volcanic eruptions are but the flicker of a flame. Besides the sun-spot agitation, the gaseous outbursts are marked and vivid. The tongues of flame or rosy protuberances are darting forth in all directions and bearing their testimony to the solar commotion. Mr. Trouvelot, of Cambridge, who makes daily observation of the sun's chromosphere, gives a graphic description of a remarkable solar protuberance that he witnessed on the 16th of November. When first seen it was large and complicated, extending upward from the sun about a hundred thousand miles. Three or four hours after it had developed into huge proportions, extending far out into space, and vanishing gradually to regions where it could not be perceived. As nearly as it could be measured, it reached a height of over a quarter of the sun's diameter, or about two hundred and thirty-five thousand miles. Such a protuberance hurled upward from the earth would almost reach the moon! Two hours after, the whole structure had collapsed, and was only about eighteen thousand miles high. Observations like this give an idea of the mighty forces at work in the solar orb, and make observers long for the time when a satisfactory solution may be found for this mysterious periodical solar disturbance, so intimately connected with the meteorological condition of the earth.—*Providence Journal.*

Tea Curing and Packing in Foochow.

The following quaintly-worded, yet very graphic description of the work done in a large Chinese tea packing house, is given by the Foochow *Herald*, at the close of a season's operations:

A large tea packing house presents a very different scene from that two months ago. Then, at the door one found lines of fifteen catty boxes and waiting to be soldered up. Now, none. Next, one found fat bags stacked up eight or ten feet, bursting with Pehling tea that escaped here and there through holes temporarily stopped with bamboo leaves; the bottom of the bags mostly stained from contact with wet flights of mountain stairs upon which the exhausted cooly had set them down on the passage.

Now, one finds but empty chests, hundreds in number, square, deep, and oblong, used for handling the tea in the factory. Ordinary tea chests would not stand the rough usage.

Farther on, one came to the dozen long double row of sifters facing each other, forty in a row, the mesh of some taking a pencil—that of others refusing a pencil point—sifting tea leaf rough and bold, that after a persuasive grasp or two in the hand broke, and consented, after a few shakes in the sieve, to be stripped of some of the sappy leaf edges and to appear below, the even and uniform leaf which tea the drinker insists he must have (plus the dust due to the persuading). The transformation in a rough leaf on passing the meshes of a coarse sieve, with a gentle crush from the sifter's hands, enhances a rough, bold tea much in value.

In place of the rows of men then seen, tilting and jerking their sieves in a monotony only broken by the Cantonese taskmaker's roll-call twice a day before the general meal of fish and rice, there is now to be seen only the bare floor of hardened earth, piles of empty benches stacked in a corner, and the sieves of the twelve different sizes used, each in its division in the three-story stands.

The dozen or score of fanning mills are still now. The trained hands are gone that turned the cranks with a uniform motion; sending the heavy tea, light tea, and flaky dust each down its respective spout separated, never again to meet, unless haphazard, mixed in a Whitechapel grocer's window.

The tea leaf separated in these fanning mills has been parted with at the smart loss of Tis. 8,000 on 3,500 piculs to the foreign buyer, and has been let go by the latter to the London dealer or auction room habitue. The mills now stand still. The tea growers in the hills who waited through June and July for their money have now been paid. The losses to the packers here, however, have been so smart that there is little third crop tea now being packed in Foochow, and the mills will rest until another May shall bring the physical courage bred of hot blood back to the pale and dispirited native teamen. There are stacked up in this huge go-down a few hundred packages of a native maker's brick tea wrapped in plaited bamboo strips, bound in half bamboo and triply rattanned. Aside here, the Chinese upper millstone is being turned upon the nether by a Chinese who is grinding the seeds left by the fanning mill.

In these sycee boxes sharp spades are falling upon the tea stems, chopping them fine enough to go into the stemmy dust mixture to which the seed dust gives the strength, while the chopped stems vouch for it being tea.

In the firing house, four Chinese rice kettles, two feet across the mouth, set obliquely across the edge, turn the tea back in a shower over the hand of the stirrer, a wood fire being kept up in the brickwork underneath. Fire holes, scores in number, follow in rows the walls of the firing house; in each an iron pan is placed, now filled and rounded with charcoal ready to be lit. Placed over each of these fires is a huge hour-glass-shaped basket-hood or muffler that shuts in all heat of each fire to but one outlet—that through the tea sieve that chokes the throat of each basket.

In these baskets is dried off the tea that comes in from the hills wet or flat from constant down-pours and from the first fermentation of the leaf. These fires are out and all is still.

Here too, on the floor above, the benches are empty where girls and women came—some too often—to throw out the stems from the leaf, getting half a cent for removing those from the two catties of tea given them in wound bamboo-woven trays.

The floor is now bare where we saw the Ningteh tea brought to a uniform shade, by shaking in bags with a few spoonfuls of lampblack; then balked upon the floor, only to be strewn white as a grave in spring with the pure muhil blossoms; then blossoms, in turn, buried under another avalanche of funeral tea, and this again with blossoms, life upon death; then both were rudely mingled together and put away in boxes for a night till the fragrance should have been robbed by the dead tea, and the faded flowers be thrown aside, spent and worthless.

Our round finishes at the shed where Chinese lads, out of long sheets of lead, are glibly making lead cases by moulding them, hatter-like, upon a box, and then running the soldering iron along the edges. Here Chinamen in their natal costume, beside this huge four-hogshead vat of hot water, are washing off the dust and sweat of the day. Here are piles of wood for the hot tea-coppers, crates of up-river hardwood charcoal for the firing pans and firing baskets. We must leave without the sight we then had of the mad dervish dance of two Chinese, who, given a dozen pounds of tea stems under their sandals in a tray, performed about the interior periphery a double shuffle, twist and grind of the enemy under the heel, that is cooler for the spectator, the thermometer in the nineties, than for the performers, from whose bodies the perspiration rolls into the tea stems below.

The box factory is elsewhere. We enter on our homeward way. It is another old disused tea hong occupied by foreigners in the days when money was made, tumbledown now and abandoned to Chinese. Inside, a few Chinese youth eating a dollar's worth of rice per month, are rapidly gluing and dovetailing together, by rough wholesale strokes, boxes by the score. Few nails are used, for these are hand-made and cannot be afforded. What a bungling "mending" the merchant will pay for when these frail cases reach the land of rough usage and coarse nails!

Here you see a bit of thin tea-wood, there a bit of paper gaudily daubed with cardinal colors, a stroke or two, side marries end, the gaudy paper cover hides all joints, and the catty boxes, gay with bird, butterfly, dragon, and phœnix, are *en route* to be stared at in a provincial grocer's window.

The only foreign devices we have noted in those busy establishments, where in the season 500 men and women are busy from daylight to dark, are a Fairbanks scales and a Canton-made fire engine. Two red tapers stuck in the earth at the door burn for good luck, and good luck we must wish the patient set who work here.

Nearly 2,000 piculs this season have passed the sieves, one might almost say, a leaf at a time. And so this year, of hundreds of packing houses, some in hamlets in the hills, some, as in Foochow, in cities ten to fifteen miles from the hills. Women have carried, each her picul, up and down the mountain pathways, twenty-five miles a day, not complaining of the bent backs, nor once rudely jostled or insulted by "foreign coolies" from outside districts who come starving their way toward the work offering, their only food a double handful of salt in their girdle to bite at before they drink along the road. Boatmen at river marts have fought pitched battles for the tea, upon the transport of which depended their livelihood.

Probably all the tea leaving Foochow has been lifted up and down as most as if it had been carried up one side of the great Pyramid and down the other a score of times. Plenty of men have been ready to fight for the privilege of carrying it; plenty of women, too, under their loads behind their new husbands.

IMPROVED COFFEE POT.

The annexed engraving shows an improved coffee pot, which is claimed to be a very superior article, and capable of making coffee of a uniformly good quality, where a good properly roasted and ground berry is used. The coffee, C, is placed in the wire cloth sack, S, suspended from the flange, R, at the top of the pot. A trap, T, covers the inner end of the spout and prevents the escape of vapor.

The construction and management of the pot are very simple, and it has the indorsement of a large number of persons who have used it.

Further information may be obtained by addressing the Ideal Coffee Pot Company, 622 Filbert street, Philadelphia, Pa.

The New Mill of the Willimantic Company.

The new thread mill of the Willimantic Linen Company is said to be the largest and finest structure in the world devoted to the manufacture of spool cotton, and also the most capacious cotton mill anywhere on a single floor.

The main building is 820 feet by 174, with two porches at the ends 30 x 40 feet each, and two wings 80 x 60 feet, three stories high. The first girders are supported by 707 columns, 12 inches in diameter, while 353 columns on the main floor support the roof. The walls are chiefly glass resting on brick piers. The roof is also largely of glass, the dark part being covered with felt overlaid with asphalt and gravel.

Internally the mill is divided into five sections, each complete in itself and driven by a separate Porter-Allen engine of 250 horse power, making 350 revolutions. The power is distributed by steel shafting running the entire length of the building, that of each section being coupled directly with its engine. No belting over 2½ inches wide is employed.

The boiler house is 80 feet square, and covers two batteries of eight boilers, each boiler of 80 horse power. The chimney is 16 feet at the base and 153 feet high.

The mill is lighted throughout by Brush electric lamps. The generators are in the center of the building on the basement floor. One supplies 18 lamps of 2,000 candle power, the other is a 40-light machine.

Ring-frame spinning is employed throughout, the yarn ranging from No. 50 up to No. 120. The entire process of thread-making is completed on the main floor, which is 820 feet by 175 feet.

The architectural design and finish of the mill are elaborate. In all the windows are ample boxes for window-gardening. In the three towers are large water tanks of 30,000 gallons capacity each, to supply the closets and for other uses. The four entrance porches are neatly fitted up and supplied with wardrobes, each operative being given a numbered compartment. The spacious main entrance leads to the inspecting room, 60 x 80 feet, tastefully finished, opening upon the main room. Here, says a reporter of the *Economist*, to whom we owe these particulars, "a view, grander than was ever seen in any mill, either in the Old World or in the New, is afforded. The wide sweep of perspective, broad and ample, the long rows of windows bordered with stained glass above, and fringed with the bloom of plants and flowers below, the solid floor shining as clean as if waxed for the occasion, the whirl of spinning frames, the long white rows of bobbins and spools, the numerous lines of contented but busy operatives in their clean attire, white and neat, as the color of the skein so deftly shaped into thread for spools, all tend to form a busy, changing, stirring scene not to be forgotten."

In one of the wings is the dining-room provided for the operatives. The room is light and cheerful, and fitted up with the appliances needed for serving hot lunches.

The mill is located on the north bank of the Willimantic River, and from its high elevation commands an extended view of the surrounding country. Some idea may be formed of the skill and energy displayed in its completion, when it is stated that the site it occupies was a pine forest up to the first of March, 1880. During the first week of that month the excavations for foundations were commenced, and during the second week the timber was cleared away. In the short space of ten months the most beautiful and complete thread works of the country, or of the world, were erected, and thousands of spindles set running in the manufacture of six-cord spool cotton.

Glass Eyes.

A reporter of the Chicago *Inter Ocean* has been investigating the trade in glass eyes. From the leading dealer in the West, a firm which has sold glass eyes for many years, he learned that there were as many as a thousand wearers of them in that city, and that from 600 to 800 eyes are sold there every year. The best eyes are made at Uri, in Germany, the manufacture centering at that place on account of the occurrence there of fine silicates and other minerals needed in the business. The German eyes withstand the corrosive action of tears and other secretions better than those made in France.

At Uri are made also vast quantities of eyes used by taxidermists in mounting birds, animals, and other natural history specimens, besides a superior quality of glass marbles, known to boys as agates.

The artificial eye is a delicate shell or case, very light and thin, and concave so as to fit over what is left of the eyeball. The shell is cut from a hollow ball or bubble of glass, the iris is blown in, and then the whole is delicately recoated.

The trade in Chicago has undergone a curious change. Twenty years ago there were sold very many more dark eyes than light, but from that period on the sale of dark eyes has been perceptibly dying out. Now nearly all are light eyes, say twenty light to one dark. In Boston the percentage is even larger, about thirty-five blue or light eyes to one brown; while on the other hand, in New Orleans fifty brown or dark eyes are sold to one light. Regarding the change of color in Chicago of course fashion has nothing to do with it. No one has yet decreed that party-colored optics shall be the rage. The change simply shows that the influx of population has been from the East principally and from northern Europe.

Surgical operations are performed much more skillfully than formerly. Time was when it was deemed necessary to take out the eye entirely. Then the artificial eye became a fixed, glassy, staring object. Now amputation of portions of the eye can be performed in very many instances, and the glass eye fitted on the stump, which moves quite naturally.

Sometimes those who have lost an eye will keep two or three artificial substitutes. They will use one for the daylight with a small pupil, and another for night time with a large pupil to offset the dilatation.

Flexible Shafting for Tower Clocks.

Philadelphia has recently adopted a time ball similar to that used in this city. The automatic apparatus for dropping the ball at noon was devised by the builder of the clock, Mr. G. W. Russel, the city time keeper. To a delicate hair trigger the armature of a magnet is attached, so that when the electric current is passed through the magnet the movement of the armature sets off the trigger and lets the ball drop.

The current is sent to the magnet in a very simple manner. In the clock are three wheels, one of which revolves but once in twenty-four hours, the other once in one hour, and the other once in a minute. In each of the three wheels is a notch, and, of course, these three notches can be in the same straight line but once in twenty-four hours. This occurs on the completion of the last second before noon, and then a lever attached to the escapement drops into the notches, completes the electric circuit, and sets off the hair trigger.

The time ball is placed above the clock tower of the Union Insurance Company's new building at Third and Walnut streets, and is visible from a long distance.

Owing to lack of space it was found inexpedient to put the machinery of the clock in the tower, so it was placed in a separate loft and connected with the dial by flexible shafting. This avoids obscuring the skeleton dial by the boxing that would have been necessary with the usual right angle connection. Mr. Russel claims that this is the first application of flexible shafting to tower clocks, and that the result has been satisfactory. The time is taken daily from Washington.

Business and Personal

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

BOLETIN DE LA SOCIEDAD DE GEOGRAFICA Y ESTADISTICA DE LA REPUBLICA MEXICANA. Mexico, 1880.

The latest installment, consisting of parts 4, 5, and 6, vol. v., of this excellent periodical, published by the Mexican Geographical and Statistical Society, has just reached us, and its contents well sustain the high character possessed by the preceding numbers. Among the principal papers worthy of note in this issue are: Report on the Results of an Exploration of the Metalliferous Regions of the Sierra Mohajada, by Santiago Ramirez; A Hydrographic Study, by Pio Bustamente y Rocha; The Ores of the Sierra Queretaro, by J. M. Reyes; and a General Resume of the Mortality in the City of Mexico during the year 1879, by M. Flores Heras. In addition to these and several other original papers, there are numerous translations from foreign scientific works of subjects coming within the scope of the society's investigations, and forming altogether a collection of considerable scientific interest.

INDIA RUBBER, AND "VULCANIZED RUBBER FABRICS ADAPTED TO MECHANICAL PURPOSES."

This is the title of a handsome book just issued by the New York Belting and Packing Company. It gives thorough details of the manufacture, as carried on at the works of the Company at Newtown, Conn., and is beautifully illustrated. It is only intended for distribution among their customers, but those who use rubber belting, hose, packing, springs, etc., will undoubtedly find here much that is peculiarly interesting, and that will enable them "to care more understandingly for the preservation and prolonged wear of rubber goods," as well as to "discriminate more closely in their purchases, and avoid such products as are of imperfect or unskillful manufacture, or made with injuriously adulterating compounds." The book also contains a full description of their manufacture of vulcanite emery wheels, and the improvements they have made in this direction, whereby their emery wheels are in demand for the best class of work abroad as well as at home.

THE "GAS ENGINEER'S" DIARY AND TEXT BOOK FOR 1881. Birmingham, England: John Wright & Co.

The second annual edition of this work, prepared for the subscribers of the *Gas Engineer*. In addition to matter of special value to the gas manufacturers of England, the volume contains a series of original articles on gas manufacture and apparatus, and several tables of use to gas engineers everywhere.

DIE MATERIELLEN VERHALTNISSE UND VORTHEILE FUR EINWANDERER IM STAATE KENTUCKY. Frankfort: Kentucky Geological Survey and Bureau of Immigration.

A pamphlet for free distribution among Germans, describing the resources of Kentucky and the opportunities the State offers for colonization; together with a number of photographs of scenery in sections available for immigrants seeking cheap lands.

U. S. COMMISSION OF FISH AND FISHERIES. PART VI. REPORT OF THE COMMISSIONER FOR 1878. Washington: Government Printing Office. 1880.

A fat volume, giving, in addition to the Commissioners' report of the year's operations of the Fish Commission and a statement of the importance of the work it has undertaken, nearly a thousand pages of matter relating to fish, fish culture, and kindred subjects. These reports are becoming a library in themselves, and one whose significance and value are very imperfectly apprehended by the public generally.

NAVIES OF THE WORLD. By Lieut. W. Very, U. S. N. New York: John Wiley & Sons. 8vo, pp. 451.

Lieutenant Very has undertaken to describe concisely the plans, armament, and armor of the naval vessels of twenty of the principal nations, and to give the latest developments in ordnance, torpedoes, and naval architecture. His point of view is that of the naval officer rather than that of the engineer or ship builder, though he does not neglect the architectural developments of the past decade or two. An interesting chapter is devoted to the principal naval engagements since 1800.

THE SILK GOODS OF AMERICA. By Wm. C. Wyckoff. New York: Published under the auspices of the Silk Association of America. $3.

The second edition of Mr. Wyckoff's account of recent improvements and advances of silk manufacture in the United States. The new part comprises the Eighth Annual Report of the Silk Association, summarizing the progress of the year 1879, which, as our readers already know, was extremely encouraging. The directory of manufacturers and dealers in silk covers 38 octavo pages, indicating a rapid extension of the silk industry.

FIVE LITTLE SOUTHERNERS. By Mary W. Porter. Boston: D. Lothrop & Co.

A children's story of child life on a sugar plantation, with a tragic conclusion in a hurricane on the Gulf.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) A. H. asks (1) for the process of coating or plating small polished steel articles with tin (or a composition similar to it), by dipping the articles into the melted metal and have a good smooth, bright surface when taken out. A. *a.* Boiling water, 12½ lb.; ammonia alum, 17¾ oz.; add protochloride of tin, 1 oz. Dip the articles in hot potash solution, then rinse in clean water, dip in dilute sulphuric acid, and suspend in the tin solution for a few minutes until bright. *b.* Bitartrate of potassa, 10½ oz.; water, 17 oz.; protochloride of tin three-fourths oz. Immerse in this the cleaned articles in contact with a piece of zinc until tinned. *c.* Pyrophosphate of soda, 11 oz.; water, 17½ oz.; protochloride of tin, 4½ oz. Dissolve. Connect the cleansed articles with a wire from the zinc pole of a battery and immerse in the solution, the vessel containing which should be lined with pure sheet tin connected by means of a wire with the copper or carbon plate of the battery. In Wegler's process the bath consists of stannic chloride, 1; water, 10. The articles are pickled in dilute sulphuric acid, scoured with fine sand or scratch-brushed, rinsed with clean water, loosely armed with zinc wire or ribbon, and immersed for ten or fifteen minutes at ordinary temperature. Rinsing and scratch-brushing follows, after which whiting is used for finishing. 2. Will the same process do as well to coat or plate polished brass articles, and give a bright, smooth surface? If not what different process will be necessary? A. Yes.

(2) E. J. C. asks: 1. Will a steam gauge fixed upon a boiler during the hydrostatic test show the pressure within the boiler the same as it will show the pressure of steam? A. Yes. 2. I have a model oscillating engine, 1 inch by 2 inch cylinder. The valve faces are 1¼ inch by 2¼ inches. How can I lubricate these faces while the engine is running? A. With a proper lubricator cup attached to the steam supply pipe or steam chest. 3. What should be the weight of a fly wheel for the above engine, running with 15 lb. of steam and driving the belt from a 2-inch wheel on the shaft? A. 12 or 14 lb.

(3) C. P. asks: 1. At what temperature will a bar of soft steel, say half-inch in diameter, sustain the greatest weight? A. We know of no experiment to determine this point, but if steel behaves in the same manner as wrought iron, its greatest tensile strength is between 325° and 400°. 2. Are car wheels more liable to break in very cold weather, because the wheels are affected by the cold, or because the road bed is frozen, and consequently is not elastic? A. Yes from both causes. 3. Will a steel spring break quicker at a temperature 40° below zero, than at 40° above zero? A. Yes, especially if there be any sudden movement or jar. 4. Will a railrod sustain more weight at 40° below zero than at 40° above zero. A. No. 5. At what degree of temperature will a chain stand the greatest strain? A. From 325° to 400° Fah. 6. Is the power of cohesion in wrought iron the strongest at a very low temperature? A. No. 7. Is the power of cohesion in gray iron the strongest at a very low temperature? A. No.

(4) J. E. F. asks if the lumber for a boat bottom below the water line should be green or dry. A. All lumber used in the construction of a boat should be dry or seasoned.

(5) D. J. L. asks: 1. Is it safe to blow off steam with 60 lb. pressure and two gauges of water while the engine is running? If it is safe to do this, how low should I allow the water to go? I have blown off steam at 60 lb. on Saturday, and on Sunday at noon it will have water to the bottom of the glass. How can I remedy it? A. It is safe, but when the steam is blown off the water should be above the usual height to allow for evaporation over Sunday, and have ample supply for raising steam on Monday morning. 2. The polished parts of my engine become rusty quite frequently from water dropping on it. What can I get to keep it bright without using emery? A. Use pumice stone and oil. 3. I have a glass tube on the water gauge which has iron rust burnt into it, what can I get to clean it? A. Try vinegar or dilute sulphuric acid.

(6) C. H. F. asks: 1. Do the compressed air motors of to-day generate their own pressure while in motion, or do they have to be charged before leaving a certain place and stop to get charged again when the first is exhausted? A. They are charged at the stations. 2. Is there in existence, to your knowledge, any device whereby a greater head can be put on at a water power without increasing the natural head? That is, a greater head with the same dam, amount of water, and same mill machinery. A. No. 3. What does the term "perpetual motion" mean, or apply to? Does it needs be some machine that will not wear out and run perpetually, or one that will run perpetually if replaced when worn out by friction? A. A machine that will run without extraneous aid until its parts are worn out. 4. What is the reward, and by whom offered, for perpetual motion? A. The laws of force are now so well understood that any one acquainted with the rudiments of the subject would never think of offering a prize for perpetual motion.

(7) G. G. writes: Suppose I order two 3-inch governors from the manufacturer, one to run 100 revolutions and the other 170 revolutions per minute, what will be the difference in the construction of the two governors? A. With many governors there would be no difference, as means are generally provided for adjustment to the speed required.

(8) G. H. W. asks: Will opening the windows of a stamp mill diminish the noise in the mill? A. We think not.

(9) F. T. D. L. writes: I want to get a light boiler for an engine the cylinder of which is 1½ inch bore by 3 inches deep, to run at 300 revolutions per minute, with a pressure of 50 lb., but of enough strength to stand 100 lb. It is for the purpose of running a small boat. Could it be heated by naphtha lamps? I would like to know what size the smallest and lightest boiler I could use would be. A. You should have a vertical tubular boiler with 1½ to 2 square feet heating surface. Such boilers are not on sale; they are only made to order.

(10) A. M. P. writes: In making a strength test of brick, will a column have greater pressure in an upright position than in a horizontal one, provided the whole weight is thrown on the brick? A. There will be no difference, if the weight of the column itself be taken into account.

(11) W. G. A. asks: Does water in a boiler get hotter than 212°, that is, if the boiler has 125 or 150 lb. of steam, does the water attain a greater heat than boiling point to generate steam to that pressure? A. Yes, the temperature rises with the pressure of the steam. It may be heated to very high temperatures, providing the containing vessel is strong enough to withstand the pressure.

(12) C. F. H. asks: 1. How can I make a gallon of silver plating solution? A. Dissolve 5¼ oz. pure nitrate of silver, and 8 oz. pure cyanide of potassium in 1 gallon of soft water. 2. How can I make a gallon of nickel plating solution? A. Dissolve three-quarter lb. of the double sulphate of nickel and ammonia in a gallon of soft water. 3. How many quart gravity cells will it require to plate medals of about an inch and a half to two inches in diameter? How large should the positive pole be in relation to the negative pole or the thing to be plated in the solutions? A. See nickel plating, page 153, vol. xliii., and page 81, vol. xliv., SCIENTIFIC AMERICAN.

(13) E. W. K. asks: What process if any will take fly specks from bronze? A. Lavender oil, 1 drachm; alcohol, 1 oz.; water, 1½ oz. Use a soft sponge, and proceed as quickly as possible, with little rubbing.

(14) J. B. S. asks for a formula for making permanent black dye for woolen goods, something that will not rub off. This latter trouble is what I am anxious to obviate. Several formulas that I have do not relieve this trouble. A. You will find practical formulæ and directions for black dye in Nos. 53, 54, 55, 74, 75, 76, and 109, SCIENTIFIC AMERICAN SUPPLEMENT. See Hints to Correspondents.

(15) G. W. C. asks: Which gives the most heat, the dry or green wood of same quality and quantity? A. Dry wood.

(16) O. B. S. inquires as to the best method of mending broken ivory. A. Moisten thoroughly a small quantity of very finely powdered quicklime (good) with white of egg to form a paste. Use at once, clamp the parts, and do not disturb for 24 hours. Do not use an excess of the cement.

