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STREET ARCHITECTURE IN LONDON.

The tasteful building we herewith illustrate has two fronts, one in Throgmorton street, the other in Austin Friars, London. The style adopted is Venetian Gothic, somewhat modified in treatment to suit the position. The structure consists of basement, ground, first, second, third, and fourth or attic floors. It is an admirable specimen of business architecture. The basement consists of offices and two double sets of inner and outer fireproof strong rooms, one of the principal inner ones for bullion being lined throughout with steel plates, and the whole being fitted with Chubb's bank fireproof doors.

The ground floor is planned so as to utilize the light right through, with the addition of a large well hole in the center for light and air, the base of it being covered with external and internal iron skylights; the latter is a wrought iron horizontal light of Gothic design, glazed with embossed glass, adequate provision being made for portions of the light to open with concealed machinery. The whole of the glazed screens and lobbies are executed in wainscot, French polished, of Gothic character, and glazed with embossed plate glass of diaper pattern.

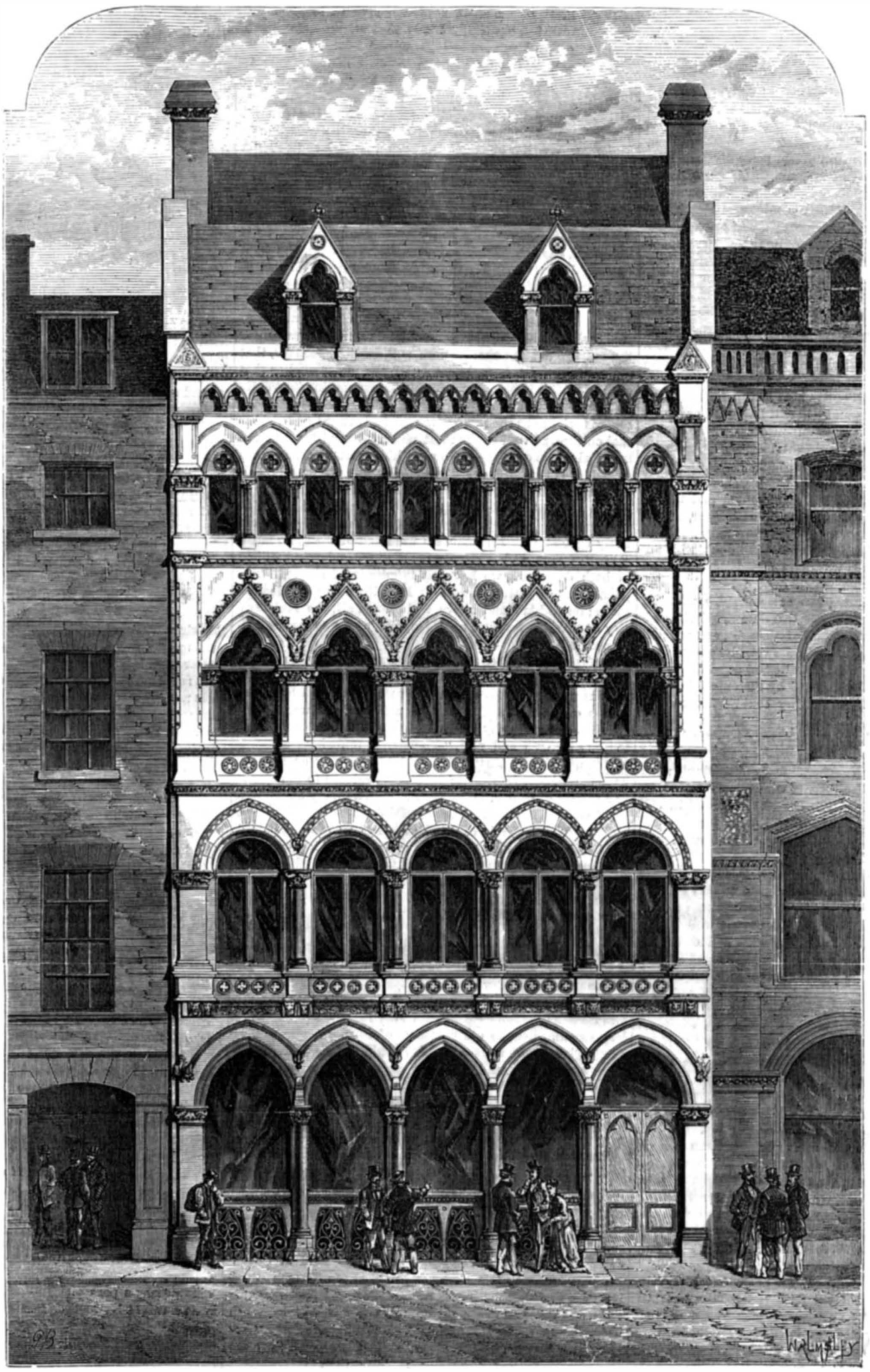
There are two staircases leading to the first floor; one for the use of a distinct suite of offices on the first floor, the other in the rear being for general use. The first staircase referred to is of oak, with oak handrails and balusters, carved and molded in Gothic character. The staircase in the rear is of Spinkwell Yorkshire stone, fitted with an iron balustrade.

The whole of the first floor is separated from the ground floor by wrought iron girders on iron columns and stanchions, and cast iron subgirders, with arches in three and four rings respectively, of Cubitt's tiles, the spandrels being filled in with concrete, with flooring over it, to form an excellent fireproof floor.

The joinery is executed partly in wainscot and partly in deal, slightly stained and varnished. There are marble, Painswick, and inlaid chimney pieces, and stoves to match in character.

The well holes are lined with Minton's tiles, and the entrance lobby is laid with a tile paving. The ground floor has flat iron lath revolving shutters. The exterior in Throgmorton street is faced throughout with brown Portland stone; the rear front to the hight of the ground floor, with the same; above which level are white brickwork and stone dressings. The Throgmorton street front is supplied with polished Peterhead granite columns of red and gray on the ground and first floors respectively, and on the second and third floors with polished red and green serpentine columns. For ventilation of the offices and rooms, there is a system of flues with gas jets at their mouths to give an upward current for carrying off the foul air, the fresh air being admitted through brass hit-or-miss gratings placed between the window sills and floors; the fan-lights, too, are hung to transmit a current of fresh air through the offices.

The architect is Mr. Thomas Chatfield Clarke.



OFFICES, THROGMORTON STREET AND AUSTIN FRIARS, LONDON

How Enameled Cloth is Made.

Enameled cloth enters into many uses as a substitute for leather. It is light and pliable, and, at the same time, firm and durable. It has all the appearance of leather, with nearly all its durability. Its most important use is that of covering for carriage tops, for traveling bags, and trunks. It is extensively employed in the manufacture of cushions and upholstering of a similar nature, and not rarely is it worked up into rainproof coats and pants. We briefly describe the process of manufacturing the black enameled cloth, which enters mostly into consumption. The foundation of the article is cotton cloth of the best quality, made expressly for this manufacture. It varies in texture and width according to the kind of goods for which it is intended. The cloth is taken from the bale and wound upon a large cylinder, and looks in that position very much like the huge rolls of home-made cloth, seen in the garrets and chambers of many old New England farm houses, when weaving was in fashion. It is now ready to receive its first coat; so it is slowly passed through the machine, across and between the huge iron cylinders, from the smaller of which, at the top, it receives its first coating of composition—a black disagreeable looking substance, composed of oil, lampblack, resin, and other ingredients, boiled together till about the consistency of melted tar. From between the cylinders, dressed in its black coat, the cloth is carried to and wound upon a huge wooden frame, resembling in shape the old-fashioned reel. By an arrangement of spokes upon the arms of this huge wheel, each layer of cloth is kept separate, so that no two portions of the cloth will come in contact. The frame, with its contents when filled, is passed into what is called the heater, an apartment kept at a high temperature, for the purpose of drying in the coating or composition. After remaining in the heater a sufficient length of time to complete the drying

process, it is removed and passed through the hands of workmen who make all the rough places smooth. It is laid on long tables, and the workmen alternately sprinkle with water and rub with pumice stone, till the whole surface is made perfectly smooth. The cloth is then wound upon the cylinder again, as at first, and passed through the machine to the huge reels, and again under the pumice stone. The cloth is passed through the machine five times, or till the required thickness has been laid on. After the last scrubbing down, the fabric is taken to another department, thoroughly varnished, and again passed through the heater. It is now represented as a piece of cotton cloth, with a thick, shining coat of black, very much resembling patent leather. But it has not yet received its leather finish; so in another apartment it is passed through the enamel machine, which consists of another set of huge rollers, one of which covers its surface with regular indentations, resembling the grain of leather. The cloth is now carefully measured, and rolled up in packages of suitable size, put up in boxes, and is ready for the market.

TYNDALL'S FRAGMENTS OF SCIENCE FOR UNSCIENTIFIC PEOPLE."

The fragments are not all of them easy reading. You cannot run through them as you can through a lady writer's romance, although certain portions of them are more sensational than the most sensational novel. There is never an attempt to hide rough ground under the flowers of rhetoric or the sticks and straws of verbiage. Wherever there are hard places to be traversed, Professor Tyndall tells you they are and will be hard, and advises you to gird up your loins accordingly. When the trying bit of climbing is accomplished, he says, like a man, "Thus patiently you have accompanied me over a piece of exceedingly difficult ground; and I think as a prudent guide, we ought to halt upon the eminence we have now attained. We might go higher, but the boulders begin here to be very rough. At a future day we shall, I doubt not, be able to overcome this difficulty, and to reach together a greater elevation."

Such frankness, combined with such lucidity, renders the reading of Professor Tyndall's works a mental tonic. They often require the effort which it takes to plunge bodily into a chilly pool, but the resulting re-action of conscious energy and delight more than compensates for the effort. The Professor's mind is doubly clear; clear to itself and clear to others. Obscured by no mists, it puts forth no humbug. It has never been the writer's privilege to hear this gifted lecturer's *vivâ voce* discourse, but certain he is that he would never do what he relates what Faraday did upon occasion. Faraday did not confine himself to experimental discovery. He aspired to be a teacher, and reflected and wrote upon the method of scientific exposition. "A lecturer," he observes, "should appear easy and collected, undaunted and unconcerned;" still, "his whole behavior should evince respect for his audience." These recommendations were afterwards in great part embodied by himself. Dr. Tyndall doubts his un concern, but his fearlessness was often manifested. It used to rise within him as a wave, which carried both him and his audience along with it. On rare occasions also, when he felt himself and his subject hopelessly unintelligible, he suddenly evoked a certain recklessness of thought, and without halting to extricate his bewildered followers, he would dash alone through the jungle into which he had unwittingly led them; thus saving them from *ennui* by the exhibition of a vigor which, for the time being, they could neither share nor comprehend.