(17) O. E. W. asks: 1. How can I make a galvanic battery with copper and zinc plates, each 2x2 inches, strong enough so that I can feel the current? What kind of acid shall I use? A. It would require several hundred such elements, joined copper of one to

zinc of next, and so on, and an interrupted current to produce the statical effects required. See "Galvanic Batteries," in SUPPLEMENTS, Nos. 157, 158 and 159. Also "How to Make Induction Coils," SUPPLEMENT, No. 160. 2. How can a cracked lamp be mended so the oil will not leak through? A. Clean the glass thoroughly with strong hot solution of sal soda, warm, and apply over the parts inside and out the following: Resin, 3 parts; caustic soda, 1; water, 5; boil together until completely saponified, then mix with half its weight of plaster of Paris. 3. What kind of wax is it that engravers use to coat the metals that are to be engraved upon by nitric acid? A. White wax, 2 oz.; black and Burgundy pitch, of each, ½ oz.; melt together; add by degrees powdered asphaltum, 2 oz., and boil until a drop taken out on a plate will, when cold, break by being bent double two or three times between the fingers. It must then be poured into warm water and made into small balls for use. 4. Is copper better for a boiler, 6 inches diameter and 12 inches long, than iron? A. Yes. 5. Is the pressure in the cylinder the same as in the boiler? A. No; it is always less, and how much less depends on the length and size of the steam pipes and the manner in which they are protected.

(18) I. K. E. asks: Can waterglass in small quantities be prepared for experiments without expensive apparatus? A. Fine quartz sand, 2 parts; carbonate of soda, 3½; reduce to fine powders, mix, and heat to a very bright red in a crucible capable of holding four times as much. As soon as the mixture is in a state of calm fusion pour out on an iron plate to cool. For use dissolve in hot water.

(19) H. G. E. asks: Cannot eggs, butter, etc., be kept for a considerable period by having them in a vacuum? Could a brick vault be cemented so as to be air tight, and capable of sustaining exterior atmospheric pressure? Would an air pump be the best way of exhausting the air? A. It is not practical; they would doubtless remain unchanged in a perfect vacuum, but that is unattainable by any ordinary means. Such a vault could be constructed; the pressure from without would be equal to about 15 lb. on each square inch.

(20) C. G. W. writes: I am led to believe that the cultivation of and gathering of such sumac as grows naturally in this sandy country would be a profitable industry. The stag horn sumac (*Rhus typhina*) grows here in abundance, other varieties to some extent. A. The best sumac of commerce is the leaves of the *Rhus coriaria*, cultivated in Sicily. It closely resembles the *R. typhina*, or stag's horn sumac, which has proved, when properly handled, to be nearly if not quite as valuable. See article on sumac, on page 199, vol. XXVI., SCIENTIFIC AMERICAN.

(21) C. D. A. writes: 1. I have heard good engineers say that the friction of a valve depended entirely upon the size of the ports, and if there were no ports in the seat, a valve might be held against it, and when the steam was admitted, if the support was removed the valve would drop down; is this true? A. It would drop down. 2. I always supposed that the size of the valve determined the amount of friction. A. The friction depends upon the size of the valve, deducting so much of the ports as may have steam within, and the pressure upon the unbalanced surface of the valve.

(22) S. B. G. asks: Does a large wheel have any advantage in power over a small one in overcoming the friction on the axle, the axle and load being the same, and running on a smooth level surface? A. Yes.

(23) H. C. M. writes: I notice in vol. xliv., No. 24, page 378, of SCIENTIFIC AMERICAN, article 8, a formula for making oxygen gas for inhalation. Can you tell me whether it is the same as is used by physicians in Philadelphia? A. Probably. 2. Can water be surcharged with it, and if so, how? A. By passing the gas through cold water under pressure the quantity of oxygen it normally contains may be slightly increased. On exposure to the atmosphere or heat the oxygen thus taken up will soon escape again. 3. If not, how can it be used other than in the manner given in the paper referred to? A. We know of no other way of using it. There is no liquid solvent for oxygen that will take up enough of the gas to be of practical service in the way you propose.

(24) W. H. asks: 1. Of what kind of silk are balloons made? A. Good common undyed silk will answer. 2. What kind of oil are they prepared with? A. Usually a mixture of boiled oil and wax, thinned with turpentine. 3. How are the seams made air tight? A. The seams are "felled," waxed, and varnished inside and out. 4. Will gas keep its lifting power for one week, or longer? A. Yes, if kept in a perfectly air-tight vessel. In an oiled silk balloon envelope as usually constructed, no.

(25) J. B. B. writes: 1. A claims that a hollow shaft equal in diameter to a solid one has more strength in driving machinery than the solid shaft. B claims that the solid shaft, equal in diameter to the hollow one, is the strongest. Which is right? A. If of the same diameter, the solid shaft is the strongest; if of the same weight, the hollow shaft is the strongest. 2. What steam pressure is considered in getting the nominal horse power of a steam engine? A. The average pressure in the cylinder. 3. Is it not advisable to give a slide valve as small a stroke as possible, provided you get sufficient port opening? A. Yes.

(26) D. B. M. writes: I have a copper boiler, 36 inches long, 12 inches in diameter, ⅛ in. thickness, no flues. What would be the highest pressure to run with safety? A. Without knowing more of its construction we could not say. 2. Would a two horse power engine, with the above boiler, afford sufficient power to run one of Edison's generators to supply one of his lamps? A. Your boiler will not supply a two horse power engine, it is not equal to one horse power except it be driven very hard. 3. What would such a generator lamp, etc., probably cost? A. They are not in the market. You should write the inventor in regard to them.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

M. F. M.—No. 1. Tremolite—calcium-magnesium silicate. No. 2. Blue glass. No. 3. Calcium aluminum silicate. No. 4. The habitation of some insect—the material is chiefly lime carbonate. No. 5. Marcasite—FeS_2—with a coating of iron oxide. No. 6. Magnetite and hematite. No. 7 Argentiferous (silver bearing) galena. No. 8. Chiefly lead oxide. No. 9. Iron, alumina, and silica, with possibly a trace of silver.—E. S. B.—The gravel contains no precious metals—only mica and pyrites.

COMMUNICATIONS RECEIVED.

On a Mysterious Boiler Explosion. By W. A. D.
On Ripening Melons Underground. By I. T. B.
On the Wax Myrtles. By J. P. S.
How to Mount very Small Lenses. By C. J. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 8, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1836, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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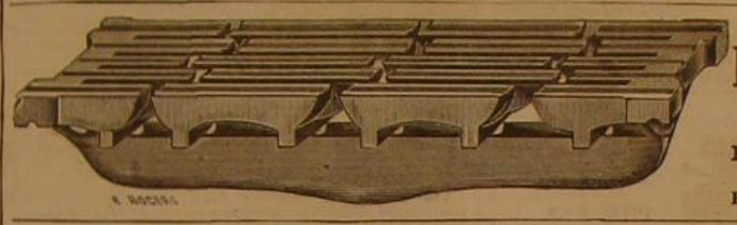

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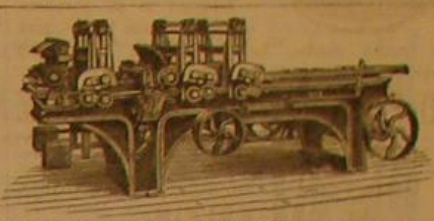

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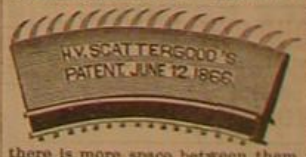

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Vol. XLIV.—No. 12. [NEW SERIES.] NEW YORK, MARCH 19, 1881. [$3.20 per Annum, [POSTAGE PREPAID.

Lard Cheese.

The following statements with regard to the use of lard in cheese making were made recently at Albany by Assemblyman Crapser, of St. Lawrence county, before the Assembly Committee on Public Health:

The main elements in cheese manufactured from milk are caseine and fat. Rennet is used to coagulate. It is necessary to add oil if a richer cheese is wanted. We have never been able to do it in this country until recently. Lard is now substituted in place of cream or butter oil. To 100 pounds of milk we add 1½ pounds of lard, and have to buy the best lard we can. We get it at Chicago or elsewhere, and it has to be deodorized by heat in the usual way. Steam-rendered lard is better than kettle-rendered. By the new process it requires six to eight hours to render it. One would get 4 pounds of cream from 100 pounds of milk, and this 4 pounds is one-third caseine, so that about 2 pounds out of 100 is real oil. Therefore, 100 pounds of skim milk and 1½ pounds of lard will make 10 pounds of cheese. It makes a good quality of cheese. We have been able to sell all we could make. We make salable cheese out of skim milk, and so benefit farmers.

This new cheese is made from sweet milk, from which cream has been removed at 40° F., after standing twelve hours. No chemicals are used in this process, except some coloring matter, which we make. I have twenty-one factories, and have put them to making lard cheese as fast as possible. We have to work on the sly, but the honest farmer would not take any advantage. We got along with them by paying more for their milk than it is worth. Seven of my factories are now making the lard cheese, which goes to Chicago, Boston, New York, and Baltimore. The fact that it was made of lard sold the goods. The skim cheese factories in St. Lawrence use chemicals. I skimmed mine so close for butter that it could not make salable cheese. This kind of cheese we can sell to the middle classes, but not to the millionaires. Lard can be treated by difference of temperature and not be injured like butter. To deodorize the lard we blow hot steam through it. We manufactured 2,500 boxes of 60 lb. each last year.

THE artesian well in Providence street, Boston, has been sunk about 1850 feet. It is believed that the well can now easily deliver from 300,000 to 400,000 gallons of water a day.

BARREL MACHINERY.

In our issue of Feb. 19 we described several improved machines made by Messrs. E. & B. Holmes, of Buffalo, N. Y., to be used in the manufacture of barrels. We are now able to present our readers with engravings of other machinery made by this firm and applied to the same manufacture.

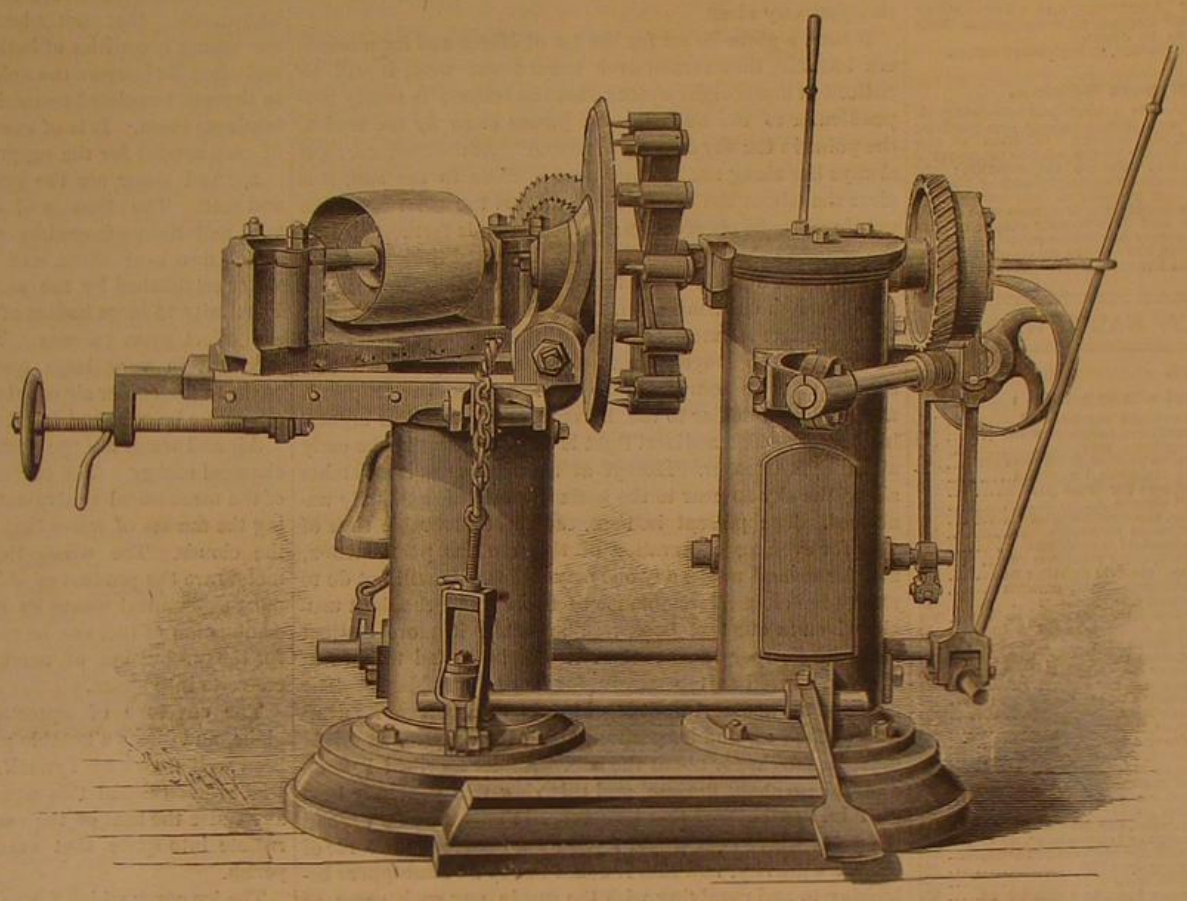

Fig. 1.—MACHINE FOR ROUNDING HEADS.

This firm make a machine for dressing rived heading of all sizes for beer, oil, sirup, spirit, and other casks in which rived heading is used. The machine receives the heading in its roughest condition, takes out all of the winds and crooks, and prepares it at the rate of three thousand pieces per day for jointing and dowel boring. This is done on the combined heading jointer and fan, which delivers its shavings at any desired point. Fig. 2 shows a plain heading jointer.

The heads after being dressed, jointed, bored, and put together are made either truly circular or elliptical by the head rounding machine, shown in Fig. 1. This machine is fed by an attendant, but it turns and discharges the head automatically, while another head is being taken up to place in the machine. An important feature of this machine is an attachment for giving to the head a slightly oval form to compensate for the shrinkage and compression of the material.

The operation of this attachment is entirely automatic. This machine forms the heads rapidly, and is adapted to heads of different sizes and thicknesses. It completes the machine work on parts of the cask, but machines are provided by Messrs. E. & B. Holmes for doing much of the subsequent work of putting together and finishing.

Fig. 4 shows a machine for leveling kegs and small casks. This machine drives all of the truss hoops at once on kegs

[*Continued on page* 178.]

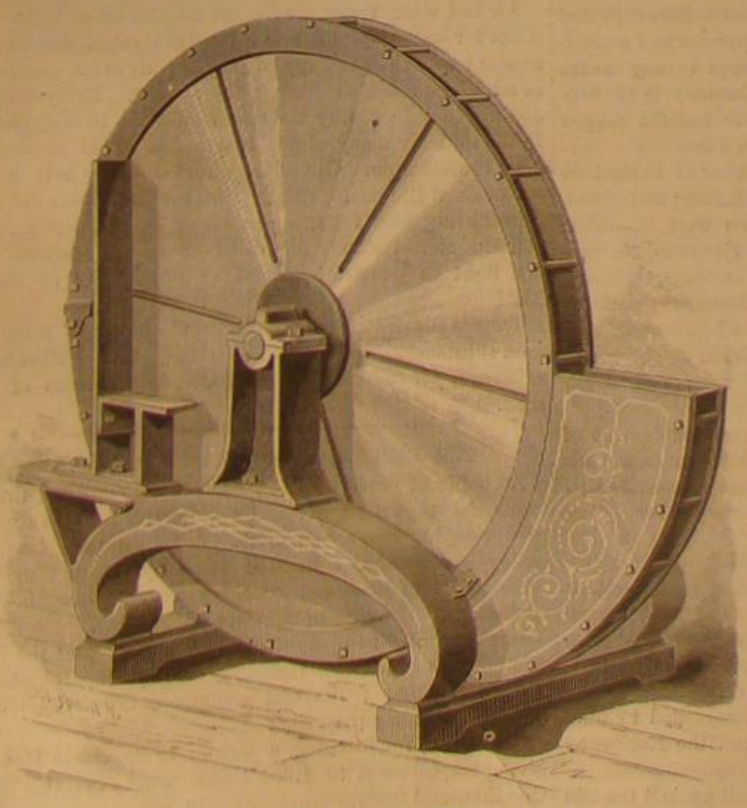

Fig. 2.—MACHINE FOR JOINTING HEADING.

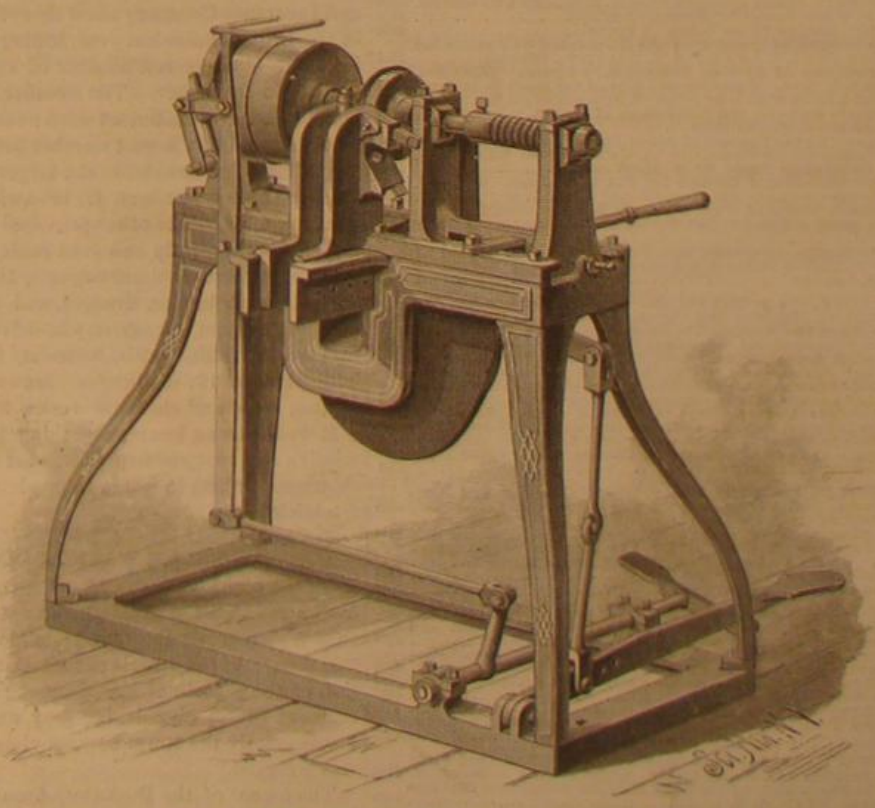

Fig. 3.—MACHINE FOR TURNING THE HEADS OF KEGS.

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NEW YORK, SATURDAY, MARCH 19, 1881.

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THE ZODIACAL LIGHT.

On almost any clear moonless night now this phenomenon may be noticed in the western sky. In the early part of such an evening, after the twilight has disappeared, a triangle of faint light will be seen extending up into the sky. Its base will be found about the place on the horizon where the sun disappeared, and may be of considerable, though of varying and somewhat indefinite width. It will taper upward and gradually fade out about half way from the horizon to the zenith, although it has been observed extending through ninety degrees, and even entirely across the sky. Its edges are so indefinite that no two observers will agree as to just what its limits are. It is not generally noticed, because it looks so much like an extension of twilight that it is mistaken for that. But, as has been said, it is to be seen when the twilight has entirely disappeared, and its shape is so different that any one can distinguish it. It is found to lie along the ecliptic, that is, the sun's path in the heavens. The ecliptic is more nearly perpendicular to the horizon during the evening now than during the evenings of any other part of the year. A glance at any celestial globe, or at a terrestial globe having the ecliptic marked upon it, will make this perfectly clear.

If such a globe be set for the 1st of March and for a northern latitude, then turned over toward the west, it will be noticed at about eight o'clock that the ecliptic is nearly perpendicular to the horizon, and passes close by the zenith, the point in the sky directly overhead. As the zodiacal light always lies along the ecliptic, and is close to the sun, it is clear that about the 1st of March affords the most favorable evenings for its observation; it then extends farthest up into the sky. In the latitude of the north United States its path does not run directly toward the zenith, for the ecliptic never runs through our zenith, but to a point a little way south of that. In fact it extends up toward the noonday position of the sun in the longest summer days. The globe will also show that at an hour or more *before* sunrise the ecliptic is nearly perpendicular to the horizon, and hence rises highest in October. The zodiacal light is thus seen best in the early morning in October. Except at these seasons it stretches along the sky so near to the horizon that it is generally unnoticed. The present is, then, the most favorable time of year for evening observation of this curious phenomenon, and for several weeks any one may find it. It will not do to expect too close a resemblance to the cuts of the light usually given in our text books. They make it more distinct and with sharper outlines than it will be found to have in the sky, as well as too narrow for its ordinary shape. The cause of the zodiacal light is still uncertain. From its nearness to the sun, and its position along the ecliptic, its origin must be sought for about the sun. Kepler ascribed it to an atmosphere about the sun, and this view was generally held until Laplace showed that its observed limits were far beyond the point where centrifugal force would balance the force of the sun's gravity, and that it could not be an atmosphere belonging to and revolving with the sun in any such sense as our atmosphere belongs to the earth. Prof. Wright, of Yale College, has shown by means of the spectroscope that the zodiacal light is *reflected sunlight*. But this does not determine the nature of the reflecting substance. It may be a cloud of gaseous matter, or possibly of small particles of solid matter, surrounding the sun and extending out upon all sides toward the earth's orbit. More probably it is due to immense swarms of meteoroids surrounding the sun, and thus reflecting its light to the eye. G. M. P.

WHOSE BOILERS EXPLODE.

The records kept by the Hartford Steam Boiler Inspection and Insurance Company show that 170 steam boilers exploded in the United States last year, killing 259 persons and wounding 555. The greatest number of explosions in any month was 25, in December. The number for January is 19, September and November, 16 each; the other months ranged from 10 to 14, the lowest number being in June.

The classified list shows the largest number of explosions in any class to have been 47, in sawing, planing, and woodworking mills. The other principal classes were in order: Paper, flouring, pulp and grist mills, and elevators, 19; railroad locomotives and fire engines, 18; steamboats, tugboats, yachts, steam barges, dredges, and dry docks, 15; portable engines, hoisters, thrashers, pile-drivers, and cotton gins, 13; iron works, rolling mills, furnaces, foundries, machine and boiler shops, 13; distilleries, breweries, malt and sugar houses, soap, and chemical works, 10.

It would be an interesting thing to have a statement of relative frequency of explosion—the number, that is, to each thousand boilers in use in each given class of steam-using establishments.

STORM WARNINGS IN COURT.

On the night of March 24, 1877, the hull of the steamboat Rockaway, built at Norfolk, Va., was taken by the steamship Wyanoke, of the Old Dominion Line, to be towed to this city. As the vessels passed Fortress Monroe the attention of the captain of the Wyanoke was called to the Government Storm Signals, but they were disregarded by him. Subsequently the storm became violent, and the Rockaway was wrecked.

The owner of the Rockaway brought suit against the Old Dominion Steamship Company to recover damages to the amount of $40,000. The main plea of the plaintiff was that the captain of the Wyanoke, in disregarding the storm signals, failed to exercise due diligence and precaution for the protection of the property in his care. The case was recently decided, the jury returning a verdict for the plaintiff, giving him $35,018.37, with five per cent. allowance.

AIR AND WATER.

The two substances everywhere met with on the surface of this globe which receive the least popular attention are air and water. The latter especially is one of the most remarkable substances in nature, and exceeds in its pervasiveness even the air. Go where we will, on the most arid desert, the mountain top, the frozen pole, in the deepest cavern, we meet with water in some or all of its forms. The coldest, hottest, or driest air found in nature contains aqueous vapor. Water forms a large portion of many minerals, in which by the giant power of chemical affinity it is directly combined or is locked up as water of crystallization. To adequately discuss all the natural phenomena in which some form of water is a factor, would require a volume; to enumerate and describe all its industrial applications would require a number of volumes.

Both air and water are essential to the existence of all known life. Our bodily health can only be supported by our taking quantities of both at short intervals. Both may and often do become the vehicles of deadly poisons, which in densely populated countries and towns are liable to contaminate them. It is of essential importance that supplies of each needed for the support of animal life should be pure.

Air and water are the great natural distributers of heat and cold. The climates of different parts of the world are very materially affected by the hot or cold currents of air which flow over them, and by the analogous currents of water established by the action of heat in the great seas. Proximity to large bodies of water also has a very important effect upon climate. Water slowly absorbs the summer heat in very large quantity, and slowly gives it off again to the colder air of winter, thus tempering what would otherwise be cold and freezing winds, and retarding frost.

Air and water are the great natural distributers of mechanical energy. The currents of rivers represent a portion of the mechanical equivalent of solar heat expended in raising the masses of water that flow through their channels to the clouds. The winds that propel our ships and wind motors are the product of solar energy also. The chief and most economical means by which the heat generated in the combustion of fuel can be converted into mechanical energy for the propulsion of machinery is water, which this heat converts into steam.

The envelope of aqueous vapor which surrounds the globe, and forms a notable part of its atmosphere, is, as has been well shown by Tyndall, the great conservator of terrestrial heat. Should this aqueous envelope be removed by any cause the heat of the earth's surface would so rapidly radiate into space that every living thing would shortly perish.

The ice cover which forms upon the surfaces of lakes and rivers protects the life which exists in such waters. Were it not for this provision of nature these water deposits would become solid masses, in which all their teeming life would be immovably imprisoned.

The snowblankets which have spread this year over a large portion of our land perform a similar service for the vegetable life which lies dormant below. Without this protection the ground would be too deeply frozen, the frost would be too late in leaving the earth in the spring, the growing season would be shortened, and many of the plants that now thrive in the temperate zones would cease to exist in latitudes where they now abound.

Air and water vapor are the great diffusers of light. Were it not for our atmosphere no solar light could penetrate our houses where the sun's rays do not directly enter, except such as might be reflected from solid objects. Everything not directly illuminated by the sun would lie in deep shadow. In the mid-day many of our apartments would require artificial illumination. Out of the direct sunshine only the lowest forms of life could exist. But the enormous diffusing, transmitting, and reflecting power of our atmosphere compensates almost wholly for disadvantages of position, causing light to penetrate almost as universally as the air itself.