Now Professor Tyndall, we believe, would never do anything of the kind. In the first place, he would take good care never to lead his hearers into a jungle unwittingly; and in the second place, if he had strayed with them into one, he would make it a point of honor to pilot them out of it. So long as an uncouth difficulty is malleable, he never tires till he has hammered it into shape; if it be utterly refractory, he tells you it is so, and lets it alone.

"Let us get a clear idea of this," or words to the same purport, is his constant and urgent appeal to his hearers when about to attack some knotty point. "My wish to render our mental images complete, causes me to dwell briefly upon these known points, and the same wish will cause me to linger a little longer among others." "My aim throughout has been to raise in your minds distinct physical images of the various processes involved in our researches." He struggles heroically to be clear, and the endeavor results in his being clear. Witness his explanation of the chemical action of certain rays of light, and the way in which he obstinately persists in not allowing the leading principle of the undulatory theory of light to be forgotten.

"Here I would ask you to make familiar to your minds the idea that no chemical action can be produced by a ray that does not involve the destruction of the ray. But the term "ray" is unsatisfactory to us at present, when our desire is to abolish all vagueness, and to fix a definite physical significance to each of our terms. Abandoning the term 'ray' as loose and indefinite, we have to fix our thoughts upon the waves of light, and to render clear to our minds that those waves which produce chemical action do so by delivering up their own motion to the molecules which they decompose."

Or let us take polarized light as an example. Most educated persons have heard of polarized light; they certainly see it every day, as their attendants talk prose, without knowing it. They may perhaps have seen its brilliant effects displayed in the microscope of some ingenious neighbor. But ask them in what respect polarized differs from unpolarized light, and they will be hard put to give an answer. The present writer has seen no answer to the question to be compared, in respect to clearness and capability of popular comprehension, with Professor Tyndall's explanation. "There is another subject connected with our firmament, of a more subtle and recondite character than even its color. I mean what Herschel calls that 'mysterious and beautiful phenomenon,' the polarization of the light of the sky. The polarity of a magnet consists in its two endedness, both ends, or poles, acting in opposite ways. Polar forces, as most of you know, are those in which the duality of at traction and repulsion is manifested. And a kind of two-sidedness, noticed by Huygens, commented on by Newton, and discovered by a French philosopher named Malus, in a beam of light which had been reflected from one of the windows of the Luxembourg palace in Paris, receives the name of polarization." In short, a beam of polarized light has two sides, which differ from each other in their nature, qualities, and effects. If the beam be flat and broad, like the blade of a knife, one side is sharp and thin, as it were, the other flat and blunt; if the beam were cylindrical, like a walking stiek, or square like a draper's measure, one half of it might consist of wood, the other of barley sugar. The opposite sides of a polarized beam of light differ quite as much as that.

This clearness is a natural consequence of Professor Tyndall's writings being eminently truthful. It may be too much to assert that every muddle headed or muddle tongued person is untruthful, but certain it is that all uncandid, insincere persons, all rogues, swindlers, and intriguers, are obscure, involved, contradictory, and often unintelligible in their sayings. "Speech was given to man to hide his thoughts," said one of the artfullest of men. Professor Tyndall is too good a philosopher, and too kind hearted, to hit any fellow philosopher hardly; but is there no well known cotemporary writer open to some such a remark as this? "A favorite theory—the desire to establish or avoid a certain result—can so warp the mind as to destroy its power of estimating facts. I have known men to work for years under a fascination of this kind, unable to extricate themselves from its fatal influence. They had certain data, but not, as it happened, enough. They supplemented the data, and went wrong. From that hour their intellects were so blinded to the perception of adverse phenomena, that they never reached truth."

What Professor Tyndall knows, he does know, and says that he knows it, and why. What he does not know he has the courage to state that he does not—adding, perhaps, that he is not ever likely to know. "Of the inner quality that enables matter to attract matter, we know nothing." While he feels a natural pride in scientific achievement—while he regards science as the most powerful instrument of intellectual culture, as well as the most powerful ministrant to the material wants of men—if you ask him whether science has solved, or is likely in our day to solve, the problem of this universe, he is obliged to shake his head in doubt. As far as he can see, there is no quality in the human intellect which is fit to be applied to the solution of the problem. It is entirely beyond us. He compares the mind of man to a musical instrument, with a certain range of notes, beyond which, in both directions, we have an infinitude of silence. The phenomena of matter and force lie within our intellectual range; but behind, and above, and around all, the real mystery of this universe lies unsolved, and, as far as we are concerned, is incapable of solution.

Professor Tyndall once walked down Regent street with a man of great gifts and acquirements, discussing with him various theological questions. He could not accept his views of the origin and destiny of the universe, nor was he prepared to enunciate any views of his own. His friend turned to him at length and said, "You surely must have a theory of the universe." That he should in one way or another have solved this mystery of mysteries, seemed to the speaker a matter of course. "I have not even a theory of magnetism," was the modest reply.

The human brain is said to be the instrument of thought and feeling; when we are hurt, the brain feels it; when we ponder, it is the brain that thinks; when our passions or affections are excited, it is through the instrumentality of the brain. But at this point Professor Tyndall very properly asks for a little more precision. How does consciousness infuse itself into the problem? Granted that a definite thought, and a definite molecular action in the brain, occur simultaneously, we should be as far as ever from the solution of the problem, "How are these physical processes connected with the facts of consciousness?" The chasm between the two classes of phenomena would still remain intellectually impassable. Let the consciousness of love, for example, be be associated with a right handed spiral motion of the molecules of the brain, and the consciousness of hate with a left handed spiral motion. We should then know, when we love, that their motion is in one direction, and when we hate, that their motion is in the other direction; but the "why?" would remain as unanswerable as before.

We travel with confidence under such a guide, and do not hesitate to inspect with him the objects that happen to lie in our path.

Telegraphs in China.

At the last meeting of the "Danish Great Northern China and Japan Extension Telegraph Company," held at Copenhagen, a report on telegraphy was read by Mr. Tietgen, director. He said that the line between China and Japan is now open, and there is every reason to expect it will be much used. The number of telegrams sent last year to China from Denmark, Sweden and Norway, was 140,000, and they are transmitted with far greater rapidity than was at first expected. The Russian and Chinese governments have shown themselves very favorable to the undertaking; the former has given great facilities for extending the line to Vladivostock, which is to be the new Russian naval station on the Pacific, its harbor being closed only during two months in the year. M. Sick, who was sent by the Danish government to Japan on a political mission, put the Company's agent in communication with the Japanese authorities, the result being that a telegraph cable has been brought to Nagasaki, and a telegraphic line will be established between the Japanese ports which are open to Europeans. The telegraphists who have been sent to China have, says M. Tietgen, acquired such a mastery over the Chinese language that they now accept and send telegrams in Chinese from place to place in the empire.

Lord Lindsay's Magnetic Experiments.

At the recent *conversazione* of the Institute in Great George street, Lord Lindsay exhibited a very powerful magnet, and during the evening himself conducted some experiments with it and some vacuum tubes, as mentioned in our report of the *soirée*. These experiments, which were both magnetic and diamagnetic, were very interesting. The poles of the magnet were 2½ inches square in section, and the magnet was excited by a 30 cell Grove battery. The poles were kept $\frac{3}{16}$ of an inch apart, and a half crown piece was placed between them. When the magnet was not excited the coin dropped instantly through, but when the magnet was charged, the half crown was six seconds in falling the distance of 2½ inches. In a second experiment a small india rubber tube filled with mercury was placed between the poles, and an electric current passed from the battery through the mercury. Directly the magnet was excited, the tube was set in motion, getting away from between the poles and assuming the shape of the letter S. Upon reversing the current the shape of the curve was instantly reversed. After this, a coil of copper wire was placed round the vertical pole of the magnet, and when the magnet was charged, and a current of electricity sent through the copper coils in one direction, the ring of fine copper wire stuck fast to the magnet. On reversing the electric current, the ring jumped off the pole of the magnet some distance into the air. In order to show the diamagnetic properties of warm air, a lighted taper was passed through a hole bored along the poles of the magnet, the light being brought to the space of ⅛ inch wide between the two poles. So long as the magnet was excited, the light burned brilliantly, the smoke coming out at the extreme ends of the poles, and not rising up directly off the flame. As soon, however, as the magnet was discharged, the smoke rose straight up and extinguished the flame.

Experiments were next made with some vacuum tubes exhibited by Mr. Cromwell Varley, to show that the luminous arch was dependent wholly upon the magnetism, and was independent of the direction of the electric current. The discovery of this arch is due to Plucker, and it has been examined by Mr. Varley and found to consist of very attenuated matter, thrown off from the negative pole. This was demonstrated in the following manner:—A strip of talc, $\frac{1}{10}$ of an inch broad and one inch long, weighing $\frac{1}{10}$ of a grain, was suspended in the exhausted tube by means of a single fibre of raw silk. When the luminous arch was allowed to play against this piece of talc, it repelled it, and although the silk did not burn, yet the glass tube was made hot. From this circumstance Mr. Varley infers that the electric current passing into the negative pole detaches small particles of matter from it. These particles are thrown off with tremendous rapidity, and are controlled in their course by the magnetic rays forming the luminous arch, the heat in the glass being produced by the concussion of these particles against the solid body. Lord Lindsay, who is largely engaged in physical experiments, is having a monster magnet constructed, which, when completed, will, it is said, be the largest in the world.—*Mechanics' Magazine.*

The Unscientific Window.

The casement may be defined "the unscientific window." Here in this single structure you may see most of the intel lectual vices that mark the unscientific mind. The scientific way is always the simple way; so here you have complication on complication; one half of the window is to go up, the other half is to come down. The maker of it goes out of his way to struggle with Nature's laws; he grapples insanely with gravitation, and therefore he must use cords, and weights and pulleys, and build boxes to hide them in—he is a great hider. His wooden frames move up and down wooden grooves open to atmospheric influence. What is the consequence? The atmosphere becomes humid; the wooden frame sticks in the wooden box, and the unscientific window is jammed. What ho! Send for the curse of families, the British workman! Or one of the cords breaks (they are always breaking)—send for the curse of families to patch the blunder of the unscientific builder.

Now turn to the scientific window; it is simply a glass door with a wooden frame; it is not at the mercy of the atmosphere, it enters into no contest with gravitation; it is the one rational window upon earth. If a small window, it is a single glass door, if a large window, it is two glass doors, each calmly turning on three hinges, and not fighting against God Almighty and His laws when there is no need.

The scientific window can be cleaned by the householder's servants without difficulty or danger; not so the unscientifi window.

How many a poor girl has owed broken bones to the casement mania! Now-a-days humane masters afflicted with unscientific windows send for the curse of families whener their casements are dirty; but this costs seven or ght pounds a year, and the householder is crushed under axes enough without having to pay this odd seven pounds p annum for the nescience of the builder.—*Charles Reade.*

EXPERIENCES OF A BUREAU OFFICER.

[Extract from a speech of Hon. S. S. Fisher, late Commissioner of Patents.