Thus is illustrated the wonderful character of these common substances—air and water—so important to all animated existence, yet so heedlessly regarded by the mass of mankind.

THE INDUSTRIAL CONDITION OF CANADA.

A couple of years ago our Canadian neighbors, tired of industrial stagnation, adopted a protective tariff in the hope of developing home industries. A return to a free trade policy is strenuously insisted upon by many Canadians, whose idea of national economy never rises above the sophistry of "buying in the cheapest market."

In an argument for the policy now under trial the *Industrial World* of Montreal describes a very hopeful state of things as its first fruits, and points out the obvious conditions of the new prosperity:

"Suppose, for instance, a factory is opened in Montreal, giving employment to 1,000 hands, what does this mean? One thousand factory employes will represent a population of at least 2,500. What would the closing of this factory and consequent expatriation of these craftsmen mean? A loss of 1,000 to 2,500? Much more. These artisans require boot, shoes, hats, caps, meat, bread, roots, vegetables, medi-

cine, clothing, houses, wood, etc., almost *ad infinitum*, and likewise each of the new or additional industries which they inaugurate or add to in all its various forms, require the same things. So that each thousand artisans probably adds, in one way or other, 5,000 additional to the population. Have our free trade friends ever considered this? What emptied one-fifth of the houses of Montreal under the late regime? The closing of the factories. What stunted the growth of the city during that dark era? The impediments which the tariff raised to the establishment of new industries and the development of diversified labor. All the artisans employed in the factories of the metropolis wanted homes. It required carpenters, joiners, bricklayers, painters, plasterers, roofers, glaziers, workingmen of all kinds to erect these houses. It required vast quantities of agricultural produce to fill the stomachs of the various craftsmen which the tariff furnished with a purchasing power. And although to-day the same clouds float over us, the same sun, moon, and stars light the heavens by day and night, in the language of Webster, How altered! and how changed! Of 2,000 notes falling due on the 3d of February in the Bank of Montreal, not one was protested ! ! Among the thousands of vacant houses in Montreal in '78, not an empty place is to be found, and the demand is for hundreds more. The market is flooded with money for investment. Canada fours are worth more than Canada sixes were formerly. Our alms houses, except for the old and infirm, are empty, and the soup kitchen is now a matter of history. The railways are unable to carry the freight offered to them, and the demand for increased accommodation is met by the employment of thousands of able hands, working night and day to meet the public wants! Never was there an era promising greater prosperity for Canada. Bank stocks have appreciated 37½ per cent, and all securities have become correspondingly improved in value, and the prospect of a £1,000,000 surplus for the financial year ending July 1, stares us in the face to terrify us into a free trade policy! If it is a bad policy to swap horses while crossing the stream, we think it would be rather imprudent to risk a change from prosperity, under protection, to one of promised increased (?) aggrandizement under free trade."

ARTIFICIAL DAYLIGHT.

The lighting of large interiors from without—that is, by surrounding the space to be illuminated with powerful lamps, so placed as to fill the air with diffused light—is certainly a bold, though not entirely a novel, proposition; yet, either to attract attention or to establish an important economic principle, the Northern Electric Light Company is begging Congress to allow them to light in that way the Capitol at Washington. At first they asked Congress to appropriate money enough to defray the actual cost of illuminating the Capitol and the grounds about it to the brilliancy of broad day, thus making interior lamps unnecessary. But no disposition being shown by Congress to encourage the experiment, the friends of the project subsequently offered to assume the risk of failure, and to furnish the means for making such a crucial test of "artificial daylight," on condition that the government would agree to accept the innovation in case it succeeded, and the saving in the cost of lighting the Capitol should prove in three years equal to the cost of the system. This proposition appears to have met with no greater favor than the first, whether from suspicion as to its purpose or feasibility, or because the expiring Congress had larger and more pressing interests to consider, does not appear.

The plan proposed contemplated a crown of electric lamps, 150 in number, surrounding the dome of the Capitol, and so arranged as to shine into the skylights in the roofs of the wings of the building.

In addition, at various points about the Capitol grounds, it was proposed to erect six iron towers, to be surmounted by circular conical lanterns, 11 feet in diameter, and from 125 to 200 feet above the ground, or 50 feet higher than the roofs of the wings of the Capitol. Each lantern was to contain 50 electric lamps. The 450 lamps upon the dome and in the tower lanterns were designed to be about 6,000 candle power each, aggregating something like forty times the light power now employed in and about the Capitol, or about that of 200,000 average gasburners. This light, it is estimated, would not only illuminate the interior of the building as well as daylight, but would furnish a surplus sufficient to remove the need of street lamps anywhere in the city.

To generate the electric current there would have to be supplied not less than three dozen large dynamo-electric machines, capable of absorbing the power of four steam engines of 300 horse power each. The cost of the system was estimated at $350,000, distributed as follows:

Four hundred and fifty 6,000 candle power electric lamps, at $80,	$36,000
Thirty-six large dynamo-electric machines, at $3,600	129,600
Four 300 horse power steam engines, twelve boilers, and the requisite fixtures and shafting	40,000
Houses for boilers and machinery	25,000
Six iron towers—two 200 feet high, two 150 feet high, two 125 feet high, including lanterns, reflectors, elevators, and foundations	80,000
Setting up machinery and apparatus, including cost of subterranean wires	15,000
Land	15,000
Engineering and contingencies	9,400
Total	$350,000

The estimated running expenses of the system, including repairs, is $60,000 a year—the present means of illuminating the Capitol costing annually upwards of $110,000, the city paying $60,000 more for street lamps. The aggregate illumination promised by the new system is twenty times that of all the outdoor lamps in Washington and all the lamps in the Capitol building combined: or a light equivalent to bright moonlight throughout the city, and diffused daylight in and about the Capitol.

Perhaps the incoming Congress will have time to investigate the project, which is, at all events, a "brilliant" one.

New Instrument for Sea Sounding.

Mr. Lucas, engineer to the Telegraph Construction and Maintenance Company, London, has invented an instrument for sea sounding which he styles a "nipper-lead." The old plan of ascertaining the nature of the sea bottom, by bringing up a specimen of it in a tube, let into the bottom of the sinker and armed with tallow, is open to several objections. For instance, the specimen is apt to get washed out in rising to the surface, and when it is safely brought on board it is usually so smeared with tallow as to be objectionable. The nipper-lead of Mr. Lucas, on the other hand, retains what it catches and renders it up in a pure state well fitted for preservation. The bottom of the lead or sinker in question is provided with two hollow claws or spoons, not unlike the mandibles of a crab. These are hinged to the sinker, and open out against the resistance of a stout spiral spring which is contained in the body of the sinker. When fully opened out they are kept apart by a locking device, consisting of two crossbars which meet end to end and fit into each other. The points of the open claws, however, in striking upon the bottom, spring this lock, and the claws snap together with great force, nipping up a specimen of the bottom at the same time, and from their hollow shape this specimen is retained. So effective is the nipper-lead that the claws will nip a sheet of paper off a table, and they have been found to raise a specimen of the bottom from 2,000 fathoms.

A Rich Man's Work Room.

The owner of the great Cornwall iron estate in Pennsylvania, Mr. Robert Coleman, has a fine mechanical taste and pays much attention to mechanics and engineering. To facilitate his investigations he has constructed a circular railroad with a double line of steel tracks, inclosed in a large building. The length of the track is about 150 feet, with two sidings. Patent safety switches, electric crossing signals, safety frogs, and the latest methods of fastening rails are employed. The turntables of the miniature round house operate automatically. The three small locomotives comprise every piece of mechanism, every rod, bolt, screw, lever, spring, tire, cock, pipe, and pump of the largest machines. The boiler-jackets, rods, and drivers are nickel-plated, and some of the bright work is silver-plated. The cabs are of solid walnut, and the boilers proper and the fireboxes are of wrought steel. The tenders are of copper, and their water supply is taken by scoops from vats on the roadway while the locomotives are in motion.

The locomotives are about four feet in length, including the tender, and are models of beauty. They are of English design, so far as high driving wheels are concerned, otherwise they are advanced American mechanical ideas and have many original appliances of Mr. Coleman's invention.

The locomotives are fired up and set in motion. Around the tracks they go, while the millionaire owner watches the movements of the miniature machinery. Hours are thus passed, all sorts of experiments are tried, high speed and low speed are compared to determine the comparative effects of friction, and other questions of railway economy.

A Remarkable Fish.

There was lately on exhibition in Boston a fish caught about twelve miles from the Isles of Shoals by Wallace Wright, of the fishing schooner Jennie P. Phillips, from Swampscott. At the time of its capture it was 15 feet long and weighed 2,430 pounds. In its stomach were found a codfish weighing 50 pounds, two smaller cods, and two coots. It had a large mouth, containing seven rows of sharp teeth, and in general appearance was somewhat like a shark, but what is most singular is the fact of its being uncommonly well supplied with respiratory organs. It had not only a mouth, but gills, nostrils, and blow holes. While on exhibition at Lynn the fish was examined by several scientific gentlemen, but no one has been able to classify it.

Improved Lace Machine.

A machine for making laces hitherto produced only by hand work is reported in France. Even old styles of laces, the art of making which has been lost, can readily be reproduced. The machine employs from 1,800 to 2,000 spindles, and from 200 to 300 pins. The *Moniteur des Fils et Tissu* speaks in high terms of the machine and its products, which are said to be fully equal to the best hand-made laces.

A Big Cow.

Posey County, Indiana, claims to have raised the largest cow in the world. Her name is Lady Posey; breed, mixed Durham and Big English. Her measurements are: Greatest height, 5 feet 10 inches; girth, 8 feet 9 inches; length, 10 feet 6 inches, or including tail, 17 feet. Her form is good; and, though not fat, she weighs 3,000 pounds. Her color is red and white, red predominating. Age, six years. Her present owner lives in Stark County, Illinois.

SANITARY ARRANGEMENTS IN HOUSES.

The Society of Arts, London, have just announced that they will award three medals for plans showing the best sanitary arrangements in houses built in the metropolis, such plans to be exhibited in the society's rooms, Adelphi, in June, 1881, and to be sent in on or before May 12, 1881: The conditions of the competition are as follows:

1. One silver medal will be awarded for the best sanitary arrangements carried out and in satisfactory working in a house let out in tenements to artisans for which a weekly rental is paid.

2. One silver medal for the best sanitary arrangements in actual satisfactory working in a house of the yearly rental of from £40 or less, to about £100 in value.

3. One silver medal for the best sanitary arrangements in actual satisfactory working in a house of the yearly rental value of £200 and upward to any amount.

4. The houses must be open to the inspection of judges, who, in considering their award, will be guided by the suggestions of plans for main sewerage, drainage, and water supply, made under the Public Health Act, 1875. The houses must have been in actual occupation within the last three months, and a certificate must be given by the occupiers, on a printed form, stating the satisfactory working of all the sanitary arrangements, such form to be obtained at the Society of Arts.

5. The houses may be old, fitted with modern sanitary arrangements, or may be new. They must be within the metropolitan area of the Board of Works.

6. The sanitary arrangements must include the conditions for good water supply, drainage, warming, and ventilation of the house, and precautions taken against frost.

7. The medals may be awarded to the occupiers of the houses, or the lessees, or the owners.

8. The plans must consist of a ground plan and sections, to the scale of not less than 1 inch to 5 feet; details not less than 1 inch to the foot. The plans may be accompanied by specifications.

9. The names of the architects, surveyors, or sanitary engineers who directed the sanitary arrangements should be given, and certificates will be awarded to those whose plans obtain the medals

French Electrical Exhibition.

The works for the Paris Exhibition of Electricity will soon begin. A viaduct is to be built for the English electrical railway by Siemens, which will convey visitors from the Place de la Concorde to the Palais de l'Industrie. The internal arrangements will only be made at the end of the Art Exhibition, which takes place from May to July. The French exhibitors of the electric light have come to an agreement in order to combine for the illumination of the nave and other parts. They are trying to obtain from the city an indemnity for their working expenses.

Simple Fire Escape.

The netting which trapeze performers use to break their fall, in case of accident, the *Fireman's Journal* suggests, might furnish a valuable hint to Fire Department officials. Such a net could easily be carried in a small compass attached to the hook and ladder truck, and could be readily and securely fastened by ropes to lamp posts, telegraph poles, awning posts or the like, in front of the burning house, or in case of need be upheld by dozens of sturdy and willing arms. It would, no doubt, help to save many lives of persons compelled to jump from upper windows. Such a device has been tried in Germany with good results.

Marking Salmon.

The Fish Commissioners of Maine have adopted the plan of marking salmon to obtain data with regard to the development and migrations of these fish. Several hundred salmon lately set free in the Penobscot River have been labeled with light metal tags, the number on each being recorded. The Commissioners ask that whoever catches a labeled salmon in any waters of the State will forward to them the fish, for which they will pay an extra price, or else forward the label and whatever they know about the fish that wore it.

Rectifying Alcohol.

If a quantity of 40 to 50 per cent alcohol is placed into a retort and a vacuum is created in this retort by means of an air pump, and the retort is placed into or in connection with the cooler of an ice machine, the alcohol will be evaporated. As the evaporation of the alcohol causes the temperature of the retort to drop below the surrounding temperature, the warmth of water at an ordinary temperature will be sufficient to evaporate the alcohol, and the same can be rectified without the use of fuel.—*R. Pictet, in Revue Univ. de la Brass et Dist.*

BLEACHING ALBUMEN BY MEANS OF ELECTRIC LIGHT.—The albumen, from which the blood corpuscles have been entirely removed, is subjected to the action of an electric light, the rays of which are properly collected by means of lenses, etc., and will be bleached within twenty-four hours. The albumen may be in a dry or fluid state.—*L. Manet (Monit. prod. Chim.).*

AN examination has taken place at Brussels of the railway employés, in order to test their eyes. More than one-twentieth of them have been found defective, and consequently will be discharged as being unable to fulfill their functions with a sufficient security for travelers.

BARREL MACHINERY.

[*Continued from first page.*]

and small casks such as are used for lead and other paints, butter, powder, nails, and other similar commodities. The truss hoops are driven by screw power, and the machine does its work rapidly and thoroughly, and when used in conjunction with the other machines which are intended to be used as a part of the plant in the manufacture of kegs, completes a system of machinery that will perform most of the cooper's work on this class of packages.

A machine for turning the heads of kegs is shown in Fig. 3. This machine is capable of making all kinds and sizes of heads, is very rapid in its operation, is readily changed from one size to another, and will work well on any kind of wood.

Fig. 5 shows a machine for leveling and trussing slack barrels. As the production of flour, sugar, cement, salt, and vegetables is very large, and as the greater part of these commodities are put in barrels, it is a matter of great importance to have the barrels made not only as cheap as possible, but strong and capable of bearing rough usage. The machine for leveling and afterward trussing such barrels, and the machines furnished with it for completing the plant, will level and then drive all the truss hoops upon 6,000 barrels per day, and the machines that make up the plant are equal to it in capacity and usefulness; they are as follows: barrel setting up forms, power windlass, and the chamfering and crozing machine. The last named machines will do their portion of the work at the rate of 3,000 barrels per day, and it requires two of each to be equal to keep pace with the trussing machine in making 6,000 per day.

Messrs. E. & B. Holmes manufacture a large number of machines for making kegs, barrels, and casks, which are described in their illustrated catalogue.

Further information respecting this class of machinery may be obtained by addressing E. & B. Holmes, Buffalo, N. Y.

The Glycerine Barometer.

Mr. James B. Jordan, of London, in the course of his experiments on various fluids for the barometer was led to try glycerine, which appears well adapted for the purpose. Its vapor has a very low tension at ordinary temperatures, and as its freezing point is much below zero, it is so far excellently adapted for use in barometers. The mean coefficient of expansion by heat is, according to Professor Reinold, 0·000303 for a degree of Fahrenheit's scale, and a table has been computed on this basis for reducing the observations to 32° Fah. Glycerine possessing the capability of absorbing moisture from the atmosphere, its surface in the cistern is covered by a layer of mineral oil, which has no effect whatever on the glycerine, and which does not evaporate at ordinary temperatures. At sea level the pressure of the atmosphere supports a column of glycerine of a mean height of 27 feet, and accordingly the tube of the barometer is made some 29 feet in length. It is formed of composition gas pipe, five eighths of an inch in diameter, but the upper part, 4 ft. or so in length, is of glass tube, having an internal diameter of 1 inch. The top end, instead of being sealed, is spread out into a cup shape, having a small orifice plugged with a stopper of rubber. The cistern is of tinned copper, 4 inches deep and 10 inches in diameter, and the air is allowed to press on the surface through a small hole leading into a chamber containing a filter of cotton wool. At the bottom of the cistern is a closed channel opening into the center, and to this is attached a projecting vertical tube, to which the main tube is soldered. The object of this channel is apparently to provide a means of closing the tube by a screw plug when refilling is necessary. The quantity of glycerine required for such an instrument is about a gallon, and this being warmed in a water bath and tinted with rosaniline, sufficient is poured into the cistern to cover the orifice of the channel. The plug at the top end is then removed, and the tube completely filled by pouring the glycerine gently down on one side. After allowing it to rest for some time, the air bubbles will be found collected at the top, when the tube is again filled up to the cup, and the stopper replaced. The screw plug in the cistern being removed, the column will fall until balanced by the pressure of the atmosphere, and the vacuum is as perfect as it is possible to get it, the small quantity of glycerine remaining in the cup above the stopper, hermetically sealing it. The glycerine barometer is, therefore, a simple and easily-managed instrument; but it is not pretended that it can take the place of the standard mercurial instrument for precision. It is comparatively a new instrument, and its value as a piece of scientific apparatus has yet to be shown.

MISCELLANEOUS INVENTIONS.

Mr. Hiram B. Gray, of Columbus, Texas, has patented an umbrella and sunshade which can be attached to the person, leaving both hands free for driving or other purposes.

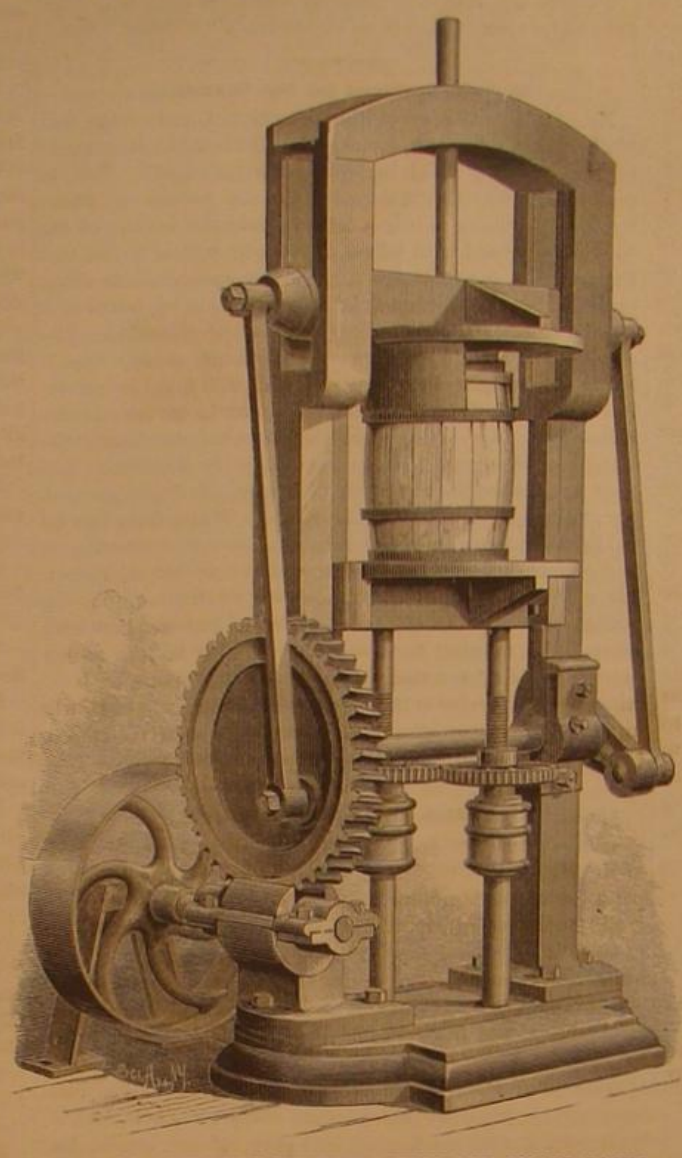


Fig. 4.—MACHINE FOR LEVELING KEGS AND SMALL CASKS.

Mr. George W. Brumm, of Boise City, Idaho Territory, has patented a book protector, which consists of a case for containing a book and securing it from injury, the case being provided with means for fastening it to desk, pew, table, etc. This invention will be found useful in churches, public libraries, schools, etc.

Mr. Alphonse J. Delavigne, of New Orleans, La., has patented a turn-table in which a novel arrangement of parts causes the table to turn in one direction by the action of the weight of the car, and in an opposite direction through the action of a spring.

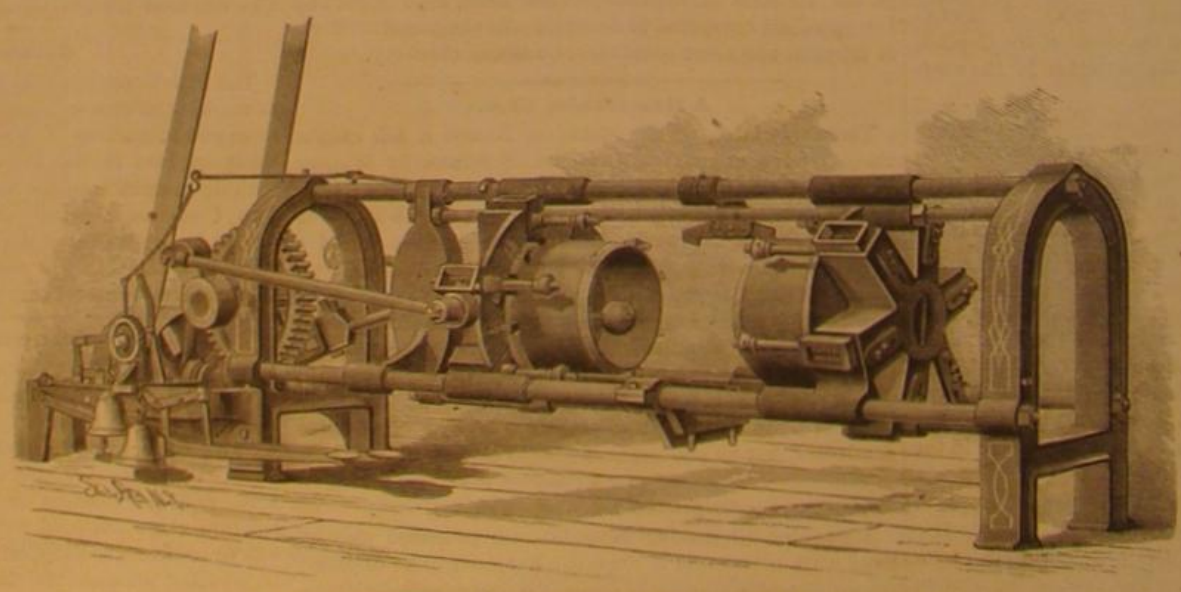


Fig. 5.—MACHINE FOR LEVELING AND TRUSSING SLACK BARRELS.

Mr. David S. Thomas, of North Platte, Nebraska, has patented a windmill which supplies an improved device for controlling or adjusting the sails or vanes. A clutch wheel or spider and a spirally grooved loose sleeve, to which is attached a small vane, are fixed on the axle of the wheel. The sleeve engages with a stud, and when turned in one direction draws the wind wheel into clutch with the spider, whereby the vanes are set to the wind. The vane on the loose sleeve also acts to adjust or throw the vanes flat in a high wind.

Mr. John M. Hastings, of Oskaloosa, Kansas, has patented a windmill water elevator, so constructed that it will automatically stop or start to keep the receiving trough always supplied with water. A valved bucket suspended on the end of a trip-rod which is connected with the wind-wheel, constitutes the simple mechanism by which object is effected.

Mr. Frederick W. Claussen, of New York city, has patented an improved drying-room clip for use in laundries, etc. It has the advantages of spring clips without the disadvantages of the ordinary spring clip. Instead of supporting the articles by the spring itself as heretofore, he suspends them on a rigid hook provided with a retaining spring.

Mr. Pierce B. Anderson, of Brownsville, Tenn., has patented a corn and pea planter, of the kind known as walking planters, which are rolled along on wheels by a person walking. He has supplied novel lever mechanism for operating the seed slide, by which the machine can alternately drop different kinds of seeds, as, say, corn and pease, so that the rows may be planted in the two kinds of seeds alternately deposited.

Mr. Franklin McLellan, of White River, Washington Territory, has patented a potato digger, the invention consisting of a forked and concave plow, an arched standard having holes in its arms, a pin or bolt, a shaft having arms, a lever and catch, a pawl having a handle, and a separator having gudgeons and wheels, whereby, as the machine is drawn forward, the wheels run upon opposite sides of the row to be dug, and the plow passes beneath the hills and raises them with the potatoes embedded in them and delivers the soil and potatoes to the separator, which separates the potatoes from the soil, the soil falling through between the bars and the potatoes falling from the rear end of the separator upon the top of the soil.

Messrs. William Mainzer and John Singer, of New York city, have patented a cask for beer and other liquids so constructed that it can be safely handled and transported without detaching the faucets, and can thus be furnished to the consumer with faucets applied ready for use, and can be returned to be refilled without detaching the faucets. The cask is constructed with two heads at one end, the outer one provided with a hinged door, a folding faucet being inserted in the inner head, and reached for operating it through the hinged door in the outer head.

Messrs. John W. Holdsworth and James C. Pringle, of St. Louis, Mo., have patented an illuminated sign which provides means for giving different colors to the letters and for changing the colors. Movable transparent colored strips are arranged behind the letters and moved by suitable mechanism to effect the result.