I was struck at once with the great preponderance of females among the applicants for office. There are in the Patent Office, in round numbers, about 250 male employés and about 65 females. A proper proportion would have made the number of applicants about four males to one female. In fact, the proportions were more than reversed, so that, having in view the number of offices to be filled, the women who applied were to the men in the proportion of about twenty to one. They were also by far the most persistent applicants. It was next to impossible to keep them out of one's room, and next to impossible to get them out when they once came in. A refusal was apt to be followed by a flow of tears, and a soft hearted Commissioner was likely to be severely tried. Unfortunately the speaker acquired the reputation of being soft hearted. Inexperienced in public life, and accustomed to treat ladies with some degree of deference, he was slow to acquire the necessary gruffness to frighten these visitors away. In truth there were many sad tales of poverty, suffering, and toil which even a hard hearted man could not have heard without emotion. A man once flung himself on his knees and begged for a place to keep his family from starving; and a well dressed lady, leading her little children into my presence, proposed to do similar obeisance with the whole family if I had not promptly declared that such a demonstration would close the door of appointment forever. I learned to distrust some tears, but there were others the genuineness of which I could not doubt; and when they shed tears of joy at receiving their places, I was soft hearted, and perhaps soft headed, enough to suppose that they really needed them. A widow, mother of an invalid child, had presented her petitions and recommendations. She was a woman of worth, intelligence, and education,, and it seemed proper that her prayer should be granted. The sickness of her child kept her at home for some days, when she called to learn her fate. In official phraseology I said: "I am happy to inform you that we have given a favorable consideration to your case." She received this remark rather coolly, until after a few moments' further conversation I asked her if she could report for duty on the following Monday. "Why," she exclaimed, "am I appointed?" "That is what I meant to say a moment ago." One joyful glance, and then bursting into tears she exclaimed: "Oh, Mr. Fisher, you don't know how much good you have done!"

The greater number of applicants of the other sex came from Virginia and the District of Columbia. In fact out of 300 employés in the Patent Office, 100 were from the District. A lady resident in Washington could always command more Congressional friends than one from a distance. The poor soldier's widow or daughter in the country had but one representative. The young miss of the capital brought in her train a couple of Senators, four or five members of the Lower House, a general or two, and perhaps a gruff admiral or commodore. If she were removed she would assault you with such an array of influence that you seriously began to ask yourself the question whether your retention in office or hers was of the greater importance to the nation. The number of these applicants, and the determination with which they pressed their claims, has led many persons to doubt the expediency of the employment of females in the government offices. I do not share in this feeling. It must be remembered, in justification of the number of applications, that the number of occupations which an educated woman can enter is very limited; that the salaries paid in the departments are above the average wages which a woman can obtain in any other office; while every department of life is open to young men, with the reasonable hope of soon obtaining better compensation than any government office can afford to pay. I caused careful tables to be prepared, showing the attendance and work of the females employed in the Patent Office. The result shows that the attendance is as good as that of the men, and the work is rather better. Some of the lady clerks had no equals among the gentlemen, and, tested by the regularity, quantity, and quality of their work, they and many of the men should have changed salaries. Nevertheless, until a year ago the highest wages a woman could get was $900 per annum, while the lowest paid to a young man, except in a few exceptional cases, was $1,200 per annum. Now the heads of departments are authorized to appoint clerks of both sexes at the same salaries. The first appointments under this law, I am happy to say, were made in the Patent Office. Before the passage of this law a lady received $700 for doing the work previously performed by a gentleman whose compensation was $1,800. Another lady, the widow of a physician formerly well known in this city, and who gave his life for his country in a gangrene hospital, performed for $900 the duty of superintending a division of twelve clerks, for which her male predecessor was paid $1,600, and she proved much the better of the two. Another, for 1,200 had charge of a division which, in the Treasury Department, would have entitled its chief, if a man, to a salary of $2,000, and he would have felt hardly used at that. Still the work was done cheerfully and well, with a laudable ambition to succeed and reflect credit on the department. It is true that nearly every man in and out of the office who could detect the slightest error in their work thought himself fully justified in sneering at the work of women, but, as these errors were less than one-half of those which had been experienced when the work was done by young men, the good sense of the general public at length triumphed over this prejudice, at once so absurd and unkind. The ladies' department of the office is in the basement, on Ninth street, entirely removed from the rooms of other clerks. No gentleman occupies any portion of their rooms or halls, and male clerks or visitors are not allowed to appear upon that floor of the building unless upon business. The rooms are light and pleasant, owing much of their cheerful appearance to the taste of the ladies themselves.

A good deal has been said concerning the various influences or kinds of pressure that are applied to government officers to control their action. It is the fact that, even as to matters in which the action of such officers is purely judicial, there is a tendency to approach them with *ex parte* statements and requests for favorable action, that would be thought very strange outside of Washington. If a member of Congress should approach one of your judges here in Cincinnati, and tell him that one of the parties to a suit before him was his constituent to whom he was under great obligations, and that he would therefore take it as a great personal favor if he would decide the case in favor of his friend, the judge would probably open his eyes a little. But this seems to be the rule rather than the exception at the capital. It is one of the legitimate fruits of the present system of appointment. It is so much a matter of course to bring every influence to bear, upon the mind of an official on behalf of an applicant, that it is easy to forget that the same influences may be exceedingly improper when directed to the discharge of the ordinary duties of his office.

After I had delivered the address at the decoration of the soldiers' graves at Arlington, I was fairly deluged for two or three weeks with letters filled with the most extravagant praise of that production, and invariably winding up with a request for office. Having retained my interest in Sabbath schools and the Young Men's Christian Association, it was no uncommon thing to receive, the next day after some address on behalf of those agencies, a letter taking strong grounds in sympathy with such remarks as I had made, and winding up with the inevitable request for office. One lady said she had been much impressed by my remarks upon the subject of consecrating our means to Christ. She wished to adopt them as her own rule of action. Unfortunately, however, she had no means to consecrate. Would I appoint her to a clerkship in the Patent Office, "so that she might be able in the future to do something in so good a cause?" Another, who was an applicant for a patent which had been rejected, wrote that she wished that I would grant her application. She knew it would be wrong to offer any compensation to a public officer, but that which I would not do for money would I not do for Christ's sake, whose follower she was? More unkind than this was another communication from a would be contractor whose bid happened to be the lowest, but who wrote to persuade me that it was nevertheless much the best, and wound up his letter by wishing me "health and prosperity, as well as the kind and watchful care of our common Father and the daily companionship of His Son, our blessed Lord and Saviour." I trust that I shall never undervalue or reject the Christian sympathy of any one, and certainly I cannot afford to despise or reject any good wishes for my welfare; but one does come at last to suspect a little the value of such wishes as these, where the earthly and the heavenly, the temporal and the spiritual, are so curiously mingled together.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of June, 1871:

During the month, there were 603 visits of inspection made, and 1,332 boilers examined—1,319 externally and 371 internally; while there were 165 tested by hydraulic pressure. Number of defects in all discovered were 533. Dangerous defects, 114. These defects were, in detail, as follows:

Furnaces out of shape, 23—3 dangerous; fractures in all, 68—28 dangerous; burned plates, 54—26 dangerous; blistered sheets, 34—2 dangerous; cases of sediment and deposit, 72—6 dangerous; incrustation and scale, 97—10 dangerous; external corrosion, 37—4 dangerous; internal corrosion, 29—6 dangerous; internal grooving, 6—1 dangerous; water gages out of order, 22—1 dangerous; blow-out apparatus in bad condition, 7; safety valves overloaded or corroded fast in their seats, 17—4 dangerous; pressure gages out of order, 85—6 dangerous, varying from —40 to +60; cases of deficiency of water, 2—both dangerous; broken braces and stays, 30—5 dangerous; boilers condemned, 8.

Among the defects enumerated above, is one where a stop valve was placed between the safety valve and boiler. These irregularities are not as frequently met with as they formerly were. There have been a number of very destructive explosions resulting from over pressure, with escape and release by the safety valve entirely cut off, and steam users of late have been careful to avoid this defect. A boiler under steam, with no openings for the release of over pressure, is little less dangerous than a powder magazine with an ignited slow match connecting with it. The carelessness of some men is truly astonishing. If the danger incurred affected only themselves there would be less occasion for concern. But, unfortunately, the well being of many others is usually involved. It not unfrequently happens that safety valves are corroded in their seats, or so heavily weighted that no safe pressure would raise them. They are practically sealed, and quite as dangerous as the case of a stop valve between boiler and safety valve. If every steam user would go to the trouble and trifling expense of arranging cords and pulleys, so that the engineer could try the safety valve daily, without the trouble of going on to the top of the boiler, he would introduce a very judicious and important feature in the management of his steam power. Steam gages were found during the past month varying from —40 to +65. This state of things can only come about from an unreliable and worthless gage, or from entire neglect. The appliances of a boiler require attention. Wood and metal will wear and decay, and unless looked after and cared for, they may be as erratic in their work as a human being who has brought upon himself combined physical inabilities, from excesses and the neglect of sanitary laws. If, under good care, a steam gage is "wild" in its indications, throw it aside at once, and secure a good one. A gage indicating —40 is a very dangerous boiler attachment; for, if the engineer were running by it, as he supposed, with 80 lbs. pressure, he would be actually running at a pressure of 120 lbs. Hence, as stated above, boiler attachments are not expected to run always and forever without care or attention. A good rule is, get the best and take good care of it.

Chloroform.

Chloroform, the most important of all anæsthetics, was discovered first by M. Soubeiran, in 1831; then by Baron Justus Von Liebig; and its chemical and physiological properties were more fully investigated by Dumas in 1835. It is formed from chlorine acting on marsh gas, and is prepared on the large scale by distilling together bleaching powder (chloride of lime) containing a little quicklime to render it alkaline, water, and spirits of wine, or wood spirit; the distilled liquor is then shaken with several successive portions of distilled water to free it from any soluble impurities, agitated with its own weight of pure oil of vitriol, and lastly, distilled from a mixture of chloride of calcium and quicklime, which removes every trace of water and acid, and renders it much more permanent and safe to use than if these impurities were allowed to remain. The specific gravity of pure chloroform is variously given at 1·497, 1·500 and 1·525; the last density, however, is too high, as the chloroform of the best makers is generally 1·497 or 1·500. It is a dense mobile liquid, having a pleasant ethereal odour and a warm, sweet taste; exposed to the air it rapidly volatilizes, leaving no residue; it boils at 141° F., and is not easily made to catch fire, but when it burns, it does so with a dull, smoky, greenish flame. Chloroform vapor is rapidly absorbed by the atmosphere, and this capacity of absorption varies with the temperature, having a certain definite maximum for each degree; for instance, it is found that air at 40° F. will take up 6 per cent of vapor, while air at 90° F. is capable of taking up 35 per cent.