Mr. Emil Puchta, of Washington, Mo., has patented an improved table of the class known as "saloon tables," provided with boxes underneath them for holding cards, beer-mugs, etc. The boxes are in this invention arranged at the corners under the top, and immediate arches, which serve to brace the table and allow a space for the legs of the sitter, are arranged between the boxes.

Mr. Burnett B. Harris, of South Bend, Ind., has patented an improvement in casting bolt-holes in chilled mould-boards, by which in casting such holes with metal dies the contraction of the casting in cooling is prevented from either cracking the mould-boards or breaking off the points of the dies.

Mr. Volney W. Mason, of Providence, R. I., has patented a reversing mechanism for elevators, which consists of a pair of beveled friction wheels attached to the driving shaft, the beveled friction wheel having a rim and being attached to the shaft, with which is connected the machinery to be reversed, the pulleys carrying the reversing cord, the eccentric sleeve for shifting the movable friction wheel, the stationary brake, and the stop-pin.

Mr. Chester C. Clark, of Brownwood, Texas, has patented a folding cradle which is formed of two triangular folding end frames provided with folding braces and connected by longitudinal rods, from which a canvas bottom is supported, which frames are pivoted at their apex on the top of two connected triangular folding standards, and are provided with a crank for swinging the cradle. A bent rod from which a fan is suspended is attached to the bearings of the cradle in such manner that the fan moves in an opposite direction to that of the motion of the cradle. The fan may be operated independently.

Mr. John H. Sutfin, of Las Vegas, Territory of New Mexico, has patented an improved coupling for earth augers and rock drills, so constructed that the bits can be easily and quickly attached to or detached from the shafts, and thus save much time ordinarily lost in such attachment and detachment.

Fruit Flavorings.

I give instructions by which all confectioners may extract and preserve their own fruit essences, and so guard the health and add to the pleasure of all for whom they provide. Among the juicy fruits are strawberries, raspberries, blackberries, cherries, and currants; among non-juicy fruits are the apple, pears, peaches, quinces, apricots, and plums.

Mash the juicy fruits in a basin to a pulp. Place on the fire and make scalding hot. Now pour into a hair sieve and allow the juice to strain through. Put into bottles and securely tie down. Place these bottles in a caldron of cold water and boil for twenty minutes. Remove from the fire and allow to remain in the caldron until cold. Then set away for use.

In the case of non-juicy fruits, such as apples, pears, peaches, etc., put the fruit into a basin. Cover with water and boil to a pulp. Now place on a hair sieve and allow to drain without any pressing. Observe now that it is only the liquor which passes through the sieve without pressing which is to be used for flavoring purposes. What remains in the form of pulp is not adapted for these uses. Now put the juice obtained as above into bottles, and proceed to treat as already laid down for the juicy fruits.

The foregoing processes are to be gone through with in the case where the extracts are to be kept transparent and clear, as for sirups, cordials, and beverages.

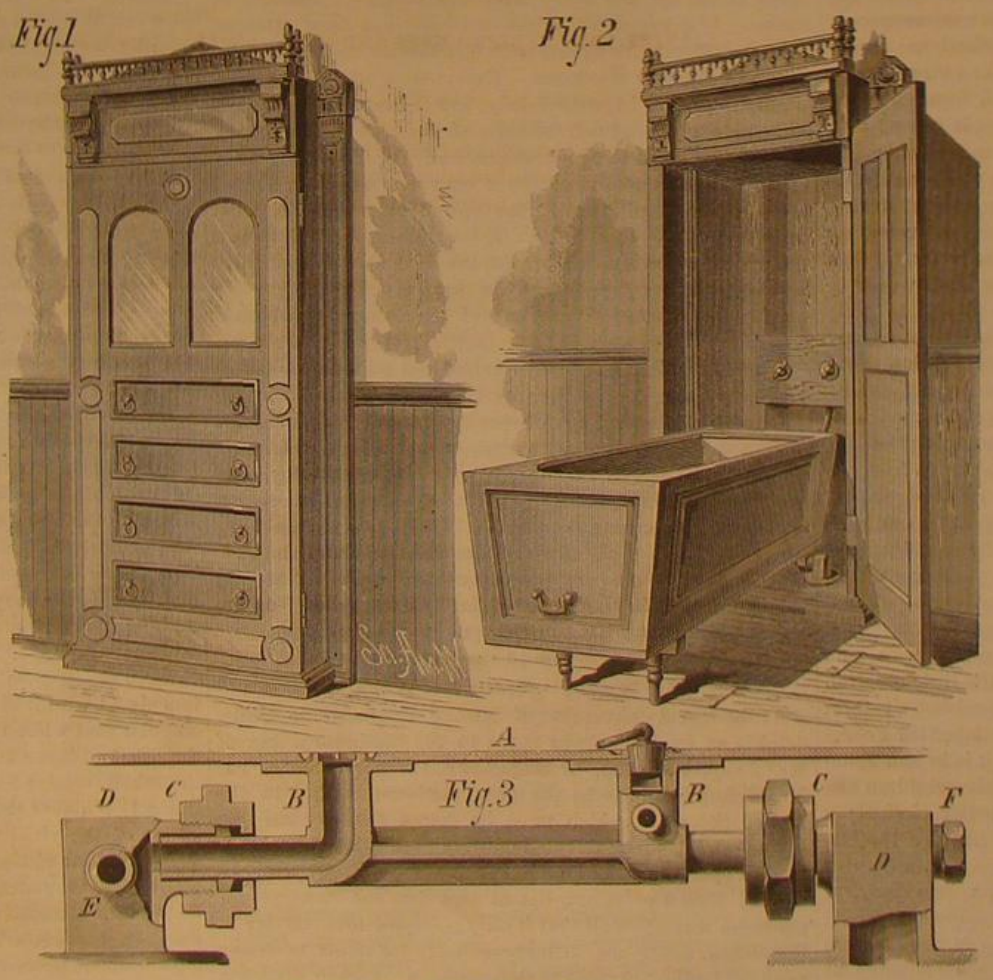
In case where the flavorings are to be used for any purpose where transparency or clearness is not desirable, such as for ice creams, fruit ices, or bonbons, then I would use not only the clear fluid, but the pulp of the fruit also. I would for these opaque purposes save and utilize everything of the fruit except the skins and seeds. This pulp to be treated as already laid down.

As thus obtained and preserved our confectioners can supply themselves with a quantity of perfectly pure extracts of all their favorite fruits, and which can always be at hand, for flavoring every description of pastry, cakes, pies, tarts, puddings, creams, ices, and beverages, and at any season of the year. Especially when there is any one in the house who is sick or feverish, cordials may be flavored with these delightful sub-acids—these remedies and restoratives of kind mother Nature herself—such as will shoot through all the veins of the most debilitated and infirm the most delicious sensations of happiness and hope.—*James W. Parkinson, in Confectioners' Journal.*

NEW FOLDING BATH TUB.

We give an engraving of a very convenient folding bath tub lately patented by Mr. George Damen, of 88 Luqueer street, Brooklyn, N.Y. When closed, as in Fig. 1, this device has the appearance of a chiffonier or bookcase, and forms an ornamental piece of furniture; and when opened for use, as in Fig. 2, it is in every way as convenient as the ordinary stationary bath tub. This construction admits of placing a bath tub in every sleeping room without occupying space valuable for other purposes. The arrangement of pipes by which the water is introduced and removed from the tubs, is shown in Fig. 3.

To the bottom of the tub, A, are attached flanges of the elbows, B, whose horizontal arms extend through stuffing boxes, C, on the hollow supports, D, and form the pivots on which the tub turns. One of the hollow supports, D, has two nipples, E, one on each side, one for cold water and the other for warm water, the two water pipes being provided with stop valves, seen in the back of the case. The outlet is provided with the usual plug and strainer, and a pipe, F, leads to the water or sewer pipe. The overflow at the foot of the tub is connected with the outlet pipe in the usual way. The bath tub has a pair of legs hinged under the head, so that they fold automatically when the tub is raised up. To economize room the wall is recessed to receive the tub when folded up, and, if desired, the tub may be placed in a small wall closet, where it will be concealed by an ordinary closet door. In some cases the inventor attaches to the closet, walls, or door a series of folding doors or screens which may be unfolded to form a temporary bath room. One of the great advantages of this invention is that it permits of taking a bath in a room that is comfortably warmed and obviates the necessity of warming the bath room.



DAMEN'S FOLDING BATH TUB.

INSTINCT OF BEES.—Here is something new, and whether it exists in fact or not, it forcibly exhibits what most people call the "instinct" of bees. In a hot dry valley in New South Wales, the bees suffered last year from a long-continued drought. This year, says a contemporary of that colony, the wonderful little fellows have made provision against another like trouble, by filling a large number of external cells in each hive with pure water instead of honey.

IMPROVED ROPE-CLAMP.

The engraving shows an improved clamp for fastening ropes and cordage, recently patented by Mr. James C. Covert, of West Troy, N. Y. It consists of a short thimble having a boss on one side, which is threaded internally to receive the pointed clamping screw. There is an opening in the thimble opposite the boss to admit the end of the screw. The clamp is applied to the rope as indicated in the engraving, the thimble being slipped over the rope, the screw passing transversely through the body of the rope between its strands.

ROPE-CLAMP.

Another New Composition.

The discoverer of celluloid is reported to have composed a new composition for buttons, boot heels, and other like purposes. A foreign contemporary gives the following as the ingredients and the process of manufacture: Leather cuttings are soaked in hot water to remove the oil, and then dried and ground to powder. The powder is afterward subjected to high pressure in suitable moulds, at a temperature of 240° to 250° Fah. This produces surface hardening, leaving the interior of the casting in an elastic state. If the powder is mixed with any other ingredient, a temperature of 290° to 310° Fah. should be employed, so as to secure partial fusion of the leather.

Disinfection with Sulphurous Acid.

At the instance of the Swiss Federal Department of Commerce and Agriculture, Dr. Fatio lately made a number of experiments at Geneva, primarily with reference to the prevention of the spread of phylloxera He has shown that it is always possible to disinfect vehicles and objects suspected of carrying dangerous germs by means of anhydrous sulphurous acid, either by injecting it in the gaseous state into vehicles that are closed, or by pulverizing the liquid against surfaces directly exposed to the open air. Various degrees of moisture in the surrounding atmosphere require considerably different doses of the acid in the poisonous mixture. With regard to disinfecting plants, he finds they resist the deleterious action of the poison better when they are treated at a stage distinct from that of vegetation; also the more aged, dry, and completely ligneous they are. The various collections of natural history (dry preparations) may be quickly, easily, and without danger freed of their parasites by simply pulverizing anhydrous sulphurous acid in their receivers, in quantity proportioned to the size, and less the more nearly hermetical the closure. Dr. Fatio further considers the method is applicable to removing parasites from furniture or tissues. He advises, *e. g.*, injection of the acid through a small hole and with a siphon into rooms infested with bugs (about 50 cubic centimeters of liquid per cubic meter of air), the rooms to be first well closed and isolated, and not to be occupied or slept in for some hours after the operation.

Oakland Harbor.

Work for the improvement of the harbor at Oakland, in San Francisco bay, is being carried on. Some idea of the extent of this great engineering enterprise may be better realized when we state that the two jetties, which are nearly parallel, extend from the shore line out into San Francisco bay a distance of 12,076 feet. This is 1,000 feet longer than the jetties built by Capt. Eads, at the mouth of the Mississippi river, about which the public has heard so much.

The stone contract now under way at Oakland contemplates raising both existing walls up to high water level, by building a heavy dry-stone coping on its old walls as a foundation. The stones on this coping are being carefully placed in position, the stones weighing frequently from one to two tons each, the spaces between these large stones being carefully filled in with smaller size by hand, so as to make a good compact wall.

Where most exposed to the sea the crest is made eight feet wide and with a slope of two to one, composed of stone carefully laid down to a point two feet below low water.

The total amount of stone required to finish this present contract is estimated to be between 60,000 and 75,000 tons, the price per ton delivered and placed in proper position being $1 and $1.19, depending upon size.

The stone now being added to the walls is taken from McNear's quarry at Pedro Point, opposite the Sisters' lighthouse, at the entrance to San Pablo bay, whence it is brought in large light draught barges, towed by a tug, and delivered at the site of the jetties at the rate of 8,000 tons per month. These barges are drawn up parallel with the walls at high water, and the rock is thrown on to the wall or wheeled down in position, according to the work being done. The men who are doing the contractors' work live in a floating barge, which is moored near by the scene of their labors. Work has gone on pretty rapidly this winter, as we have had smooth water so much of the time, few gales having occurred.

The object of raising the walls up to high water is to confine the ebbing tide from the inner harbor more effectually than has been heretofore done by the low walls built during previous contracts, and which have permitted the best half of the tidal water to escape laterally over their tops. This has, of course, lessened the scouring action of the ebbing waters, as they were not properly confined in the channel between the walls. On the very high tides a vast mass of water sweeps laterally across the jetties, and it is not until the tide has half fallen that the water can do what scouring is necessary to keep the channel clear. This lateral sweep of the water is dangerous for sailing craft during light winds, since, instead of the tide taking them to the mouth of the harbor, it is apt to sweep them on to the north wall with the ebb and south wall with the flood tide.

The walls, as they have been for a few years past, might have been considered obstructions rather than aids to navigation. Being out of sight except at half tide, schooner men had to be very careful not to run on to them.

In addition to the stonework now going on, it is contemplated shortly to dredge out and widen the present deep water channel between the jetties, so as to offer better facilities for navigation. The channel dredged out is now so narrow that steamers passing are crowded, and sailing vessels are apt to get ashore. It is confidently expected that the effect of raising the jetties to high water level will be to maintain such a channel free from sandy deposit, no matter whether it comes from the inner harbor or from the wave action of San Francisco bay.

The work on this harbor has been going on under the direction of Lieut.-Col. G. H. Mendell, U. S. Engineer, ever since its commencement in 1874, and the results have been very successful in developing the commercial value of this well known sheltered and safe harbor, being one of the few such on the Pacific coast. Mr. L. J. Le Conte is the engineer, under Col. Mendell, in immediate charge of the work. In 1874, boats drawing over 5 or 6 feet of water could hardly bump along over the bar at high water and carry cargoes of not more than 60 to 100 tons.

Since 1878 ships and barks from 1,800 to 2,100 tons bur-

den have been running regular trips and drawing from 16 to 16·5 feet of water. The completion of this year's work will admit of easy navigation for vessels drawing from 21 to 22 feet of water, which is ample for most foreign vessels that come over the bar off the Golden Gate.—*Min. and Sci. Press.*

How Opium is Produced in India.

[Calcutta Correspondent of San Francisco *Chronicle.*]

Owing to the ever poverty-stricken state of the Indian *raiat*, or husbandman, the government advances the means whereby he can engage in poppy cultivation. The nature of their engagements is about as follows: The cultivator undertakes to sow a *bigha*, or about one-twentieth of an acre, with poppy seed. For this he is given the requisite amount of seed. If a well has to be dug, he is not only given a sum on loan, sufficient to carry out his purpose, but also money enough to buy bullocks in order to enable him to draw water from the well when it is finished. This is termed the first advance, and is simply given to prepare his land for the sowing of poppy seed. The second advance is given when the plant begins to shoot above the earth's surface, and the third, when the plant is about to mature. In January or February the plant comes to maturity; in that state the pods are lanced in the afternoon. The opium is allowed to exude till next morning, when it is carefully taken off by an iron scraper. At the same time precaution is exercised to close the incisions by running the finger over the cuts. About five to six incisions suffice for the drawing of the juice.

The opium is placed in brass vessels, slightly tilted, so as to drain off the dew or any other watery substance. It is then manipulated and placed in new earthen vessels, and is thus kept till it is brought to the weighing station. The cultivator of poppies does not employ labor. His holdings are mere garden patches; so all the aid he requires, from the sowing of the seed to the maturing of the plant and the gathering of the opium, can be had from the members of his family. The whole of this work is done by himself, his wife, and his little ones. Many of these opium garden plats, worked by the man and family, amount to only one-sixth or one-twelfth of an acre, perhaps; in a few isolated instances one man is wealthy enough to own half an acre.

There are many reasons which conduce to this. First and foremost is that the native does not like to lease more land than he himself can plow and work. Even with the growth of opium, where so many untold advantages are offered for extended enterprise, the Indian husbandman prefers to give his attention to a tiny garden rather than to be put to the expense of working, with paid help, a few acres. His outlay is nothing, and thus he is enabled, at tremendous profit, to grow opium for sale to the government. He does not pay for help; manure is always handy, as human excrement only is used, and nothing is cheaper and more effective. Irrigation is equally simple. A rude well is sunk; two posts and a cross beam, over which is placed a wheel, form the only apparatus for the drawing of water. A rope is passed over the wheel and attached to it a huge leathern bucket, which is let down and drawn up by bullocks. The water is emptied into a reservoir; running from this are numerous drains, which carry off the water and flush the lands requiring moisture. The stronger members of the family are engaged in this toil, while the children, who in other lands would be deemed infants, make themselves generally useful in picking weeds and many other duties necessitating light labor.

Before the sun gilds the horizon, and while the dew is yet fresh on the grass, the family are astir, and from early morning till evening their entire attention is bestowed upon their crop, either in weeding, watering, or picking during the day; and sometimes at night, in keeping wild animals from intruding and destroying in a single hour the labor of years.

The wants of the husbandman are but few. Four mud walls and a thatched roof compose the family mansion; and in such a hovel will he live for generations. A scant cloth tied round his loins serves for coat and pantaloons. When he desires to appear to advantage a huge cotton sheet, thrown in graceful folds around his body, serves as gala costume on occasions of great festivity. His little children are in a state of utter nudity, even in the coldest weather; and when it is borne in mind that from October till February the weather is a great deal colder than it is in San Francisco, some idea of the hardy nature of native children can be formed. The women are somewhat better clothed; a simple petticoat and a gray-colored sheet has for the last three thousand years formed their attire. But, whatever money the husbandman gains, he converts into jewelry, which forms the real wealth of the native landowner, and is regarded by natives much in the same way as a European looks upon a bank account. In times of acute distress he can always part, even at a premium, with his wife's ornaments. The Hindoo religion demands that certain ornaments must be worn by married women. When the contracting parties are poor they make them of lead, but directly fortune smiles favorably they are exchanged for gold and silver. The small farmer lives with but three objects, that is, to load his wife with ornaments, to eat off brass platters, and to be able, on the marriage of his son, to make a grand display. To attain this end he will suffer years of deprivation and inconvenience, and his many years' savings will be wasted in a single week of jollification.

We can imagine how glad must be the raiat when the poppy plant has begun to exude opium, and when his opium has all been gathered he waits patiently for the order to march, with the fruits of his labor, to the weighing station. It depends entirely upon the season as to when the cultivators can bring their opium to the government stations to be weighed.

DISPOSING OF THE CROP.

As a general rule, the month of April is the commencement of the weighing season. Intimation is then given to the opium cultivators that they must present themselves on a certain day with their opium, in order to have it tested and weighed. In the districts where the poppy plant is cultivated all are astir, and grand preparations are made for a general exodus. The opium is collected safely in red earthen pots, which are put in wicker crates, and the whole family, with burdens on their heads, make for the weighing stations. The picturesque Indian lanes are crowded with these men, marching like sheep to their destination. They only travel during the night. The sultry heat of midday forces them to seek the grateful shelter of the gardens and groves so liberally planted along the dusty highways. Directly a halt is called, and preparations are made for the daily meal. After this is finished some lively spirit starts a story, recounting the savage doings of the stranger who rules the land. With terrified countenances and anxious ears they listen to these fabulous tales; but inwardly they bless the "white face" as they think of the money he is soon to disburse.

Many of these ignorant cultivators have never seen, in their life, a European; and accept with easy credulity anything detrimental to the character of their governors. No wonder is it then that the native approaches the sahib or gentleman with the most abject fear painted on every limb. He holds his breath when he hears him speak, and is ready to faint at the slightest display of anger or impatience. These sensational stories are generally propagated by rascally natives, who profit by the credulity of their countrymen in order to extort money. These men represent that nothing can be done without the bakshish or blackmail present, and they are the agents for the sahib, sent by him to collect toll. If the ignorant wretch demurs, his torturer paints a picture to which the torments of hell are but a trifle. The poor fellow, anxious to escape such calamities as he is threatened, pays the demand, and further presents his friend with a trifle in order that nothing should go wrong.

WEIGHING AND TESTING.

Early in the morning the weighing and tests commence. Notice is given to the cultivators, and they proceed to the factory, ranging themselves in a long line before the examining officer. Some men connected with the department then mix up the opium and take out a small quantity for examination. The officer, after inspection, marks the quality on the side of the earthen basin in chalk. The samples are again mixed up and tested with a solution of tincture of iodine. If it happens that the cultivator has been attempting to adulterate his opium with farinaceous matter the solution will discover the deceit. Experienced officers are alone trusted with this important duty, and it is expected of them to be able to distinguish the class of the opium as much by the feel and sight as by a chemical analysis. The consistency of the opium is easily told by a man who has been long at the work by simply turning the opium over with his hand or with the aid of a knife. If the opium is of a first-class quality the color is a rich brown, and it is so stiff that there is some difficulty experienced in turning. The poorer the quality the blacker the color and the thinner the consistency.

After the opium has been weighed and filled into separate jars according to its quality, they are sealed up and dispatched to the factory, where all the opium is again mixed up to a certain consistency and made into balls ready for exportation and sale at Calcutta. After the opium has once been delivered into the hands of the government officer, the cultivator has nothing more to do. He is paid so much by the pound; his former advances are deducted, and the connection between the *raiat* and government closes. When the balls are made they are packed into boxes called "opium chests," and sent down to Calcutta.

Mr. Bishop's Platinum Works.

At the recent convention of Mining Engineers in Philadelphia an excursion was made to the platinum works of Mr. Joaquin Bishop, of Sugartown, Chester County, Pa. Mr. Bishop is said to be the only platinum worker in the United States, by which must be meant the only one who has an establishment devoted entirely to that metal. He has made a specialty of platinum working for forty years. In 1845 he took a premium, but at that time the demand for platinum was so small that it only occupied him one day in the month, using the metal principally for rivets to fasten artificial teeth. Before the engineers, Mr. Bishop melted a piece of platinum with the ease that a plumber melts lead. The intense heat used may be imagined when it is known that a steel file held in the blast burned like a piece of wood.

The Population Center of the United States.

Ten years ago the center of the population of the United States was about forty-eight miles east of Cincinnati, Ohio. The Superintendent of the late census announces that the growth of the great West during the past decade carried the center of population about fifty miles west, while the large increase in the Southern States carried it a little southward. The result places the center of population within the limits of Cincinnati.

Last Year's Petroleum Product.

The conditions which prevail throughout the petroleum trade—including the export, the home, and the producing elements—are far from flattering to those who look for better prices in the immediate future, as the following points show:

1. The production seems to have continued without decline for the past month, showing an average per day of 72,390 barrels, against an average per day for the preceding month of 72,214 barrels.

2. During the past month we have added to stocks in the region (by excess of receipts into the lines over the quantity shipped from the lines) 1,162,073 barrels. This quantity of addition to stock for one month is unprecedented in the history of the trade.

3. On taking a year's view of the production and shipments of the lines we find that for the twelve months of 1880, while the average daily production was 71,124 barrels, the average daily shipment was 37,100 barrels, showing a daily excess of production over shipment or consumption, for the year, of 34,024 barrels.

4. With a stock of over 20,000,000 barrels—which, with the existing relation of excessive production to demand, must continue to increase for some months to come—there is no reason for buoyancy in the carrying of this stock, and except for the plentitude of money which has prevailed for the past six months, we are of opinion that it could not have been carried at the existing prices.

5. While nothing of any importance has arisen within the past month to indicate an extension of the field, the fact that the production has been so well kept up in the severe winter months just passed rather indicates that we may expect an increase in developments and production as the weather becomes more favorable for operating.

Notwithstanding the exceptional severity of the winter now passing, the table of statistics of drilling wells shows that more wells were drilled during this winter than in any preceding winter; thus showing a persistent determination on the part of the producer to keep up the excess of supply, if possible.

We have endeavored to hope for better condition in the trade by looking at the definition of the territory and at the plethora of money, to support the excessive and growing stocks; but in examining carefully the statistics of the business, we are forced to the conclusion that a substantial appreciation of prices based upon the relation of supply to demand is not likely to come to us for yet awhile. It will take considerable falling off of production and a considerable increase of consumption for the present year as compared with the past year to overcome the excess of 34,024 barrels which we accumulated each day of last year.

Taking the great activity in the region, together with the slow rate at which production has declined in the past few months, we fear some months must yet elapse before there come to us substantial reasons for better permanent prices.—*Stowell's Reporter.*

A New Disease.

A boy lately died at the Sainte Eugénie Hospital, Paris, of hydrophobia. His saliva, taken four hours after death, has been found by M. Pasteur to have remarkable properties, causing what appears to be a new disease. Two rabbits immediately inoculated with the saliva diluted died in about 36 hours. Other rabbits were inoculated with the saliva or with the blood of the first, and death ensued even more rapidly. The process was several times repeated, and with like effects. The animal, in five or six hours, loses appetite, afterward becomes weak and paralyzed, and at length dies of asphyxia. The windpipe is a good deal congested and shows hemorrhage. There is also a swelling of the ganglions on either side, and of the groin and axillæ, etc. M. Pasteur has observed in the blood of the inoculated animals a small organism, or microbe, which (by his method of artificial cultivation) he finds good reason to regard as the agent of the malady. It is a very short rod, slightly contracted about the middle; a sort of aureola appears round it, probably due to mucous substance. It is somewhat like the microbe of chicken cholera, but differs entirely in its effects. Fowls inoculated with it are not in the least affected. It is further singular that while the rabbit is always so quickly killed by the effect of inoculation, the guinea-pig, so closely related to the rabbit, retains its vigor and appetite weeks after inoculation. Whether there may not in this case be a long incubation of the virus remains *sub judice*. The new malady seems thus far distinct from rabies in the absence of the usual incubation, the nature of the anatomical lesions, and the transmission by inoculation with the blood of the dead animal. Further, dogs inoculated with the boy's saliva died in a few days without presenting rabid symptoms. M. Pasteur, however, thinks it would be rash to affirm the absolute independence of the two disorders; and if rabies may be attributed to the presence of a microscopic organism, some hope is offered that science may find a means of attenuating the action of that terrible malady.

The Jubilee of the Hanover Technical Academy.

Doubtless many of our readers will be interested in the announcement elsewhere in this paper of the 50th anniversary of the Polytechnic Institute of Hanover, Germany, to be celebrated next June. The festival committee are desirous that all former students at that institution shall send in their names at once, even though they cannot accept the cordial invitation to participate.

How the Telegraph is Kept in Order.

Every one has seen a "line man" walk up a telegraph pole as readily as if he were going up a flight of stairs. With a quick, nervous jerk of the foot he drives the spurs into the wood, and takes a firm hold every time. This dexterity comes from practice. It looks dangerous when a man is near the top of the pole, but that there is really little danger is proved by the fact that accidents very rarely occur. The men become accustomed to working at a great height, and mind it no more than sailors on a ship. An experienced man looks out for rotten poles and rotten cross beams, and once confident of these, he feels no further alarm. He hangs on by his legs as cleverly as a monkey by its tail, and thus has the free use of his arms and hands.

The spurs are of steel, and consist of a flat bar with a bend, which passes under the instep. A sharp point projects diagonally downward so as to bear a heavy weight from above. The greater the weight the deeper the point sinks, and the wood would have to be very rotten for it to slip. It leaves behind on the pole those queer little holes, which so much resemble the work of a woodpecker on a tree.

The line men are divided into two classes, climbers and ground men. The latter rank little higher than ordinary laborers, but in time, if they are ambitious to learn, they graduate into climbers. Climbers are paid from $40 to $75 a month, and at present are in great demand owing to the large amount of telegraph construction going on throughout the country. Ground men dig holes, plant poles, carry wire, and do whatever other labor is necessary.

The climber is provided with a pair of pliers, a hand vise, and a strap. He catches up the broken ends of wire, draws them together with the vise and strap, and splices them with the pliers. Care is taken to leave a certain slack, so as to allow for contraction by cold in winter. In large cities a number of climbers are kept constantly on duty at the central office, so as to be sent out at a moment's notice to repair a break. If a pole falls prompt action is taken. The fallen portion is chopped into sections and dragged out of the way of traffic. The stump is dug out. If a hole is to be dug, it is bored with a great earth auger, which does its work more neatly and quickly than spades.

There are different ways of raising the poles. If it is a very long pole—say seventy feet—a short pole is temporarily inserted and used as a guide. These long poles are becoming common in the city, for the reason that they raise the wires above the great mass of wires that covers the streets with a network of iron. Smaller poles are raised with pikes. A slanting ditch is dug from the surface of the ground to the bottom of the hole. The pole is laid in this, and this raises the upper end from the ground. Eight or ten men with pikes get under it. These pikes are long, smooth poles, with a sharp spike in the end. The men drive the spikes into the under part of the pole, and raise all together. They stand in such a way that the center of gravity of the pole falls among them, and there is no danger of its toppling to either side. Of the ten men eight will retain the advantage gained by the lift. The other two loosen their pikes, and, going in front of the others, insert their spikes lower down. Another lift is given, and this process is continued until the pole is raised to a perpendicular. The earth is then firmly wedged in about it, and it is ready to receive the wires.

The wires used are generally of size No. 8. For very long circuits Nos. 6 and 4 are used. The Western Union Telegraph Company has two No. 4 wires running to Chicago. The telephone companies use smaller wires, generally No. 12. This accounts for the greater damage done them by a sleet storm such as that of the 21st of January last.

The insulators are of glass, and cost from three to four cents apiece. Very many other devices and various kinds of material—stone, porcelain, rubber, etc.—have been used as insulators, but glass has been found to be the best and cheapest.

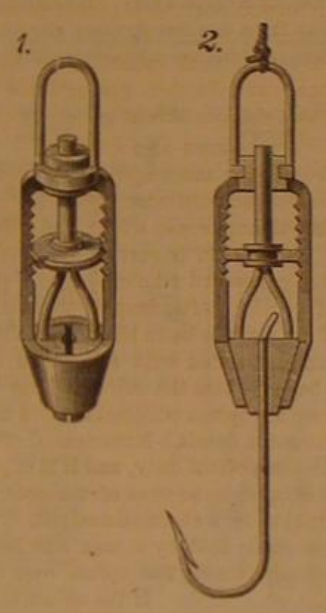
The chief operators of the offices in the large cities have charge of repairs for a wide circuit about them. At the American Union office, in this city, the chief operator has control to Philadelphia, to Hartford, and to Albany. At various stations along the lines between these points are test offices. The operators in these are required to be on duty at seven o'clock every morning. The chief operator in New York at that time calls up Philadelphia. Receiving a response, he tries every wire to Philadelphia. If all work properly it is all right. If a wire fails to work, the chief operator calls the test office nearest Philadelphia. If he again receives no response, he continues calling the successive test offices until he receives an answer. He thus locates the place of trouble, and then orders out the line men who are in waiting at the test stations on either side, who go along the line until they discover what is wrong. Another method is to call the test officers, beginning at New York, and cause each to ground its wire, until the point of damage is located.

It is easy to locate a break in the city where line men are constantly on the lookout, but in the country it is a different thing. Line men, who are necessarily climbers, are engaged by the month, and have each a certain tract of line assigned to their care. If the lines run along a railroad a man has control of an average of fifty miles. In case of a break he travels on a baggage or hand car to the place of trouble. These line men are under the control of certain head offices, and can be concentrated at any serious point of damage. In many instances the operators at unimportant stations also act as line men, and this is a part of their regular duty. Where the operator works on commission, he is paid extra for his line work. If the line runs on a turnpike away from a railroad, the line man has only fifteen miles under his care. He is obliged to live within call of the nearest station, and to be ready to go out at any time. Night or day, hot or cold, he must be prepared to start for the scene of trouble. The lines often run through desolate places, on the sides of mountains, and in wide prairies. The line man on horseback dashes from pole to pole, following the wires with his practiced eye. He often camps out all night, for he must not stop until the work is completed. In the winter some of these men travel on snow shoes, and lately, out West they have had the strange experience of digging down to the wires, where the snow was so deep as to cover the poles. It is a rule that the line man must go over the line once a week, to see that the poles are in order and to replace broken insulators. His hours of toil are often repaid by days of ease. He is alert for duty, but may have nothing to do for a long time. His pay continues just the same, and as long as he keeps within call he can do what he pleases.

The telegraph companies would like to run their wires under ground, but they find it won't work. They have been unable to insulate the wires so that they will work properly for any length of time. This compels the use of poles, which are generally of two kinds, cedar or chestnut. Cedar is the lightest, trimmest, and best looking, but chestnut lasts longer. Wires last from six to eight years. Rust is their great enemy, and smoke is another foe. Neither wires nor poles are expensive. Labor is the great item in making repairs, and in times when there is universal disaster to lines the companies have to pay high wages.—*N. Y. Sun.*

IMPROVED SWIVEL-HOLDER FOR FISH-HOOKS.

The engraving shows a simple and effective holder for fish-hooks of different sizes. The housing or head has at the top a cylindrical sleeve, to which is attached a swivel



HYMERS' SWIVEL-HOLDER FOR FISH-HOOKS.

loop for receiving the line. The bottom of the housing is connected with a conical sleeve for receiving conical jaws attached to a forked rod extending upward through the cylindrical sleeve. This forked rod carries a double cam, which engages notches in opposite sides of the housing, and holds the conical jaws in any desired position. The device is adapted to hooks of different sizes by inserting the conical jaws to a greater or less distance into the conical sleeve and fastening them by means of the cam.

This device facilitates the removal and replacement of broken fish-hooks, and admits of using on a line, hooks of a size suitable for any purpose. It answers as a sinker, and may be made small enough for catching minnows or large enough for the largest lines in use. It is a perfect swivel and a reliable holder. The inventor applies the same holder to rods, wire rope, etc.

This device was recently patented by Mr. C. Hymers, of 1601 Monroe street, St. Louis, Mo., who may be addressed for further information.

A Great Crucible Steel Casting.

Messrs. Jessop & Sons, Brightside Steel Works, Sheffield, have recently cast the largest crucible steel casting yet produced. It is a spur ring 28 feet in diameter, machine-moulded, and cast whole. To cast it 270 pots were used, each pot holding 80 lb. weight of molten steel. When the steel had been poured into the three large ladles, the plugs were removed, and it ran into the mould, the weight when cast being about 10 tons. In its finished state the weight will be about 8½ tons. It is, without doubt, by far the largest crucible cast steel casting of its kind that has ever been produced. Messrs. Jessop & Sons anticipate that this will be the beginning of an important trade with Lancashire mill owners, as they discover how much more durable steel wheels are than the cast iron wheels at present in general use. The firm have previously cast wheels 13 feet and 14 feet in diameter, but to 28 feet was a great leap. Now, however, they are prepared to undertake castings up to 34 feet. The operation of casting occupied 8½ minutes.

NEW INVENTIONS.

Mr. Henry B. Burin, of New York city, has patented a machine for threading bolts and tapping nuts, so constructed that when one tap or die is forced forward to do its work another die or tap will be withdrawn from its work. Thus the machine works continuously, and no time is lost in withdrawing the die or tap.

Mr. Major Thorp, of French Creek, West Va., has patented a cattle shed for use as temporary shelter in open pastures or fields. It consists of a roof pivoted to an upright support in combination with a windwheel and connecting devices, whereby the roof is turned so as to afford shelter from the wind coming from any quarter.

Mr. Elmer P. Newman, of Dimondale, Mich., has patented a copy holder for writing-books ruled parallel with the binding edge. The copy holder is formed of metal or other suitable material, having the ends bent under to form grooved flanges, which embrace the edges of the pages, and the upper longitudinal edge is bent over forward on the upper side to form a longitudinal flange for holding the copy, which is also held by the bent prongs on the lower edge of the holder.

Mr. Matthias Naumier, of Port Byron, N. Y., has patented an improvement in grain cradles, which relates to cradles made with either straight or bent snaths, and has for its object to give increased strength to the implement, and which consists in a novel system of bracing, which strengthens the snath, post, and fingers.

Mr. James E. Gowen, of Peabody, Kansas, has patented a self-adjusting weather strip for doors. It consists of a wood or metal strip, which, by means of springs, is caused to fit tightly against the casing of the door when the latter is closed.

Mr. Robert I. Draughon, of Perdue Hill, Ala., has patented a cotton chopper, which can be easily guided along a row of plants, whether straight or crooked, and around stumps or other obstructions, which will chop the plants to a stand without throwing the soil out of place, and which will allow the horse to walk at the side of the row.

Mr. James H. Brown, of Boston, Mass., has patented an improved machine for sawing kindling wood, which automatically feeds the sticks to the saw. The principal feature of the machine is a wheel with radial arms and spring clamps, by which the sticks are presented to either a circular or reciprocating saw, and devices for thrusting the sticks longitudinally to insure the cutting of definite lengths.

Mr. Carl L. Praeger, of Philadelphia, and Hubert F. Praeger, of South Bethlehem, Pa., have patented a self-adjusting wrench for bolts and nuts. The invention consists in a curved handle, one end of which serves as a lower jaw, and which is socketed and chambered to receive the shank and operating mechanism of the upper jaw. By means of a spring, slotted wedge, and lever, the upper jaw is adjusted and held. Some modifications of these devices are shown in the patent, but the principal features are as stated.

Mr. Arthur S. Pierson, of Harvard, N. Y., has patented a jointer for circular saws, so constructed that it can be readily adjusted to operate on saws of different diameters, and which will bring all the teeth to a uniform length. It is an ingenious, simple, and effective device.

Mr. George W. Miller, of Fawn Grove, Pa., has patented a rein holder for holding reins high enough above the dash-board of a vehicle to keep them out of reach of the horse's tail. It consists of a wire frame hooked on to the upper edge of the dash-board, a rectangular loop of the same material extending down in front to rigidly hold the frame, this loop being fastened to the front end of the box.

Mr. James A. Raney, of Cross Cut, Pa., has patented a sieve for middlings purifiers, so constructed that all parts of the sieve cloth will be covered by the middlings, thus preventing the air blast from passing through any uncovered portion of the sieve and the consequent waste of fine middlings.

Mr. Godfried Laube, of Wausau, Wis., has patented a car heater and ventilator, so constructed as to constantly reheat the air contained in the car, which allows a supply of fresh air to be introduced into the car when desired, which allows the hot air to be moistened before its introduction into the car, and which can be advantageously used for heating rooms and buildings.

Messrs. Herman H. Beckman, Claumer H. Beckman, and Christ Beckman, of Clayton, Iowa, have patented an improved windmill, so constructed that it turns more or less toward the wind according to the velocity with which the wind blows, and always remains in balance on its supports.

Mr. Richard Poindexter, of Bethania, N. C., has patented a tire shrinker, which is a cheap, simple, and effective device for holding a tire upon the anvil while it is being operated upon to shrink it, or upset it by hand forging.

Mr. William B. Van Hutton, of La Bahia Prairie (Burton P. O.), Texas, has patented a folding crate for the transportation of poultry, small animals, fruit, vegetables, etc, which is firm, strong, and durable, and may be folded so as to occupy little room in reshipment.

Mr. William J. Suttle, of New York city, has patented a nose piece for eye-glasses for holding the glasses and supporting the spring. The nose piece has several points of attachment to the lens or bow, and a socket for the end of the spring.

Mr. John Flanagan, of Newburg, N. Y., has patented an improvement in submerged pumps, which consists of a double cylindered pump provided with pistons composed of elastic diaphragms secured at their edges in the sides of the

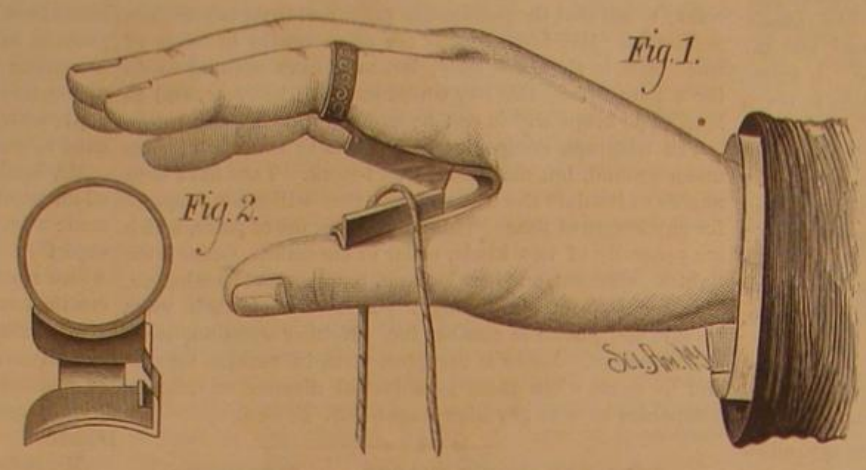
cylinders, and centrally in arched and perforated valve boxes, that are provided with ordinary hinged lift valves, said cylinders having open and cup-shaped bottoms forming suitable seats for ball valves, and having egress ports above the elastic diaphragm, the design being to submerge the pump and operate it by means of a rocking lever to lift and force water.

NOVEL SCISSORS.

The engraving shows a scissors attachment to the hand for cutting twine, tape, thin fabrics, etc. It is intended as a substitute for the shears or scissors ordinarily employed, and it consists of two short cutting blades attached to a V-shaped spring, one end of which is secured to a ring worn on the index finger. The spring is provided with suitable bearing plates for the thumb and finger, and the device is held as indicated in the engraving.

Scissors of this construction are always ready for use, and are not in the way when out of use.

This novel device is the invention of Mr. O. C. Haward, of Washington, D. C.



SCISSORS ATTACHMENT.

Hudson River Tunnel.

According to the *Railway News* the Hudson River Tunnel is advancing satisfactorily toward the New York shore at the rate of five feet a day. Two hundred men are employed digging out the dirt and putting in the iron and brick work. The tunnel is finished as they go along, and the work is much safer than under the old plan, which resulted so disastrously. A small tunnel, about six feet in diameter, is run ahead of the larger tunnel, which follows and incloses it; warning is thus given of the nature of the soil. The work is now in the south tunnel, which is now completed 290 feet from the shaft, and will soon be out as far as the north tunnel, which has been cleaned out, but not extended, since the accident. Both tunnels will then be carried along together. A caisson is in course of construction for beginning the work on the New York side.

NEW TELEPHONE TRANSMITTER.

BY GEO. M. HOPKINS.

The microphone, with pendants, figured and described by the writer in the SCIENTIFIC AMERICAN of Nov. 16, 1878, was among the earliest of telephone transmitters, and although the device was crude in appearance and exceedingly simple in its construction, it contained the germ of a successful instrument, and was favorably noticed in the scientific papers of Europe.

The transmitter shown in the annexed engraving is based upon the same principle, and, so far as the devices for varying the currents go, it is even simpler than the original microphone. Fig. 1 shows the exterior of the instrument, Fig. 2 the interior, Fig. 3 a detail of the transmitter proper, Fig. 4 a sectional view of the receiver, and Fig. 5 is a diagram showing the battery and line connections. Everything, excepting the battery, bell, and receiver, is contained in the box. In the center of the cover is formed the mouthpiece, behind which is placed the diaphragm, consisting of ordinary Russia iron of the thickness commonly used in stovepipe. It is 2¾ inches in diameter, and is held in position in a circular cast iron frame by two springs attached to the frame and pressing the diaphragm. The edge of the diaphragm is bound with soft rubber or felt. This arrangement, however, is not essential to the successful working of this instrument, as equally good results may be obtained when the diaphragm is clamped tightly at the edges between two rings fastened with screws to the front of the box.

To the center of the diaphragm *a* (see Fig. 3) is attached a metal clamp, *b*, which supports, in a horizontal position, a cylindrical pencil of hard electric-light carbon, ¼ inch in diameter and 1 inch long. A disk, C, of battery carbon 1¼ inches in diameter and ¼ inch thick, is grooved around the edge and wound with fine copper wire, which terminates in a flexible spiral connected with the upper hinge of the box. The carbon disk is suspended by a silk thread from a spool formed on the inner end of a screw extending through the box cover, and capable of being turned so as to raise or lower the carbon disk, as may be required. The disk is slightly inclined from the perpendicular, and the line of contact between it and the carbon pencil is a little above the center of gravity of the disk. This arrangement of the two carbons prevents any marked break in the local circuit, as the disk tends to rock on the carbon pencil rather than fly from it when the diaphragm is set in vibration. The carbon disk has been saturated with melted paraffine in some instances with beneficial results.

The clamp which holds the carbon pencil is electrically connected with the lower hinge of the box. From the hinges the connections may be more easily traced in Fig. 5 than in the perspective views.

This diagram shows all of the connections for one end of the line, both ends being alike. The connections are shown in condition to call or receive a call. When a call is received the current passes from the line through the switch, E, button 2, key, bottom or outer contact of the key, bell-magnet, and ground wire, A, to the ground. When the key is depressed to call a distant station, the key touches the inner or top contact, on the battery wire, B, sending the current through the button 2, switch, E, and line to the bell and ground of the distant station. The current returns by the ground and wire, A, to the battery. After calling, the switch, E, is moved to button 1, and the switch, F being connected with the switch, E, by an insulating connection, is at the same time moved to button 3, as shown in dotted lines. Now the line connection is through the switch, E, button 1, wire, G, secondary wire of the induction coil, and receiver to the ground. The switch, F, when turned as described, completes the local circuit, the current passing from one cell of the battery through the wire, D, switch, F, button 3, transmitter, primary of the induction coil, ground wire, A, and wire, C. The connections are now correct for talking. The diagram shows the connections adapted to the class of transmitters employing but a single battery element, and to a line requiring several cells of battery to call. If a single cell of battery is sufficient to call, the posts of the wires, B D, will be connected together.

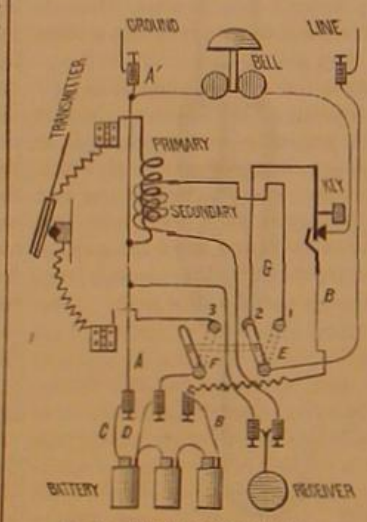


Fig. 5.—Telephone Connections.

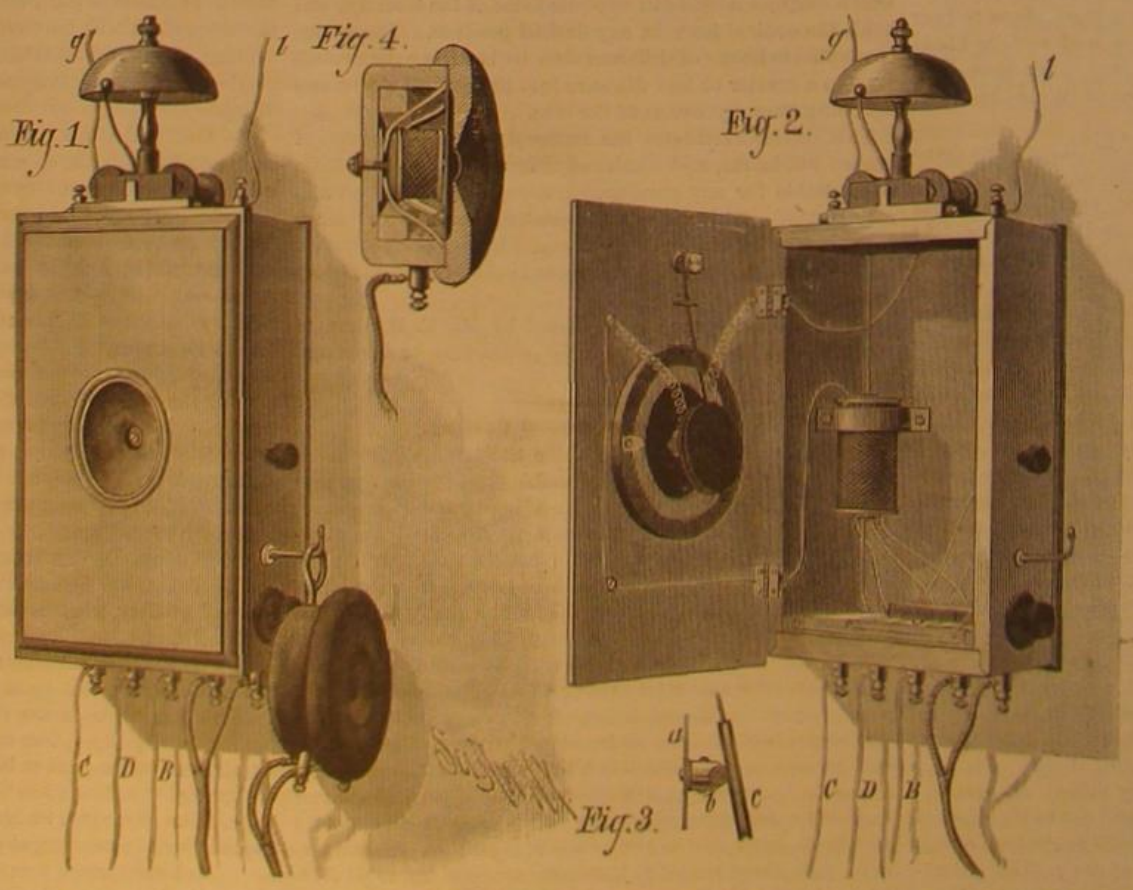
The button which moves the switch extends through the side of the box below the hook upon which the receiving instrument is hung. This arrangement insures the readjustment of the switch after talking, as the receiver cannot be hung up until the switch button is pushed in.

Three layers of No. 18 silk covered wire form the primary of the induction coil, and the secondary consists of some ten or twelve layers of No. 36 silk covered wire.

The receiver, shown in section in Fig. 4, has a diaphragm of the usual size mounted in a hard rubber case 2¼ inches in internal diameter and 1 inch deep. The bobbin of the usual style is placed on a soft iron core having a large convex head, and held in place by a screw extending through the bottom of the case. A soft rubber button is placed between the casing and the convex end of the core, and eight curved permanent magnets, one-eighth inch thick and one-quarter inch wide, touch the convex end of the bobbin core and are pressed upward into contact with the diaphragm by a rubber ring at the bottom of the case. The diaphragm at its points of contact with the magnets is freed from japan or oxide, and the ends of the magnets are let into notches cut in the case, so that when they press upon the diaphragm the latter is backed by the mouthpiece.

This receiver is very compact and light, and as to efficiency it is all that can be desired.

The transmitter works well, is perfectly simple, requires no particular care in its manufacture, and never gets out of adjustment.



SIMPLE TELEPHONE TRANSMITTER.

Telephonic Electric Condensers.

In order to make a condenser sing it is merely needful to connect its armatures with the extremities of the secondary helix of an induction coil, interposing in the primary helix a battery and a microphone analogous to the transmitter of Reiss. If thus arranged the apparatus merely reproduces musical sounds. The author interposed a battery in the secondary helix of the coil; *i. e.*, he connected one extremity of the induced wire with one of the poles of a battery, the other pole communicating with one armature of the condenser, the second armature being attached to the other extremity of the induced wire. Articulate sounds are then reproduced with perfect distinctness. M. Th. du Moncel observed that this fact confirms his ideas on the origin of sounds in the telephone.—*A. Dunand.*

A Reception of Professor Bell.