Chloroform is also the best known solvent for camphor, resins, sealing wax, and gutta percha; it also dissolves the vegetable alkaloids, strychnia, morphia, quinia, etc., in large proportions, and is very useful as a local anæsthetic in allaying the pain of toothache; as a solvent it will remove greasy spots from fabrics of all kinds, but its chief use is as an anæsthetic, of which kind of medicinal agents it is the type, There are several other volatile organic bodies which possess similar properties, but none, so far as we have yet been able to discover, produce the total unconsciousness and muscular relaxation that follow the inhalation of chloroform.

Mammoth Factory for Canning Lobsters.

The factory referred to is that of Messrs. Wm. Underwood & Co., at Mount Desert, Me. There are employed during the busy season, about 150 men, women and children, and 50 fishermen, the wages of the latter averaging from $3.00 to $7.00 per day, while those employed in the factory earn from $9.00 to $11 per week. The boys and girls make bills ranging from $4.00 to $7.50.

The lobsters are brought in fresh every day, being caught within a radius of fifteen miles from the factory. Every lobster not coming up to the proper standard of excellence is rejected, and the greatest care is exercised in the cleaning and boiling. None but *live* ones are, allowed to pass into the boilers.

The yearly product, at this factory, amounts to over seven hundred thousand cans. Besides the large amount required for the home market, they are shipped off in great quantities to England, France and Germany. These lobsters are put up in one, two and three pound packages.

There are in use, three large boilers, each having a capacity of 600 pounds, and three baths for boiling the cans after the lobsters are packed, for the purpose of exhausting the air, each with a capacity of 1,500 cans. The daily product now reaches from 4,000 to 5,000 cans. Few people are aware how small a portion of the lobster is used in the packing process. It takes 550 pounds of these shell fish to fill 100 one pound cans, nothing but the claws and tails being used. The bodies and refuse are made into a valuable fertilizer, The profits would be extremely small, were it not for the immense quantity put up, and the large demand.

Lobsters are running small and scarce this season, and it will probably be with considerable difficulty that dealers can fill orders.

Premiums awarded to Mowing Machines.

The mowing machines and hay tedders exhibited at the last Fair of the American Institute were tested by the following Committee of Judges on the farm of Samuel Sinclair at Croton on Wednesday, June 21: H. L. Reade, Jewett City, Conn; Josiah H. Macy, Rye, Westchester County, N. Y.; Frank D. Curtis, Charlton, Saratoga County, N. Y. The Board of Managers has since awarded the following premiums, in accordance with the report of the Judges:

No. 535.—Adriance, Platt & Co., No. 165 Greenwich street, N. Y. for the best mowing machine, "Buckeye." First premium.

No. 160—Sprague Mowing Machine Company, Providence, R. I., for the Sprague mower. Second premium.

No. 777— Clipper Mowing and Reaping Machine Company No. 154 Chambers street, N. Y., for the Clipper mowing machine. Certificate of honorable mention.

No. 7—Frank Bramer, for "Young Warrior" mower. Certificate of honorable mention.

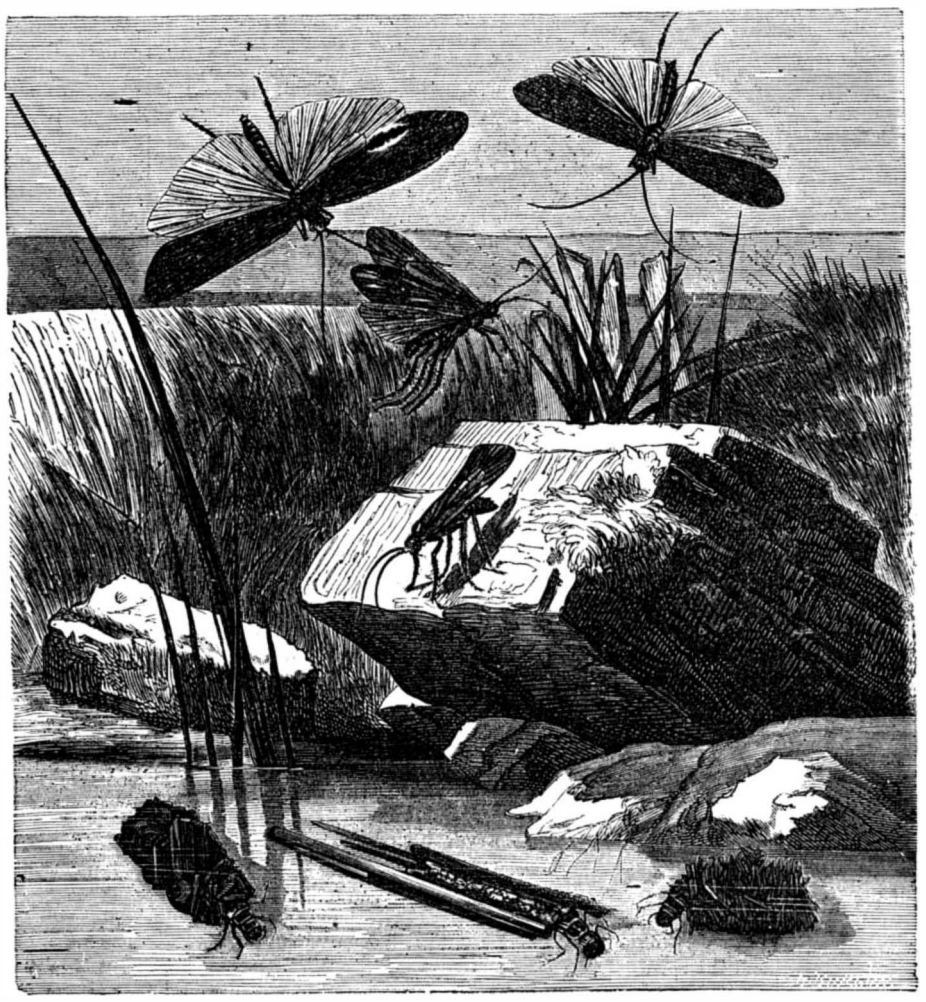
No. 113—E. W. Bullard, for the Bullard hay-tedder. First premium.