A grand reception has been recently given by the Mayor and Corporation of Brantford, England, to Professor Bell. The reception was attended by about 300 people. After the presentations the Mayor presented on address to Professor Bell, to which the latter made a suitable reply. An address was then presented by the Board of Trade, to which a reply to the following effect was made:

It might not be uninteresting to them, although not connected specially with trade, if he were to make some remarks upon his recent discovery of the photophone. He described it as at present rather a contribution to science than to the world's utilities, but he looked forward to important practical applications. Among them he specified communication between passing ships at sea, lighthouses and the shore, and in case of war communication with distant places could be received without the necessity of an intervening wire. He then described the apparatus and experiments, and added that he had spoken for a distance of 800 or 900 yards, and had sent the musical sound a mile and a quarter, but he saw no reason to anticipate any difficulty but that of the convexity of the earth in transmitting articulate speech by light to any distance.

THE CHEIROMELES.

BY FREDERIC A. LUCAS.

If the curious bat (*Cheiromeles torquatus*) shown in the accompanying engraving is not the most singular member of the order cheiroptera, it certainly has very few rivals. The skin is thick, almost naked, and marked with deep wrinkles, so that the animal has something the appearance of a diminutive pachyderm. Like the other members of the small sub-family to which it belongs, the cheiromeles has long, narrow wings which fold compactly up, very little membrane in front of the fore arm, and feet entirely free from the wing membrane. It thus has greater freedom of movement than bats usually possess, and the creature can crawl so rapidly over the ground that it is not an easy matter to pick it up. The first toe is quite separate from the others, and is furnished with stiff hairs along the outer edge. The thick round tail is free for more than half its length, and the interfemoral membrane is movable upon it, thus allowing the extent of surface exposed to the air to be increased or diminished at will, and probably aiding the animal in its rapid turns while in pursuit of the insects on which it lives. The lips are thick and extensible, and the teeth sufficiently large and sharp to crush with ease the hardest beetles. Beneath the neck, running from shoulder to shoulder, is a deep fold or sac, which receives an oily secretion from glands situated in the upper pectoral muscles But the most peculiar feature of the cheiromeles, and one not found in any other species of bat, is a sort of inverted pocket situated beneath either arm pit, formed by a fold of skin running obliquely downward and inward from the elbow. Dr. Dobson suggests that these pouches are to support the young, which otherwise would be unable to maintain a hold on the naked body of its mother during flight. The mammæ are situated at the upper end of these "nurse pouches." As both male and female have these pockets it is probable that when two young are born the male takes charge of one. This bat is nearly eight inches in length from nose to tip of tail, and twenty-two inches across the wings. It is of a dingy lead color, and dwells in holes in trees. Although not at all common, the cheiromeles has quite an extensive range, being found in Java, Borneo, Sumatra, and the Malay Peninsula.

It lives only in wilds far from the habitations of men, where its peculiar voice may be frequently heard; it has some similarity to the notes of the wild wood-pigeon, but is far louder and accompanied with guttural tones, and is uttered so suddenly and with such vehemence that it has a very startling effect. Sometimes one can catch a glimpse of these birds as they walk proudly upon the sand banks near the rivers. If they are approached they fly up and resemble in the broad surface of their wings, their coloring, and flapping, the urubu, or black vulture. They perch upon the top of thickly foliaged forest trees, and though they can seldom be seen, their loud, shrill voices indicate their whereabouts. In the brooding time they are found in pairs, sometimes four or six individuals joining together. The food of the horned screamers consists chiefly of vegetable substances, such as the leaves and seeds of aquatic plants, in search of which they wade through the morasses. Their flight is strong and easy, their walk erect and bold, and their mien lofty like that of the eagle. Their nests are found upon the ground in the forest marshes not far from rivers; they contain two large white eggs, and consist only of a few twigs. The young follow their parents almost as soon as hatched. Their flesh is not edible. Their quills are often used for pens.

CHEIROMELES TORQUATUS.

THE HORNED SCREAMER.

The horned screamer (*Palamedea cornuta*) is found in Central Brazil and northward in Guinea and Columbia. On account of the horn on the crown of its head, the thickly feathered wings, short head, and neck feathers, it will be recognized as a representative of the family of horned birds.

The horn, fastened only in the skin, rises from the brow about five-eighths of an inch from the root of the bill. It is slender and from four to six inches long, standing nearly erect, but slightly curved toward the front. Its diameter at the root is one-eighth of an inch, and it may properly be compared to a catgut string

The horned screamer is armed with two spurs on each wing; the upper one on the bend of the wing is triangular and very pointed. It is about nine-sixteenths of an inch long and almost imperceptibly curved outward. The lower one is only five-sixteenths of an inch long, almost straight, and very strong.

The soft velvety feathers of the upper part of the head are of a light gray, black toward the tip. The throat, neck, back, breast, and tail are blackish brown, the shoulders and large wing coverts are of a glistening metallic green, the lesser wing coverts a muddy yellow at the roots, the upper half and the upper part of the breast are a clear silver gray with a broad edge of black, the rump and belly are pure white. The eye is orange colored, the bill blackish brown, white at the tip. The horn is light gray, the feet a darker gray.

The horned screamer is a large and beautiful bird, about the size of a common turkey, and is an ornament to the primeval forests of Brazil. In traveling from the south to the north it is not generally found until the sixteenth degree of south latitude is reached, where it may be seen in large numbers.

THE HORNED SCREAMER—(*Palamedea Cornuta.*)

The horned screamers when domesticated are confiding and obedient, associate with fowls, and are peaceable when unmolested. They always place themselves on the defensive toward dogs, and know how to use the spurs on their wings to such purpose that they put them to flight with a single blow.

Wool Velvet.

According to *L'Ingénieur Universel* an extremely novel and interesting process has recently been discovered by M. Puech, of Mazamet, France, by which the wool on sheepskins may be transformed into velvet. Up to the present time sheepskins tanned with the wool on have only been used for mats, linings of coats, etc., and the wool not having been subjected to any preparation, is always matted or curled. Seeing that the innumerable fibers are naturally disposed in a most regular and perfect order, eminently fit for velveting, M. Puech conceived the idea of cleansing the skin and wool of all impurities, and of so preparing and dressing them that the hairs would be well preserved and not entangled one with the other, the occurrence of the latter contingency being, of course, fatal to the success of the operation. After long and continuous experiments success has been achieved in the following manner: The *modus operandi* is divided into ten principal operations, the 1st, 2d, 3d, and 4th relating to the complete scouring of the skins on the wool side and cleaning them on the flesh side, and the 5th, 6th, 7th, 8th, and 9th to tanning and preparing the skins so that the perfect adherence of the wool to the skin is insured; finally, by the 10th operation, the skin is submitted to special machines for preparing the wool like velvet.

The following are the ten numerically arranged and successive operations referred to as constituting the process: 1st. An ordinary water bath is prepared at a temperature of from 45° to 50° Cen., to which a scouring substance of some sort is added, such as crystal or soda salt, soap, and so forth, in which the skins are steeped. 2d. If dry skins are operated on, such as come from America or other foreign country, they are steeped eight to ten minutes, but for fresh or recently slaughtered skins three or five minutes will suffice. The skins are then passed to a pressing roller of sufficient power to separate the burrs, yolk and other impurities. 3d. The skins are then as quickly as possible and while still warm submitted to a beating machine. The object of this beating operation is to purify them of all foreign matters, and at the same time to wash them thoroughly with cold, tepid, or hot water, which is made to fall in abundance between the drum of the machine and the apron supporting the skin. 4th. The skin on the flesh side is then passed to this same beating machine, which cleanses it, renders it more supple, and disposes it to receive the tanning matter. 5th. The skins thus prepared are steeped about one hour in tepid water, or four to five hours in cold water, which operation completes the softening. 6th. They are then passed to a pressing roller to extract all the water and leave fifteen to twenty per cent of moisture. 7th. On the flesh side is applied, either by hand or mechanically, one of the known drugs composed *ad hoc*, constituting the tanning matter. In order that the action on the leather may be complete the skins are placed in piles for five to ten hours, after which they are hung up to dry. 8th. The leather is now moistened with a rag or sponge, and the skins are replaced in piles for five to ten hours to soften the leather and permit of cleaning the flesh side. 9th. The hides are stretched and are then passed to the softening iron, always on the flesh side, and the skins are scoured and tanned. There now remains only the 10th, or velveting operation, which is effected thus: By the scouring and beating system the staple of the wool is perfectly preserved and each fiber is in place. It then suffices to pass the skin on the wool side to the gig machine, which replaces all the staples where they had been displaced in the tanning operation, and causes the skin to part with what little tanning drug it may contain in the wool. After this the skins are passed to the dressing machine, which commences to dress the wool, cards it also a little, and prepares it for velveting. The skin on the wool side is then gently sprinkled and beaten with a rod by hand or mechanically. This is one of the most essential operations, as the wool being then damp the rod raises it and hastens the preparation of the velvet. The skin has now to be dried and sheared with cloth shears or other apparatus having the same effect, and this completes the process.

If it is desired to color the velvet, it is after the 4th operation that the dyeing takes place, the other operations then succeed as has been described. If the color necessitates boiling or temperature approaching it, which would be inconvenient to an untanned skin, the operation is performed after the 7th operation, and this 7th operation is renewed after dyeing and then followed by the subsequent operations.

Animal Reasoning.

A correspondent of *Nature*, writing from Cambridge, Mass., says: A lady, a friend of mine, was at one time matron of a hospital for poor women and children which was maintained by subscription. One of the inmates was a blind girl who was there not as a patient, but temporarily till a home could be found for her. She had learned to feed herself, and at meal times a tray containing her dinner was placed on her knees as she sat in a comfortable chair for her special convenience in feeding herself. One day while she was eating, the pet cat of the establishment placed herself before the girl and looked long and earnestly at her, so earnestly that the matron, fearing the animal meditated some mischief to the girl, took her out of the room. Again the next day, at the same hour, the cat entered the room, but this time walked quietly to the girl's side, reared herself on her hind legs, and noiselessly, stealthily reached out her paw to the plate, selected and seized a morsel that pleased her, and, silently as she came, departed to enjoy her stolen meal. The girl never noticed her loss, and when told of it by her companions laughed very heartily.

It is evident that the cat from observation had entirely satisfied herself that the girl could not see, and by a process of reasoning decided she could steal a good dinner by this practical use of her knowledge.

The White Alligator.

Writing to the *World* from Ca-Manos-Alto, at the foot of the great rapid of the Rio Negro, Brazil, the explorer, Mr. Ernest Morris, says:

Over one of the camp fires the crew are roasting with boisterous merriment a live alligator (*Jacaré tinga*), about five feet long. When I asked why they did not kill the animal before roasting, the pilot, who is always the spokesman of the party, answered that it would spoil the meat. The white alligator is highly relished by both whites and Indians. It differs entirely from the *Jacaré assu*, or large alligator, rarely attaining five feet in length, and is distinguished from the larger species by its pointed nozzle, somewhat rounded tail, whiter color, and its freedom from the *acatinga* (or smell). Though it is found throughout the whole course of the Amazon, it abounds more in clear-watered rivers and creeks. I have often found this alligator in streams of the high hills, miles away from any river or lake, and have frequently seen the skulls and bones in the forest. That it travels far and well on land there can be no doubt; and the Indians say that its eggs are deposited in the forests. The flesh resembles veal in appearance and has a fishy taste.

The Excretion of Lime.

Many investigations have been directed to the determination of the amount of lime excreted in various pathological states, and many observations exist of changes in the excretion. One of the earliest observations was that of Prout, relating to the phosphatic diathesis, which was recognized by the deposit in the urine. Later an increased excretion of earthy phosphates was assumed to exist in many diseases of the nervous system and kidneys, and a diminished excretion in some other diseases. Beneke studied the mode of formation of oxalate of lime in the organism, and Senator has directed attention to the variations in the amounts of lime excreted in various conditions. The last contribution to the subject is contained in an article in the current number of Virchow's *Archiv*, by Dr. Schetelig. The method of estimation which he has employed is the precipitation of the lime by oxalic acid; the precipitate was dried and dissolved in hydrochloric acid, and the lime precipitated by soda. The phosphoric acid was estimated by means of acetate of uranium.

The first question to determine was the amount excreted by normal individuals, since the statement of different authorities on this point differ largely, varying from 100 to 500 milligrammes. Experimenting on himself during eight days, the excretion was found to vary from between 350 and 500 milligrammes. It is greatest, like the other solid constituents, in the morning urine, and, when no breakfast was taken, the minimum was found in the urine passed just before the mid-day meal. Five hours later the quantity was greater; ten hours after the meal it was greater still. The excretion seems thus to bear relation to the material taken at a meal, and to the process of intestinal digestion. In starvation, accordingly, the excretion of lime almost ceases. On two days the mid-day meal was omitted, and on a third only an extremely small quantity of solid food was taken; the morning excretion of lime fell to an average of 70 milligrammes, and once only 35 milligrammes were noted.

The long delay after food before the amount of lime is increased in the urine makes it probable that it passes through the organism in some other path than, for example, that taken by the haloid salts, which find their way into the urine in a very short time. From a long series of observations, the conclusions were drawn that carbonate of lime, even when given in very small quantities and with much water, is quickly absorbed and appears in the urine. The lime phosphates of meat are, to a small extent, transformed into chloride or directly absorbed, but for the most part pass with the albumen into the small intestine and into the lymphatic vessels, but need the presence of the hydrochloric acid of the stomach for their preparation for absorption. The ingestion of water assists the passage of the lime into the vascular system in a very striking manner. No pathological increase in the excretion of lime could be demonstrated in chronic diseases of the thoracic organs or of the central nervous system, and seems to be improbable. The amount of phosphates in the urine is apparently regulated by the process of intestinal digestion and absorption, rather than by the conditions of the cell life of the body. The best means of counteracting the effect of the ingestion of lime is the free administration of water and chloride of sodium, or of hydrochloric acid.—*Lancet.*

Elasticity of Wires.*

The experiments described in this paper form a continuation of experiments undertaken in connection with the work of the Committee of the British Association for commencing secular experiments on the elasticity of wires.

Long-continued application of stretching force increases to a very great extent the tensile strength of soft iron wire. Thus in experiments described to the British Association in 1879 (see report of the committee just referred to), a particular very soft iron wire was shown to have a breaking weight 10 per cent higher, if the weight necessary to break it is applied half a pound at a time per day, than it has if the breaking weight is applied half a pound at a time at intervals of say two minutes. It was found, also, that this wire, quickly broken, extends before breaking by as much as 25 per cent of its original length; whereas if the application of the stress is very slow, the extension is not more than 5 or 6, or perhaps 8 per cent. Further experiments have been undertaken on this subject, and are still in progress.

Using a continuous arrangement for applying the stretching weight and employing some very soft iron wire which had been specially prepared, and which was used in former experiments, the greatest weight which could be rapidly put on the wire without breaking it was determined. It was found that with a weight of 41 pounds gradually applied in 6¼ minutes, the wire stretched by 24·4 per cent of its original length, and broke 18 minutes after the weight was put on. With the same weight 41 pounds applied in 6¾ minutes, the wire stretched 22·1 per cent and broke in 24 minutes. With 41 pounds, however, applied in 7¼ minutes, the wire stretched 18 per cent and did not break. This weight, therefore, appeared to be just as much as the wire would bear with this method of applying the weight. Accordingly it was applied to a great number of wires for different lengths of time for the purpose of hardening them, and arrangements have been made for keeping a number of wires for very long times with this stretching force applied to them. The amount of extension produced by the application of the hardening stress was observed in each case.

After the hardening stress had been applied for a certain time the additional weight necessary to break the wire was determined, and also the additional elongation before breaking, which was in all cases almost insensible. The wires seemed permanently set in about forty minutes from the time when the hardening stress was applied. They did not alter in length till just before they broke, when they generally stretched 1 or 2 millimeters on a length of about 1,800 mm. The following table shows some of the results out of a great many that have already been obtained.

Length of wire used.	Hardening stress applied in pounds.	Time taken by continuous machine in applyi'g the hardening stress in minutes.	Extension produced by application of hardeni'g stress in per cent in original length.	Duration of hardening stress in hours.	Total breaking weight after hardening
50 cm.	41	6¼	24·4	Broke with 41 lb.	
"	"	6¾	22 1		
"	"	9½	18·7	24	47 44
"	"	7	17 2	27	47 5
"	"	8	17 3	117	48 13
"	"	7¼	18·1	790	52 31

Curves have also been obtained and were exhibited to the section showing the extension with gradually applied weights both of a number of wires and of the different parts of the same wire; also curves showing the extension at different intervals of time from the beginning of an experiment in which the wire is running down under a weight sufficient to break it finally.

The author acknowledged the great assistance that he had received from Mr. A. C. Crawford and other students in the Physical Laboratory of the University of Glasgow.

Similar experiments are in progress on wires of copper and tin, and it is intended to test gold wire very soon, as it will probably give interesting results, and results very different from those given by soft iron wires.

* Strength and Elasticity of Soft Iron Wires. Abstract of a paper read at the British Association, by J. T. Bottomley, M.A., F. R.S.E.

The Egyptian Obelisk Presented to New York.

The last act in the history of the obelisk removal was its official presentation to the city of New York by the United States, at the Metropolitan Museum of Art, February 22.

In his presentation speech, Mr. Evarts, Secretary of State, gave some interesting particulars touching the removal of obelisks from Egypt:

"The first was taken by the conquering Assyrian, a monarch of great mark in his time, and remembered through all ages since—known better to us, and more easily, by his Greek name of Sardanapalus. He took an obelisk to Nineveh, the capital of Assyria, when that empire was the mistress of the world; and that movement was, indeed, a movement which embraces many of the important incidents of even a great voyage like this which our obelisk has taken. Although there are no records of the precise method or route of transportation which the Assyrian took for his obelisk, yet it is very apparent that, as it must have been water-borne, it was taken to the Red Sea, then down the Red Sea into the Indian Ocean, then up the Persian Gulf to the mouth of the Euphrates, and thence to Nineveh, beyond the navigation of the river. This route, speaking roughly, must have included some fifteen hundred miles of journeying, and we are somewhat at a loss to understand how the method and vehicles for such a transportation could have existed at that age, we have so little record of them. But as the obelisk undoubtedly got to Nineveh and could not go across the desert by land, it must have made this circuitous route for upward of fifteen hundred miles.

"The next conqueror that assumed to take obelisks from Egypt was Rome in the time of the emperors. They took as many as fifteen, one after another, and twelve now remain in Italy. This brings us to the period close upon the Christian era; and in the time of the famous Cæsar, Julius, and on through his successors, Egypt, subject and abject, yielded up these treasures of its art and of its pride to a conquering spoiler.

"Now came the Empire, with Byzantium as its capital; and it, too, demanded from the wealth of Egypt the contribution of an obelisk to mark the domination of this city. Byzantium, now Constantinople, contains the obelisk then taken; and this closes the transactions, or transportations, in ancient times. All subsequent movements have been within this century. The French and British, as we know, made Egypt a battlefield at the commencement of this century. Egypt, recognizing its obligations to England, as early as 1819 had offered an obelisk to England, the great power of the earth. But the difficulties of transportation and the expense seemed so serious to the mother country that that gift remained lying on the sand at Alexandria; nor was any movement made for its transfer until the year 1877—completed in 1878. The height of English ingenuity and experience in architecture of naval vessels, in navigation, and in engineering, had only taught the English that an obelisk could not be carried in the hold of a ship; and the experiment was made of building a vehicle around the obelisk that could float it and itself and be towed by a steamer—giving this abundant opportunity of safety, between the sinking of the obelisk and the sinking of the tow; the tow might cut loose from the obelisk and leave nothing therefore for the chance of loss of life. The experiment was not such as to encourage imitation by us, even if Captain Gorringe had not had that faith in a ship which had been his cradle from his youth, that if it could carry all the men and all the armor and all the cargoes that modern civilization burdens ships with, it could carry an obelisk. The caisson, or whatever it was called, in which the English obelisk was inclosed, was abandoned in mid-ocean, and the experiment was delayed—delayed for fifty years and more from the time the gift was made until the courage and the skill were present to undertake it. Some adventurers at sea picked it up, brought it into London, took it into a Court of Admiralty, and received £5,000 for executing what the original arrangements had failed to do.

"The French obelisk was given in 1823 or 1824, by the Egyptian Government, doubtless in execution of a readiness on their part to favor the plan of Napoleon, to make that transfer as a part of his triumph to ornament his capital. In 1831, just fifty years ago, Louis Philippe undertook the transportation, and placed the monolith where so many good Americans have seen it in Paris, in the Place de la Concorde. It is noticeable that the expense of this transfer across the Mediterranean, or around by the Bay of Biscay, whichever way it went, cost nearly $500,000, quite five times as much as our enterprise, under the lead and the execution of Lieutenant Commander Gorringe."

The following statement of the transportation expenses of our obelisk was furnished by Lieutenant Commander Gorringe:

Net cost and expenses of removing, transporting, and erecting the New York obelisk	$73,844 03
Net cost and expenses of removing, transporting, placing, and repairing the pedestal, steps, and base	28,732 00
Total net cost	$102,576 03

This sum does not include the cost and expenses of the steamer, which must be recovered from her sale. The word "expenses" is used to designate and include amounts that have been paid for the use of the money needed to carry on the work. These amounts aggregate $15,973 03. Deducting this sum from the total net cost, the actual cost of lowering and removing, and transporting 5,382 miles by water and 11,520 feet by land, and erecting the New York obelisk and its pedestal and base, is $86,603.

The entire cost of the undertaking was defrayed by William H. Vanderbilt. The credit of carrying it out under great financial and political difficulties, at his own personal risk, is due to Commander Gorringe.

Nasal, Pharyngeal, and Bronchial Catarrh.

The complaints above named are very prevalent throughout all those regions of this continent where sudden changes in temperature are frequent. Acute attacks are, in popular language, called "cold in the head," "sore throat," and "cold on the lungs." The latter is, however, most generally confined to the bronchial tubes, and consequently the popular name is a misnomer. We find in the "Proceedings of the Medical Society of the County of Kings, N. Y.," for February, 1881, a very extended discussion of the relation of locality to the prevalence of this class of diseases. It is supplied in a report of the Committee on Hygiene of the society, which has made an apparently successful attempt to determine whether catarrhs are more prevalent in Brooklyn than New York, this being a popular notion.

To local readers it will be of interest to know that this notion is not based on facts, catarrhal affections being, in the opinion of the committee, equally common in both cities. This opinion is based upon statements supplied by the oldest and best physicians in both New York and Brooklyn. For the general reader, however, the conclusions of the committee have value beyond the decision of the main point in issue.

We may properly state here that the course pursued to gain the required information was systematic and thorough. It embraced inquiries into the meteorological conditions of both cities for a number of years, an examination of the received authorities in printed works upon the relations of catarrh to climate, locality, and individual constitution and temperament, inquiry into the tendency of repeated catarrhal affections to induce tuberculosis or real pulmonary consumption, and interviews with local physicians of character and large experience.

It was found that the climatic difference between the two cities is very slight indeed.

It was also determined that no real change of climate has occurred along the line of Atlantic coast cities for indefinitely long periods of time, although, apparently, there have been brief cycles of heat and cold, of moisture and of dryness, succeeding each other under the operation of some unknown law.

CAUSES OF PHARYNGEAL CATARRH.

These, as enumerated by various authors, are: "Personal idiosyncrasy, straining the voice as in shouting. As secondary to nasal catarrh, indiscretion in leaving off clothing, or in getting feet wet; rude changes in the temperature of the air; local irritants, as tobacco, spices, and hot drinks; certain atmospheric causes as yet unknown; thus, in spring and autumn catarrhs often prevail *endemically*. The same causes (perhaps, *e. g.*, pollen) sometimes operate to produce the epidemic varieties: *e. g.*, influenza and hay fever are symptomatic of certain exanthemata.

"Generally 'moist and cold climate with frequent and sudden and severe variations of temperature.'

"Biermer draws attention to chilly winds with increased moisture.

"Lebert noticed this before, as also the effect of sudden depressions of temperature. He finds that the 'fair weather' years are *not* the best, but those when the transitions of the seasons and the changes of the temperature are *least marked*. He has also proved that the extremes of temperature and pressure produce less trouble than *sudden* changes. He shows that in Switzerland 50 per cent of all catarrhal bronchitis is in the first *four months of the year*. Heller obtained nearly similar results at the Vienna Hospital."

NASAL CATARRH.

The like causes produce nasal catarrh, except such as in the above enumeration relate to exercise of the voice and sequelæ of nasal catarrh.

CAUSES OF BRONCHIAL CATARRH.

"The sudden cooling off of the whole body, or a part of it, *i. e.*, the process of 'taking cold.' 'Inhalation of dust,' affections so well shown up by Hirt. Catarrhs from inhalation follow the following order of frequency: 1st. Inhalation of *vegetable* dust, next metallic dust, then that of animal origin, and least noxious is mineral dust. Inhalation of gases and vapors—vapors most often of nitric and sulphuric acids—then of hydrochloric acid. Catarrh from iodine inhalation is very rare. Hirt has noticed *marked tolerance* of these *irritants after a few attacks of catarrh*. He finds a few vapors that are not only innocuous, but seem to diminish a disposition to catarrhal disease, and even to hasten the favorable termination of an already existing catarrh. In this class belong vapors from oil, from glue, burning tar, and *salt air*.

"The theory that an undue amount of ozone in the atmosphere is a cause of catarrhs has not been established. During the prevalence of the epizootic or influenza among horses a few months since, the daily tests at Central Park showed almost an entire absence of ozone from the atmosphere."

The committee expresses the opinion that "though climatic and city influences have much to do with the creation of catarrhs, yet defective heating, lighting, airing, sunning, and drainage of houses, with improper views as to air, clothing, bathing, and exercise, are the main causes."

The effect of change of location upon catarrhal affections seems very pronounced.

The committee asserts that a mere change of residence "from New York to Brooklyn, or from Brooklyn to New York, or accompanied with better food, more healthy and cheerful surroundings, may relieve a catarrhal patient; and that a change, with or without the above acquirements, from an exposed part of one city to a protected part of the other, from one house or section in either city to another house or section in the same, may likewise afford relief."

Those parts which are considered "exposed," in contra distinction from "protected" portions of a city, are those in which cold winds have more free access to exert their chilling effects.

Seaboard cities, though not, in general, considered favorable places of resort for catarrhal and consumptive patients, may yet afford benefit, provided the change is attended by increased comforts, enjoyment, better opportunities for treatment, and attention to personal hygiene.

Color Relations of Metals.

In a paper on the color relations of copper, nickel, cobalt, iron, manganese, and chromium, lately read before the Chemical Society, Mr. T. Bayley records some remarkable relations between solutions of these metals. It appears that iron, cobalt, and copper form a natural color group, for if solutions of their sulphates are mixed together in the proportions of 20 parts of copper, 7 of iron, and 6 of cobalt, the resulting liquid is free from color, but is gray and partially opaque. It follows from this that a mixture of any two of these elements is complementary to the third, if the above proportions are maintained. Thus a solution of cobalt (pink) is complementary to a mixture of iron and copper (bluish-green); a solution of iron (yellow) to a mixture of copper and cobalt (violet); and a solution of copper (blue) to a mixture of iron and cobalt (red). But, as Mr. Bayley shows, a solution of copper is exactly complementary to the red reflection from copper, and a polished plate of this metal viewed through a solution of copper salt of a certain thickness is silver white. As a further consequence, it follows that a mixture of iron (7 parts) and cobalt (6 parts) is identical in color with a plate of copper. The resemblance is so striking that a silver or platinum vessel covered to the proper depth with such a solution is indistinguishable from copper.

There is a curious fact regarding nickel also worthy of attention. This metal forms solutions, which can be exactly simulated by a mixture of iron and copper solutions; but this mixture contains more iron than that which is complementary to cobalt. Nickel solutions are almost complementary to cobalt solutions, but they transmit an excess of yellow light. Now the atomic weight of nickel is very nearly the mean of the atomic weight of iron and copper, but it is a little lower, that is, nearer to iron. There is thus a perfect analogy between the atomic weights and the color properties in this case. This analogy is even more general, for Mr. Bayley states that in the case of iron, cobalt, and copper, the mean wave length of the light absorbed is proportional to the atomic weight. The specific chromatic power of the metals varies, being least for copper. The specific chromatic power increases with the affinity of the metal for oxygen. Chromium forms three kinds of salts: Pink salts, identical in color with the cobalt salts; blue salts, identical in color with copper salts; and green salts, complementary to the red salts.

Manganese, in like manner, forms more than one kind of salt. The red salts of manganese are identical in color with the cobalt salts and with the red chromium salts. The salts of chromium and manganese, according to the author, are with difficulty attainable in a state of chromatic purity. He thinks these properties of the metals lead up to some very interesting considerations.—*Chemical Review.*

The Electric Lighting of Mines.

At one of the sessions of the American Institute of Mining Engineers, in Philadelphia, the Edison system of electric lighting, as applied to mining, was described by Mr. A. O. Moses. The method adopted is very simple. Wires run direct from the dynamo-electric machines to the different workings, supplying light to the shaft on their way. Each lamp may, if desired, be immersed in water, or may be protected from fracture by a coarse wire screen; the connections can all be made under water, and thus lamps may be put in or out of circuit without the slightest danger from the electric spark.

Far too much importance, the speaker thought, has been attached to the consequences that may arise from leading wires into mines for conveying electricity, notably by such high authority as Mr. Preece, the English telegraph engineer, but his deductions are not sustained by facts.

One of the most important advantages of the electric light in coal mines is in obviating the necessity of hermetically sealing up old or temporarily abandoned workings. Another is their prompt availability at times when light is of the most vital importance, when many lives may be in jeopardy after explosions, and dangers are multiplied on every hand, when everything depends upon immediate and vigorous action; then the weakness of all lamps that require to be fed with air asserts itself.

Dr. Wendell, Horticulturist.

Dr. Herman Wendell, one of the best known pomologists of this State, and owner of one of the largest orchards in the country, died at Hazlewood-on-the-Hudson, February 22, at the age of 70 years. Dr. Wendell was for several years President of the State Horticultural Society, and Vice-President of the State Agricultural Society. His orchard contained from eight to ten thousand fruit trees, every one planted by his own hand.

MECHANICAL INVENTIONS.

Mr. Albert Bonzon, of Santiago, Cuba, has patented a chronograph watch. The invention consists in a wheel rigidly attached to the second hand arbor and roughened on its upper surface, and in a heart cam with a roughened lower surface, which cam is loosely mounted on the second hand arbor and provided with a sleeve carrying the second hand and acted upon by a spring, whereby it can be raised or lowered, so as to come in and out of contact with the roughened wheel. An adjustment screw on the spring acting upon the cam regulates the distance that the end stud of this spring is removed from the heart cam.

Mr. William L. Miller, of Pittsburg, Pa., has patented a reversing and cut-off mechanism, which dispenses with the ordinary link motion. A disk is fitted and fixed on the shaft, and a movable eccentric having lugs which play in slots formed in the disk slides on the flat face of the disk. A sliding collar on the shaft is by links made to shift the eccentric, the weight of the eccentric being counterbalanced to equalize strain on the collar.

Messrs. Orry M. Shepard and William A. Knight, of Evansville, Indiana, have patented a railway time signal, which consists in a novel construction, arrangement, and combination of devices operated by wheels of a passing train, whereby both night and day signals are displayed, retained for a certain length of time in sight, and then gradually changed to different positions.

Mr. Luther C. Baldwin, of Manchester, N. H., has patented an apparatus for drying bobbins which dispenses with the use of boards for arranging the bobbins so that the ends will not touch after they have been painted. An endless belt is substituted on which the bobbins are placed, and which, running slowly, discharges the bobbins at a distance from the point where they are placed on the belt. The paint used being of a kind which quickly dries, the bobbins are discharged finished. A registering apparatus is employed to record the number of bobbins so discharged.

A Railway Station in the Gothard Tunnel.

The daily journals of Switzerland and Germany contain long articles in regard to an underground station in the great Gothard Tunnel, below the village of Andermatt, which has about 800 inhabitants, is situated about 5,000 feet from the sea, and directly over the tunnel. The Gothard Pass and the well-known Furka Pass, leading into the valley of the Rhone, cross here, and it seemed desirable to connect the railroad with the Furka Pass. The design is to cut a slanting tunnel from Andermatt down to the Gothard Tunnel and convey the passengers up and down by means of a wire cable road. At the connections of the two tunnels, restaurants, depots, etc., are to be cut out of the rock. The inhabitants of Andermatt expect to do a very great business, as all the passengers will prefer to leave the train at this novel station and be carried into the beautiful Ursérenthal, in which Andermatt is located, by the rope railway. The freight traffic would certainly be increased, but all this will probably not pay the cost of the additional tunnel, which would have to be about 1½ miles long. The idea is a very novel one, and is no doubt deserving of some consideration, but at present it will probably remain idea only.

L. d. V D. E. V.

Long Voyage in a Small Boat.

According to a correspondent of the London *News*, the sailing boat Il Leone di Caprera, 3¼ tons register, and manned by three Italians, stopped at Las Palmas, Canary Islands, February 9, on the way from Montevideo, S. A., to Naples. The boat had been 95 days on the voyage. She is described as being 27 feet long, 7½ feet wide, 3 feet deep in the center, and 5 feet fore and aft, flush deck, with bulwarks 2½ inches high. In the after part of the boat is a small semicircular space 3 feet deep, in which the helmsman sits. The hold, which is fitted with a number of hermetically sealed zinc tubes, 10 inches in diameter, capable of floating 40 tons, is entered by a hatchway in the after part of the vessel, close up to the semicircular space before mentioned. Here their provisions and water are stored, and there is just enough space to allow one man to lie down at full length. The planks are of cinnamon wood, and the framework is made of algarroba (carob tree.) The two masts are of walnut wood, and fitted in such a manner that in case of a sudden squall they can be lowered almost instantaneously. When in 48° longitude and 30° latitude the boat was struck by a heavy squall, and was thrown on her beam ends, the tops of the masts being forced two or three inches under the water, but she raised herself almost instantly, and suffered no damage. The commander was Capt. V. Fondacaro, an experienced navigator.

An Illustration of Amœboid Movements.

The curious movements of the lowest forms of life are illustrated by Dr. Haycraft with a simple mechanical contrivance, which will be found useful in the classroom. He takes an India-rubber ball, perforated with a number of small holes, fills it with colored albumen (white of egg), and immerses it in a solution of sugar of about the same density as the albumen. A gentle pressure applied to the ball forces out the albumen in finger-like processes, which are retracted when the pressure is relaxed, thus clearly imitating the extension and retraction of the amœboid processes of protoplasm familiar to all microscopists.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. S. M. writes: In the last SCIENTIFIC AMERICAN in answer to J. S. M., in regard to reboring the cylinder, or grinding with segment of lead and sand or emery, I will ask if it is not possible to wear the cylinder smooth by constant use, keeping the packing set slack and keeping it well lubricated with good oil mixed with good plumbago, the cylinder being quite soft? I know of one case where a cylinder became cut quite bad on opposite sides by the piston rod being bent on account of one of the follower bolts working out. This cylinder became smooth in about four months of running twelve hours each day, without any special care on account of its being cut. This case makes me think that a cylinder that has become cut in one or two places might, with extra good care, be made to wear smooth. What is your opinion in the case? You have told me already that the only safe way was to rebore the cylinder, and I think it is; but if it is possible to wear it out I would like to do so. The diameter is 22 inches, being cut in one place about 5 inches wide, whole length of stroke 20 inches. A. We think that with care it might be accomplished in the way you propose, but the process must necessarily be slow, as all other parts of the cylinder must be worn or abraded to a diameter sufficiently large to remove the metal to the depth of the cuts.

(2) W. L. asks: How much stiffer would a wrought iron pipe, 4 inches in diameter and ⅛ inch thick, be, than a pine stick 8 inches in diameter, both to be 10 feet long? A. The pipe would be about 3½ times stiffer than the wood.

(3) O. P. S. asks: 1. What is the best preparation that I can use to ebonize or blacken parts of a light-colored ash wood, used for furniture, the preparation to be applied with a brush? A. See page 91, (18), vol. xl., SCIENTIFIC AMERICAN. 2. Will a simple rotary fan blower, 6 inches in diameter, with the wings 2½ inches across, be sufficient to run a sand blast, and what would be the greatest speed to get the strongest blast? A. Such a fan will do. It should run at from 2,500 to 3,000 revolutions per minute.

(4) H. F. W. writes: 1. In the description of Elisha Gray's electro-harmonic telegraph, in No. 27, vol. xliii., it says that the steel reeds are operated by electro-magnets, and "the current, operating one reed when passed over a line, will set in motion at the farther end a reed exactly corresponding to the first," etc. Why is not one reed set in motion by the current as much as another? A. A reed will answer only to electrical impulses corresponding in rapidity with its period of vibration. 2. Has any motor been invented to use simply the power of a permanent magnet? A. No.

(5) J. P. F. asks: 1. Where can I procure a good cylinder air pump? A. From any good metal pump maker. See our advertising columns. 2. What would be the weight of one square foot of steam, at a density of 140 lb. to the square inch? A. One cubic foot, 155 lb., total pressure = 0·00348 lb.

(6) H. A. M. writes: A maintains that white is a color. B says that white is not a color. Is white a color considered in the same sense as green or yellow, etc.? A. White is popularly considered as a color, but in reality it is the union of all colors.

(7) J. L. K. writes: 1. I want to bring water to a turbine wheel, a distance of 800 feet, fall 60 feet, size of pipe about 15 inches. I propose using 500 feet of pipe and 300 feet open race. Can I make a substantial pipe of 3 inch plank, and how should I construct it? A. Yes; make the pipe with staves, hooped with wrought iron band. The lower end must of course be hooped closer than the upper end. 2. What power do I require to drive a two-block shingle machine, self-feeding saw, making 1,500 revolutions per minute, and cutting half an inch each revolution? A. About six horse power.

(8) J. W. H. asks: 1. How much power is required to run a 24-inch saw to cut or split hardwood plank from 3 to 4 inches thick? A. The power does not depend upon the size of the saw, but upon the amount of work to be done; and, as you do not state this, we can give you only a general reply. With a kerf of one-eighth inch, 1 horse power will saw 2·66 square feet per minute. 2. Which is the best steam engine, one with large cylinder and short stroke, or a smaller cylinder and longer stroke, both to be of the same horse power? A. For high speed short stroke, and for slow speed long stroke. 3. Which is the best, the upright or the horizontal—the engines not to exceed 15 horse power? A. There is very little choice; the upright occupies the least room.

(9) C. N. F. asks: 1. How can water be kept in casks for fire purposes in mills, in winter, without freezing? A. I have used salt, but it don't seem to be a sure preventive. A. Salt will answer very well if you use enough of it.

(10) J. W. B. writes: I want to plate table cutlery with Banca tin, by melting the tin in a crucible, and dipping the articles to be plated. How shall I prepare the solutions to be used before and after the dipping, so that no polishing will be necessary? A. Cleanse by dipping in a mixture of equal parts muriatic acid and water, and scouring with a brush and fine sand or pumice stone; rinse quickly in running water, and put into a bath of hot melted tallow for half an hour, then for an hour in the molten tin at about 433° Fah. On removal dip in very hot tin, and remove all superfluous metal with a brush of hemp. Dip again in a very hot bath of purest tin, and transfer at once to a bath of hot oil, where excess of the metal drains off. On removing dip the edges in the hot tin to take off the thick border. Finally rub with dry bran until the oil is removed and the work presents a silvery gloss.

(11) W. S. asks (1) how to obtain a pure or nearly pure carbon gas. A. We do not know what you mean by carbon gas. 2. Can a vessel containing said gas be heated to redness without danger? A. Illuminating or similar hydrocarbon gas, or vapor of petroleum oils, et., if unmixed with air, may be passed through red hot iron tubes without danger. Owing to the expansion caused by heat it would not be safe to heat such a gas in sealed vessels. 3. Can carbon be made a non-conductor of electricity, and if so, will it retain its infusible properties? A. The diamond (pure crystallized carbon) is practically a non-conductor of electricity, and infusible; the other forms afford a passage to the current. The conversion of these latter into the crystalline form has not yet been accomplished in a practical way. 4. Will kaolin withstand the heat of incandescent carbon of ordinary lamps (say Edison's)? If not, is there any substance, a non-conductor, that will? A. Not very well; you might try pure caustic lime or magnesia.

(12) G. G. asks: Is there any way to prepare India ink so that it will not gum or harden? If so, please inform me how to do it. A. Dilute Cooper's liquid glue with about six parts of water, mix into a perfectly smooth thick paste, with the finest purified vegetable lampblack; mould and dry slowly.

(13) G. G. P. writes: I am at a loss for a mordant for dyeing pearl buttons either blue or red. Can you assist me? A. Use a strong alcoholic solution of aniline blue or red; dry, and rub down with cork moistened with oil of vitriol.

(14) C. C. asks: 1. Can I soften celluloid so I can press it into a plaster cast of a wood engraving and then print from it as from a stereo or electrotype? A. Yes, by steam and pressure; also by means of a hot oil bath. 2. Where can celluloid be bought, and cost per sheet or lb.? A. See our advertising columns and Hints to Correspondents. 3. Where can bisulphide of carbon be obtained in small quantities, say 1, 2, or 3, oz., and cost per oz.? It cannot be had here or in Denver. A. Your druggist can doubtless procure it for you; costs about 40 cents a pound. 4. Can electrotypes be produced with the dynamo electrical machine? A. Yes. 5. Can you explain how engravings on wood are made to look similar to pencil drawings and lithographs, as seen in *Scribner, St. Nicholas, Wide Awake*, and the Jersey bull, in this week's SCIENTIFIC AMERICAN (February 5); show shape of tools? A. The plates are prepared by the photo-engraving process. See printing by photography, SUPPLEMENTS, Nos. 143 and 146. 6. Where can the tools be bought? A. See answer No. 2. 7. Give parts of hydrofluoric acid and parts of water for etching on glass. A. Use ordinary strong hydrofluoric acid, or powdered fluorspar, made into a paste with strong sulphuric acid slightly warmed.

(15) W. P. D. asks: What is the best mixture to apply to iron shaft and castings to protect them from dilute acids? A. Clear lard, 1 lb.; camphor, ½ oz.; melt together and mix with enough blacklead to color. Clean the parts and coat thoroughly with this.

(16) O. C. asks: Can you inform me of any process by which eggs can be prevented from spoiling and kept in a reasonably fresh state, say from April to January? I have tried some pickling process but not with success. A. One of the best means of preserving eggs is the following: Select good fresh eggs and pack endwise in a mixture of equal parts of fine dry charcoal and salt (cold). Keep in a cool dry place, until required for use. A thin coating of gum or a trace of oil will prevent loss of moisture through the shell.

(17) A. E. N. asks: How is the sensitive paper used for taking blue prints (photographic) prepared? A. Ferricyanide, 1 oz.; ammonio-citrate of iron, 1 oz.; water (distilled), 10 oz. Both the ferricyanide and citrate must be chemically pure. Dissolve the former in six ounces of the water and the latter in the remainder. Mix the solutions together, put into a shallow porcelain dish. Float the sheets of paper on the surface of the liquid, raising the corners alternately to drive out air bubbles. Hang up by one corner in a dark place to dry. After exposing to sunlight behind the design or drawing, wash immediately and thoroughly in running water to remove all unchanged chemicals.

(18) C. E. S. asks for a process for tinning malleable cast iron. The acid used to tin wrought iron will not do for malleable iron. I have tried it without success. A. Do not leave in the acid or bran too long; scour thoroughly with fine sand (and a wire brush where it can be used), and pass through the following solution before entering to the grease pot: Ammonia alum, 11 oz.; fused protochloride of tin, ½ oz.; water, 4½ gallons; heat to boiling.

(19) T. H. C. asks: What kind of a machine is used for emerying those iron or steel ramrods used in the army guns? A. We believe an emery belt is commonly used for this purpose.

(20) R. J. W. writes: I have several boilers in this section of the country receiving their water from driven wells. The water is perfectly clear, is good to drink; but when used in a boiler to make steam it forms a froth or scum on top of water. How can I get rid of it? It will not sink so that I can blow it out of mud drum. Will a surface blow-off answer, by putting the pipe from top of boiler down to water line? A. Use a surface blow-off valve with a scum pipe inside the boiler.

(21) F. M. W. asks: Please explain how I can make gas bags in some cheap way, that will hold enough oxygen and hydrogen gas to run a magic lantern for two or three hours without filling again? A. Gum caoutchouc, 1 part; benzole, 20. Warm the latter over hot sand (out of doors), and gradually add the former, cut in fine shreds. Let it stand, with occasional stirring, until solution is complete. Give fine cotton ducking two coats of this (on one side), letting the first become nearly dry before laying on the second. Place two of these pieces, cemented faces together; go over the double piece (both sides) with a hot iron, and expose to the air for a week, to dry. Having prepared enough of this double cloth, stitch together with strong linen thread to form a wedge-shaped bag; give the seams several coats of the cement, thinned somewhat with benzole, and seal in the stop cock with the same. With an ordinary oxyhydrogen jet and quarter lb. pressure per inch you will require at least 15 feet of oxygen gas and about twice as much hydrogen (pure hydrogen). A "wedge" bag, 4½x4x2 feet, will hold sufficient oxygen.

(22) S. C. asks for the process of making chloride of lime in small quantity. A. Paint with asphaltum dissolved in oil of turpentine the inside of a long shallow box, all the cracks of which have been previously stopped with putty. When this is dry sprinkle the bottom of the box with slaked lime just moist, to a depth of half an inch. At one end place a stoneware jar half filled with a mixture of 6 parts black oxide of manganese, 8 parts salt, mixed with 20 parts of water. Then stir in 13 parts of oil of vitriol (which will heat the water nearly to boiling). Set on the cover tightly at once and let it alone for twelve hours. The lime will be found sufficiently chlorinated for use. The box should be kept out of doors. Avoid inhaling the chlorine gas. Usually it is very much cheaper to purchase than to make small quantities of bleaching powder.

(23) F. M. J. asks: 1. Cannot a small electric lamp for an ordinary room be furnished with light from a battery run by clockwork, similar to Edison's, but on a small scale, that would be an improvement on the ordinary kerosene lamp, the lamp to be stationary or otherwise. A. A one light machine could doubtless be constructed, but the clock work motor would hardly prove practicable. Small dynamo machines are not as economical as large ones. 2. Please explain the *modus operandi* of clarifying the crude oil kerosene as we receive it at 150 test. A. Agitate with about 3 per cent of oil of vitriol, then with plenty of water, and finally with water containing a trace of soda. 3. I find "aluminum gold" jewelry advertised—warranted to keep color and not distinguishable from gold, even by experts. Is the metal what it is represented to be? A. Aluminum bronze can be made to closely resemble gold in appearance. Experts can easily distinguish the alloy from gold.

(24) W. T. asks how to make asphalt pavements or walks. Are they expensive? Where can the material be obtained? Is it durable? What is the best mixture for walks that will stand hard usage? A. Ordinarily gravel screened to various sizes is stirred up with asphaltum liquefied by heat until the pebbles become well coated with the material. The road bed having been excavated to a depth of 6 or 7 inches and walled at the sides with inch planks, a layer of the coarser gravel is laid down and compacted by heavily rolling. Other layers of tarred gravel grading to fine sand at the surface are then put down in a similar manner. These walks are much cheaper than flagging, but they do not stand the weather in this climate very well. Good hydraulic cement mixed with about twice its weight of very fine sharp quartz sand and one one-hundredth part of silicate of soda dissolved in water makes a good walk when properly hardened. For materials see our advertising columns.

(25) T. H. S. asks: Can you inform me if there is any paint or other material which can be depended upon to make a wooden cistern watertight? If cement is used will it adhere better to brickwork than to wood? A. Try the following: 1. Boiled linseed oil, 3 parts; asphaltum, 4 parts; rosin, 12 parts. Melt and stir together over a gentle fire for an hour. Try a sample by cooling under water; if not sufficiently firm add more asphaltum and resin. Apply to the dry wood hot (not too hot). 2. Litharge, plaster of Paris, and dry white sand, each 10 parts by measure powdered; 1 part finely powdered resin. Mix into a stiff paste with warm boiled oil. Use at once and give three days to harden before wetting.

(26) J. M. A. writes: The front glass of my aquarium, one-sixteenth inch thick, 13x28, has cracked across the narrow part. There is no support for the top of the glass, but a strip is laid on. How can it be made secure without trouble of replacing the glass? The fracture is very neat, so that it scarcely leaks. A. Clean the glass with a little soda, and cut a piece of thin glass an inch wide and as long as the crack. Smear both glasses with the following warm solution: Fine isinglass and gelatine, each 1 drachm; bichromate of ammonia, 12 grains; water, 2 ounces; filter. Slide one glass upon another so as to carry off all but a film of the cement, which exposure to light soon renders perfectly insoluble in water.

(27) J. A. B. asks: What is the process for making the article called pumpkin flour? A. The cleaned and pulped fruit is dried by exposure to currents of warm dry air, then ground in a mill.

(28) G. B. asks for directions for embossing designs on glass ware, that is, goblets and shade globes. We understand the work is printed on by impressions taken off brass plates, then transferred to paper and from that to the glass, and then the glass is put in a bath containing white acid. A. Print from engraved plates on soft paper and immediately place the printed paper smoothly on the glass to dry. Moisten the back of the paper with a sponge, when it will come off, leaving the design on the glass. Then dip the surface in hydrofluoric acid until properly etched, rinse in water, and take off the fatty design by soaking in benzole.

(29) T. C. asks: What is the composition of the charges used for charging small fire extinguishers? A. The vessel is partially filled with a saturated aqueous solution of bicarbonate of soda. Over the liquid, near the top of the vessel, is suspended a lead bottle of oil of vitriol, in such a manner that when its stopper is withdrawn by pulling up the rod at top the bottle inverts and the acid is thrown into the bicarbonate solution.

(30) H. S. C. asks how to make and apply self-luminous or calcium sulphide paint. A. Boil together for an hour 2¼ oz. caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 oz. of pure sulphur (floured) and a quart of soft water. Set aside in a covered vessel for a few days, then pour off the liquid, collect the clear orange colored crystals which have deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clean black lead crucible provided with cover. Heat for half an hour at a temperature just short of redness, then quickly for about 15 minutes at a white heat. Remove cover, and pack in clay until perfectly cold. The addition of a small quantity of pure calcium fluoride to the sulphide before heating it is made. It may be mixed with alcoholic copal varnish.

(31) E. I. asks: 1. How can I make a lacquer for polished brass, etc. Can it be purchased? How is it applied? A. Seedlac, dragon's blood, annatto, and gamboge, each 4 oz.; saffron, 1 oz.; spirits of wine, 10 pints. Put all together in a covered vessel and stand the vessel in hot water and stir the contents occasionally until dissolved. Such lacquers are purchasable. Lacquering is done in two ways, called hot and cold lacquering. In the latter the lacquer is laid on evenly with a camel's hair brush, and the work is then placed in an oven or on a hot stove for a few minutes to set the lacquer. If heated too strongly the lacquer is discolored; if not enough it does not set properly. By the first method the metal is heated to the temperature of a flat iron as used by the laundress, and the lacquer is quickly brushed over it in this state, the work being subjected to the heat of an oven after or not, according to the judgment of the lacquerer. The article, if very small, will require this, because it will have parted with much of its heat in laying on the lacquer. If heavy, it will retain sufficient to perfect the process. A knowledge of the exact degree of heat required can only be attained by experience. 2. What is the best article to polish small tin articles about the size of a button? We have a good many of these to do. A. Use a small circular scratch brush attached to a lathe. 3. How can we gild cheaply? A. See article on electro-gilding, page 116, current volume.

(32) N. P. H. asks: What will make a glue that will be strong and yet be thin? A. Heat the solution for some time in a Papin's digester at 300° Fah.

(33) W. P. M. asks for the best method of coating sheet iron pans to keep them from rusting. I want some cheap varnish. A. Asphaltum, 5 parts; fine black lead (graphite), 1 part. Dissolve the asphaltum in oil of turpentine and stir in the graphite.

(34) E. E. W. asks (1) if the telephone, in SUPPLEMENT 142, will work five miles on No. 12 wire. A. If well made it would probably work through that distance, but the sound would necessarily be weak. Better results are obtained by using some form of transmitter. 2. How are the insulators attached to the bracket, or, in other words, what is the composition used to fasten or glue them on? A. The insulators are generally screwed on the brackets, an internal thread being formed in the insulator for that purpose.

(35) A. J. K. asks: What can be added to fluid ink made of gall and iron to make it jet black at first writing? Having night work I cannot see the writing until next day, when it then turns black. Does it injure the writing by any addition, and will it be as thin as before the addition is made? A. Try the addition of a small quantity of fine logwood extract dissolved in a little hot water.

(36) W. H. S. asks: 1. When do water pipes burst, when freezing or when thawing? A. In freezing. 2. Does water when forming into ice contract or expand? A. It expands. See Tyndall's "Heat a Mode of Motion."

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S. W.—It is a light fine silicious sandstone. Useful for some polishing purposes.—A. L. C.—The sediment is composed chiefly of a fine micaceous clay and sulphate of lime. Not specially injurious to cattle or steam boilers.—T. B. T.—A good marl—useful for fertilizing purposes. Its marketable value can only be determined by an analysis.—L. H. D.—Hornblende.—W. B.—The metal is iron and iron protosulphide. The shale contains much carboniferous matter, but no graphite.—A. U. G.—It is hornblende-schist—of little value.—T. E. T.—Mica schist—of no commercial value.—E. M. B., Jr.—1. Copper glance—sulphide of copper and iron pyrites—sulphide of iron. 2. Pyrrhotine—magnetic iron pyrites—may contain a little nickel. 3. Impure limonite—brown hematite iron ore.

COMMUNICATIONS RECEIVED.

On a Lunar Halo. By L. B. O.
On a Parhelion. By D. H. D.
On a Lunar Halo. By J. D. H.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 15, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1805, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Alumina, purifying sulphate of, W. Chadwick *et al.* 237,816
Awnings, device for raising and lowering, D. Fey 237,847
Axle box, vehicle, D. T. Applewhite 237,718
Axle, car, C. H. Rhett 237,906
Axle skein, T. H. Rogers 237,778
Barrel, H. Willard 237,943
Bed bottom, spring, S. Calhoun 237,726
Bed bottom, spring, D. Edgar 237,679
Bed bottom, spring, W. B. Hatch (r) 9,576
Bed, spring, E. A. Jeffery 237,871
Beehive, H. W. & J. F. Cowan 237,676
Belt clasp, T. G. Bennett 237,673
Billiard cue tip, G. C. Barney 237,719
Bit stock, N. Spofford 237,780
Blind, rolling, H. H. Hilgen 237,864
Book backing machine, W. F. Ellis 237,843
Boot, Ketchum & Skilton 237,880
Boot and shoe shave and bead cutter, H. S. Rogers 237,907
Boot and shoe sole edge trimming machine, Z. Beaudry 237,671
Bottle washing apparatus, C. Callahan 237,727
Bouquet holder, C. Erhard, Sr. 237,841
Box joint fastener, H. H. Brown 237,806
Bracelets, die for making, S. Cottle 237,823
Breast strap slide, W. B. Hayden 237,863
Brick machine, L. Cullen *et al.* 237,730
Bridge, A. Fink (r) 9,575
Buckle, Kelsey & Courtright 237,879
Calendar, J. Cussons 237,825
Can, H. Acker 237,796
Cap, naval or military, H. F. Jenks 237,695
Car brake, G. W. Laraway 237,756
Car coupling, J. Coleman (r) 9,562
Car coupling, W. A. Lovelace 237,892
Car coupling, J. D. Tinsley 237,786
Car draw bar, A. H. Weir 237,954
Car draw bar apparatus, F. W. Marston 237,748
Car draw bar, railway, W. H. Dickson 237,832
Car, hand, G. S. Sheffield (r) 9,571
Car seat and back, P. Rath 237,775
Car starter, B. C. Polo 237,697
Car starter, C. J. Underwood 237,959
Car starter, atmospheric, I. P. Wendell 237,965
Car, stock, M. M. Murphey 237,699
Car switch, W. Marqua 237,687
Car ventilator, railway, C. P. Tillinghast (r) 9,573
Carbureter, gas, P. Keller 237,753
Carpet linings, etc., substance or product for, G. S. Page 237,770
Carriage bow, H. F. Wilson 237,713
Cartridge, H. King 237,696
Cartridge shells, machine for trimming, T. G. Bennett (r) 9,566
Cask for beer, etc., Mainzer & Singer 237,894
Castanet, E. A. Fisher 237,850
Caster, furniture, J. J. Adgate 237,717
Chain, drive, H. E. Paine 237,771
Chandelier, E. S. Drake 237,834
Chuck, J. Doyle 237,731
Churn, H. Felt 237,846
Churn, P. D. Horn 237,868
Churn, L. B. & L. Wilson 237,792
Churn dasher, J. E. Finley 237,735
Circuit breaker for relays and sounders, J. C. Reed 237,776
Clevis, plow, J. W. Powers 237,772
Coach pad, E. R. Cahoone 237,725
Cock, faucet, etc., R. P. Garsed 237,783
Coffee pot, W. H. Sweeney 237,895
Coffee roaster, H. Owens 237,895
Condenser, surface, J. D. Brooks 237,674
Corn cutter, green, J. W. Jones 237,876
Corn husking implement, P. & B. Kaufman 237,877
Corn sheller, L. P. King 237,755
Corset, H. S. Strauss 237,709
Corset steel fastening, T. C. Bates 237,803
Cotton chopper, E. P. Tyson 237,961
Cradle, folding, C. C. Clark 237,830
Crushing and grinding pan for reducing ores, Steiger & Kerr 237,921
Cultivator, C. O. Gardiner 237,739
Cultivator, Gardiner & Downey 237,740
Curtain slat, C. Buckley 237,807
Door roller, J. L. Ryno 237,910
Drilling machine feed device, H. Bickford 237,722
Drying room clip, F. W. Claussen 237,821
Easel, A. H. Soukup 237,919
Egg beater, G. W. Gill 237,741
Egg case, ventilated, J. H. Batchelder 237,802
Electric light, T. A. Edison 237,732
Elevator, D. Casley 237,815
Engraving and chasing machine, C. Chevalier 237,818
Excavating machine, T. Dill (r) 9,568
Farm gate, T. F. Hall (r) 9,569
Fence, picket, R. H. McGinty (r) 9,570
Fertilizer distributer, S. H. Everett 237,843
Firearm, breech-loading, E. James 237,870
Fire extinguisher, J. M. Pollard 237,900
Fire kindlers, mould for, D. A. Beery 237,804
Fireproof shields, fabric for, J. S. Brooks 237,805
Fires, process of and apparatus for extinguishing, J. M. Pollard 237,899, 237,901
Fires, solution for extinguishing, J. M. Pollard 237,902
Fracture apparatus, E. Raynale 237,775
Fruit crate or carrier, E. W. Durand 237,837
Fuel, G. Kelly 237,878
Galvanic battery, A. F. Lelafield 237,830
Galvanic battery, portable, P. R. Erling 237,733
Garment sample, H. Leiser 237,760
Garments, making and fitting, R. F. Halleck 237,743
Gas, apparatus for making illuminating, J. Pintsch 237,898
Gems, mounting, B. J. Angell 237,669
Grain bin, portable, W. S. Brown 237,724
Grain meter, Arnold & Cawood 237,670
Grain separator, Darling & Gates 237,678
Grate, fireplace, J. J. Johnston 237,750
Grinding mill, A. N. Wolf 237,793
Gun for killing vermin, J. S. Woolsey 237,942
Hammer, power, W. R. Jenkins, Jr. 237,872
Handle attachment, H. D. Musselman 237,891
Harness loop, A. Owen 237,894
Harrow, J. R. Walker 237,789
Harrow, spring tooth, H. Gale 237,738
Hats and machinery therefor, stretching, H. C. Heckendorn 237,683
Hats, caps, and bonnets, manufacture of, Hastings & Crean 237,862
Hay rake and loader, S. L. McKay 237,690
Hoe, J. Hood 237,867
Hop extracts, manufacture of, W. A. Lawrence 237,759
Horse rake, C. T. Shafer 237,914
Hose nozzle, C. B. Hosford 237,684
Ice boat and breaker, W. W. Green 237,859
Ice house, P. O'Brien 237,768
Ice sandal, J. A. McCaffrey 237,887
Incubator, O. Martin 237,689
Indicator, L. W. Heysinger 237,747
Indicator lock, E. A. Cooper (r) 9,567
Ironing table, E. Weyl 237,791
Knob, door, B. D. Stevens 237,923
Lamp, Aikman & Osborn 237,668
Lamp, W. B. Robins 237,777
Lamp burners, extinguisher for, J. C. Miller 237,766
Land roller, C. G. McClaflin 237,888
Lantern, C. H. Fry, Jr. 237,852
Leather blacking frame, F. A. Dupuy 237,836
Life preserving mattress, T. O. Oliver 237,693
Lifting handle, H. B. Sargent 237,911
Locomotive, R. R. Wilson 237,938
Loom shuttle, J. Hamilton 237,682
Lounge, bed, A. Morris 237,767
Lounge, folding, P. M. Krickl 237,756
Low water indicator, L. Thomas 237,959
Lubricating apparatus, automatic, G. W. Baker 237,800
Lubricating the cylinders and bearings of steam engines, apparatus for, J. Absterdam 237,715
Magnetic body wear, W. Wilson 237,939
Mattress frame, R. E. Campbell (r) 9,564
Meats, preserving, J. L. Reese 237,905
Mechanical movement, G. S. Rominger 237,702 to 237,704
Metal plates, joining, O. J. Willard 237,936
Moulding apparatus, S. J. Adams (r) 9,573
Motor, B. F. Card 237,728
Mower attachment, lawn, C. G. Baldwin (r) 9,577
Mill furnace for the manufacture of iron, J. Tibbs 237,785
Needle for belt lacing, H. Royer 237,908
Needle grinding and polishing device, A. E. McDonald 237,763
Oil can spout, T. C. Chalk 237,817
Oil presses, press plate for, J. H. Small 237,779
Oiling and lubricating the bearings and cylinders of steam engines, apparatus for, J. Absterdam 237,716
Ointment, E. Frankford 237,736
Oven door, Day & Folger 237,827
Overflow apparatus for cesspools, G. W. Alexander 237,796
Oxychinoline, production of, Z. H. Skraup 237,917, 237,918
Packer, oil well, J. H. Williams 237,937
Packing case, R. S. Jennings 237,873 to 237,875
Paper for checks, etc., safety, J. Rendricks 237,746
Paper pulp from certain waste products, manufacture of, J. C. W. Stanley 237,910
Paper shot shells and apparatus therefor, manufacturing, C. A. & J. M. C. Rodney 237,709
Paper shot shells, device for manufacturing, C. A. & J. M. C. Rodney 237,703
Pianoforte action, J. Ammon 237,797
Picture cord attachment, C. A. Simpson 237,916
Piston engine, balanced, W. D. Peebles 237,694
Plaiting machine, R. B. & J. C. Copeland 237,822
Plaiting machine, N. J. Graham 237,858
Planing machine, W. H. Doane (r) 9,574
Planter, corn and pea, P. B. Anderson 237,798
Plate scraper, L. M. Fuller 237,681
Plow, W. F. Cameron 237,812
Plow shares and points, device for sharpening, C. Douglass 237,730
Plow, sulky, W. H. Cummings 237,824
Plow, sulky, E. A. Eustice 237,842
Plow, sulky, T. Meikle 237,765
Pocketbooks, elastic band fastening for, J. Menahan 237,860
Poke, animal, J. F. Furnas 237,850
Poke, horse, F. S. Osborn 237,893
Potato digger, F. McLellan 237,889
Preserving food, compound for, A. P. Gest 237,855
Printers' metal furniture, manufacture of, G. Scott 237,708
Pulley, W. H. Doane 237,833
Pulp, manufacturing, M. V. Eichelberger 237,839
Pump, S. H. Bakewell 237,801
Pump, rotary, A. Mathews 237,886
Pump, rotary, E. Madden 237,764
Radiator, C. B. Hotchkiss 237,869
Radiator, steam, G. Clark 237,819
Railway signal, J. T. Halsey (r) 9,563
Railway switch and signal apparatus, Tilden & Guerber 237,787
Railway switch, street, L. C. Powers 237,903
Railways, construction of cable, H. Casebolt 237,814
Railways, gripe for cable, H. Casebolt 237,813
Railways, permanent way for, J. Holden 237,865
Reversing mechanism, T. W. Capen 237,675
Reversing mechanism for elevators and other machinery, V. W. Mason 237,762
Saddle tree, lady's, J. C. Watson 237,790
Sash fastener, G. L. Norrman 237,892
Sash tightener, window, L. Schneider 237,913
Saw, scroll, F. Schaefle 237,912
Saw set, G. W. Atkins 237,799
Saws, correcting unequal tension in circular, G. F. Simonds 237,915
Sawing machine, crosscut, J. M. Turner 237,930
Scarf, J. T. Lynch 237,883
Scissors, J. L. Starks 237,781
Seeding machine, H. P. Tenant 237,728
Sheet metal can, J. S. Field 237,848
Sign, Holdsworth & Pringle 237,866
Skate, E. L. Gilman 237,857
Sleigh seat, upholstered, F. Selle 237,707
Soap cake, J. R. Hare 237,861
Sofa, V. Rathknecht 237,774
Spinning machines, spindle and whirl for, W. T. Carroll (r) 9,565
Spools and bobbins from plastic material, manufacture of, E. L. Bushnell 237,809
Spring, P. Fischer 237,849
Spring clasp, T. M. Hass 237,744
Steam and air engine, combined, E. M. Strange 237,708
Steam engine reversing gear, C. Straub 237,925
Steam trap, J. Ponder 237,698
Steel strips, apparatus for grinding and tempering, H. A. Kimball 237,754
Stove, gas or vapor, J. Benbow 237,672
Stove, heating, J. W. Wright 237,714
Stoves, vapor burner for, Z. Davis 237,836
Sugar from beet root and cane, purification of sirups and molasses in the manufacture of, A. P. Dubrunfaut 237,835
Sulky, trotting, C. F. Stillman 237,924
Surgical splint, W. H. Johnstone 237,751
Swinging gate, T. A. Hill 237,748
Switch and signal apparatus, interlocking fluid pressure, H. Tilden 237,786
Table, E. Puchta 237,904
Telegraphic key, J. H. Bunnell 237,808
Telegraph relay, W. L. Voelker 237,933
Telephone, A. K. Eaton 237,838
Telephone, mechanical, Watts & Maxwell 237,712
Telephones, transmitter for speaking, W. Gillett 237,856
Thermo-dynamic engine, F. A. T. De Beauregard 237,828
Timber crib, W. B. Runyan 237,909
Time register, electric, J. F. Kettell 237,753
Toy doll, C. Pfanne 237,897
Toy horse and other toy quadrupeds, T. L. Sancomb 237,705
Toy safe, L. Kyser *et al.* 237,757
Transportation can, J. F. Swab 237,710
Tray, metallic, J. A. Taylor 237,711
Trimming, J. Heimann 237,745
Truck for moving pianos, C. A. French 237,737
Truck, railway car, C. Barrett 237,720
Trunk fastener, spring, L. W. Egbert 237,680
Truss, L. B. Stuart 237,926
Tug, hame, J. R. Woolsey 237,941
Twist drill grinding machine, G. R. Stetson 237,922
Valve, A. W. Cadman 237,810
Valve, Cadman & Handy 237,811
Valve, M. M. Zellers 237,794
Valve, balance, J. H. Greenwood 237,742
Valve, stop, J. Old 237,769
Valves, machine for grinding plug, E. V. Tanner 237,784
Vapor burner, F. Marquart 237,688
Vegetable cutter, N. Evinger 237,844
Vehicle spring coupling, Wilson & Combs 237,940
Ventilating houses, W. Dewart 237,831
Wagon, buckboard, W. L. Bay 237,721
Wagon, platform, R. C. Morse 237,691
Wagon, side hill bracer, Taynton & Derickson 237,907
Wall paper, hanging, A. Johnson 237,749
Wash boiler fountain, J. Roberts 237,699
Washstand, N. O. Bond 237,723
Watch cases, device for making, C. H. Field 237,734
Watch guards, tubular slide for, H. & L. Sutro 237,782
Water meter, J. B. Curry 237,677
Wells, grappling tool for oil, O. J. Fairchild 237,845
Wheelbarrow, A. W. Pietsch 237,896
Winding yarn, machine for, Parker & Ford 237,896
Windlass, F. S. Manton 237,885
Windmill, E. Foskett 237,851
Window frame, A. Guipet 237,860
Window screen, J. G. De Coursey 237,829
Wringer, S. Pitcher 237,696

DESIGNS.

Cloths, nap surface of, F. Samson 12,176
Coffin handle ear, C. A. Bailey 12,164
Oil cloth, C. T. & V. E. Meyer 12,167 to 12,172
Range, Keeley & Atchison 12,165
Range, cooking, G. Smith 12,175
Sink, W. C. Peet 12,173
Stove, cooking, Keeley & Atchison 12,166
Stove, parlor, G. Smith 12,174

TRADE MARKS.

Buttons, J. J. Lafontaine 8,156
Gloves, kid, C. T. Jones 8,164, 8,165
Hair dressing, S. R. Van Duser 8,167
Medicated garters, E. S. Creighton 8,161
Medicines, certain proprietary, Heil & Hoelke 8,163
Tea, H. J. Weston 8,168

English Patents Issued to Americans.

From February 11 to February 15, 1881, inclusive.

Buttons, decorating, C. G. Dobbs, New York city.
Coast defenses, F. R. Timby, Rockland, N. Y.
Electric light (2), T. A. Edison, Menlo Park, N. J.
Pianos, A. K. Hebard, Cambridge Mass.
Polychromatic printing, G. Schwarzwald, N. Y. city.
Soap compound, J. F. Tyrrell, New York city.
Steam engine, W. F. Goodwin, Stelton, N. J.
Violins, E. R. Mollenhauer, New York city.

THIRTY-SIXTH ANNUAL REPORT

OF THE

New-York Life Insurance Co.

OFFICE, Nos. 346 and 348 BROADWAY.

JANUARY 1, 1881.

Amount of Net Cash Assets, January 1, 1880.....$38,185,431.68

REVENUE ACCOUNT.

Premiums	$7,014,819.59	
Less deferred premiums Jan. 1, 1880	367,989.02	—$6,646,830.57
Interest and rents, (including realized gains on real estate sold)	2,635,877.95	
Less interest accrued Jan. 1, 1880	317,989.11	— 2,317,888.84—$8,964,719.41
		$47,150,151.09

DISBURSEMENT ACCOUNT.

Losses by death, including Reversionary additions to same	$1,731,721.37	
Endowments matured and discounted, including Reversionary additions to same	564,579.85	
Annuities, dividends, and returned premiums on cancelled policies	2,203,590.02	
Taxes and re-insurances	212,424.06	
Commissions, brokerages, agency expenses and physicians' fees	770,804.30	
Office and law expenses, salaries, advertising, printing, &c	322,910.64	—$5,806,030.24
		$41,344,120.85

ASSETS.

Cash in bank, on hand, and in transit (since received)	$852,028.10	
Invested in United States, New York City, and other stocks, (market value $16,764,988.05)	14,925,174.09	
Real estate	5,029,324.59	
Bonds and mortgages, first lien on real estate, (buildings thereon insured for $15,365,000.00 and the policies assigned to the Company as additional collateral security)	16,464,922.23	
Temporary loans, (secured by stocks, market value, $3,184,840.00)	2,491,000.00	
* Loans on existing policies, (the reserve held by the Company on these policies amounts to $2,975,000)	597,451.12	
* Quarterly and semi-annual premiums on existing policies, due subsequent to Jan. 1, 1881	387,972.13	
* Premiums on existing policies in course of transmission and collection (estimated reserve on these policies $440,500, included in liabilities)	204,852.99	
Agents' balances	34,228.23	
Accrued interest on investments Jan. 1, 1881	357,167.37	—$41,344,120.85
Excess of market value of securities over cost		$1,839,813.96

** A detailed schedule of these items will accompany the usual annual report filed with the Insurance Department of the State of New York.*

CASH ASSETS, Jan. 1, 1881.....$43,183,934.81

Appropriated as follows:

Adjusted losses, due subsequent to Jan. 1, 1881	$335,195.40
Reported losses, awaiting proof, &c	198,761.98
Matured endowments, due and unpaid, (claims not presented)	109,643.96
Annuities, due and unpaid	5,294.25
Reserved for re-insurance on existing policies; participating insurance at 4 per cent Carlisle net premium; non-participating at 5 per cent. Carlisle net premium	36,473,691.79
Reserved for contingent liabilities to Tontine Dividend Fund, over and above a 4 per cent. reserve on existing policies of that class	1,752,165.82
Reserved for premiums paid in advance	14,084.62
	$38,888,837.82

Divisible Surplus at 4 per cent.....$4,295,096.99

Estimated Surplus by the New York State Standard at 4½ per cent., over $9,000,000.00

From the undivided surplus of $4,295,096 the Board of Trustees has declared a Reversionary dividend to participating policies in proportion to their contribution to surplus, available on settlement of next annual premium.

During the year 6,946 policies have been issued, insuring $22,229,979.

Number of Policies in force	Jan. 1, 1877, 45,421. Jan. 1, 1878, 45,605. Jan. 1, 1879, 45,005. Jan. 1, 1880, 45,705. Jan. 1, 1881, 48,548.	Amount at risk	Jan. 1, 1877, $127,748,473. Jan. 1, 1878, 127,901,887. Jan. 1, 1879, 125,232,144. Jan. 1, 1880, 127,417,763. Jan. 1, 1881, 135,726,916.
Death-claims paid	1876, $1,547,648. 1877, 1,638,128. 1878, 1,687,676. 1879, 1,569,854. 1880, 1,731,721.	Income from Interest	1876, $1,906,950. 1877, 1,867,457. 1878, 1,948,665. 1879, 2,033,650. 1880, 2,317,889.
Divisible Surplus at 4 per cent.	Jan. 1, 1877, $2,626,816. Jan. 1, 1878, 2,664,144. Jan. 1, 1879, 2,811,436. Jan. 1, 1880, 3,120,371. Jan. 1, 1881, 4,295,096.		

TRUSTEES:

MORRIS FRANKLIN, WM. H. APPLETON, WILLIAM BARTON, WILLIAM A. BOOTH, H. B. CLAFLIN, JOHN M. FURMAN, DAVID DOWS, GEORGE A. OSGOOD, HENRY BOWERS, LOOMIS L. WHITE, ROBERT B. COLLINS, S. S. FISHER, WILLIAM H. BEERS, CHARLES WRIGHT, M. D., EDWARD MARTIN, JOHN MAIRS, EDW. A. WHITTEMORE, HENRY TUCK, M. D., ALEXANDER STUDWELL, R. SUYDAM GRANT.

THEODORE M. BANTA, Cashier.
D. O'DELL, Superintendent of Agencies.
CHAS. WRIGHT, M. D., HENRY TUCK, M. D. } Medical Examiners.

MORRIS FRANKLIN, President.
WILLIAM H. BEERS, Vice-President and Actuary.

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Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

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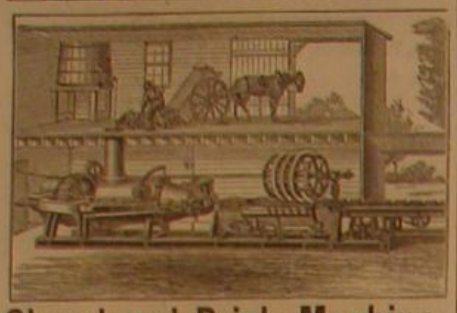

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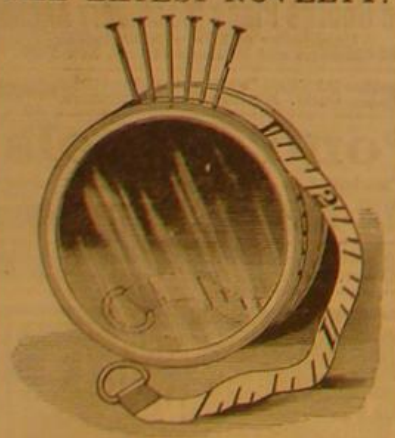

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THE BEST
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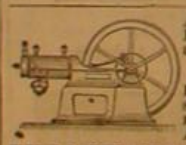

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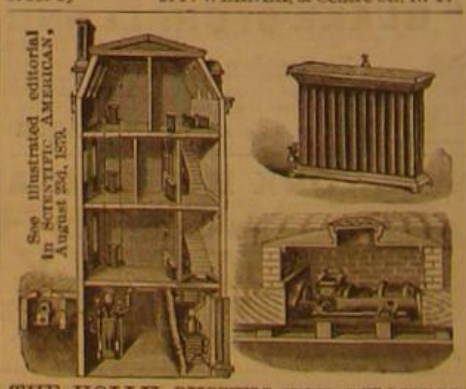

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