[For the Scientific American.]

THE NEUROPTERS.

BY PROFESSOR E. C. H. DAY.

We have now touched upon six of the seven orders, into which the true insects are generally divided; examples having occurred to us of the dipters, the hymenopters, the lepidopters, the coleopters, the hemipters, and the orthopters. We have thus only left the Neuroptera, or nerve-winged insects. Any one who glances at the wing of the dragon fly, or devil's darning needle, as the children call it, will see at once the appropriateness of the term "nerve winged" to these typical forms of the group. The wings, of elegant outlines and of thin transparent substances, devoid of any scales, are strengthened by very numerous strongly defined nervures, arranged in peculiarly netted patterns of very great beauty; so that, while pleasing to the eye, they are also suggestive of great support to the delicate membrane. This perfect combination of large expanse, of lightness, and of strength in the wings, indicates a power of flight that entitles the dragon fly to be considered among the most aerial of all insects. The head is relatively large, the thorax small, and the abdomen generally very lengthened and slender; the legs are slight and weak; the compound eyes, supposed to be for "long sight," are disproportionately large, and the mouth is armed by powerful biting jaws, formed much on the pattern of those of the orthopters or grasshoppers. Such an insect is evidently meant for an active and aggressive existence; and no one who has watched these beautiful creatures, beautiful in their varied colors and metallic tints, as well as in their graceful outlines and rapid movements, darting over a still pool in search of insects on the wing, now seizing one with an action so swift as to baffle the eye, now alighting on a favorite perch to devour its prey and to watch for a fresh victim, can fail to compare them to the falcons amongst birds. This analogy is recognized in the popular name of "mosquito hawks," given to the common species. The French, in allusion to their elegance and beauty, and disregarding their habits, know them by the poetic appellation of "*demoiselles.*"



In carnivorous habits, the larva of the dragon fly resembles the perfect insect; but fortunately for the inhabitants of the waters in which it dwells, it does not possess a similar rapidity of movement, while in appearance it is altogether hideous instead of charming. This horrid wingless creature, with its huge head and disproportionately long abdomen, and apparently inefficient limbs, is, however, a sufficiently terrible foe. In the face, it is armed with a strange weapon, its under lip is provided at the extremity with a pair of powerful nippers, that can be protruded considerably beyond the head; while at the opposite end of the body, we find a still more extraordinary mechanism for enabling it to reach its prey. It breathes chiefly through the vent, filling its intestine with water, which is then brought in contact with the branches of the trachea or air tubes. By a muscular movement, the creature can violently eject this water in a jet backwards, and in so doing is itself energetically driven forwards. This enables the wretch to spring upon its prey, which it seizes with its protruded nippers; and De Geer tells us that it will grasp and devour very small fish, and is not above the cannibalism of eating its own kind. It is strange how Nature, with her immense variety of mechanical contrivances, applies very different ones in creatures closely allied, while in other creatures, totally dissimilar, we meet again with the same principle. Thus, we find that the cuttle fish, at the head of the molluscan sub-kingdom, propels itself violently backwards by the forcible ejection of water from the muscular sac, within which its breathing organs lie.

Although the dissimilarity between the aquatic wingless larva and the mature dragon fly is so great, yet the metamorphosis of this creature is incomplete, as it continues active in the pupa state, then acquiring the rudiments of wings. In this it resembles the grasshoppers, passing, like them, from stage to stage, by merely moulting its outer skins.

Such is the typical Neuropter; now let us turn to the insect here figured, the *Phryganea*, better known as the stone fly of the English angler, with whom it is, both in its perfect and in its larval form, as the caddis or case worm, a favorite bait for the wary trout. At a glance you see how different this insect is from the dragon fly; the wings, wanting the delicacy and beautiful reticulations of the latter, are, moreover, clothed with minute hairs; the antennæ, very short in the mosquito hawks, in this are long; the feet are large and the legs are furnished with spines, and on examination, the mouth would prove to be formed of parts altogether rudimentary, when compared to the serviceable organs of the types of the order. You might, in fact, on a cursory examination, be excused for mistaking this creature for an ally of the clothes moth, so unlike is its superficial appearance to the neuropters. The resemblance does not even end here; the reader will recollect that the larva of the clothes moth makes itself a case of the substance on which it feeds; in which case it lives, protruding only so much of its body as is necessary for locomotion and feeding. So the larva of the stone fly, the caddis worm, living in the water, beneath stones and other shelter, makes itself a little tube, composed of fragments cemented together. The nature of the fragments will vary according to the species, each species confining itself, it is said, to one kind of material; some use grains of coarse sand, others particles of broken shells, or minute shells themselves, others, again, bits of wood or short lengths of rushes, or of the stems of grapes. Within such cases, the grubs live, feebly moving about, and seizing such small insect prey as comes unawares within their reach. When fully grown, they attach their case to some object, close it tightly, and pass into a pupa, or chrysalis stage. In this feature of their history, they thus again differ from the types of the neuropters · and so weighty have some of these points of difference seemed to some naturalist, that they have placed these phryganeids in an order by themselves, to which they have given the name of *trichoptera*, signifying "hairy wings." Most entomologists, however, retain them as true, though very aberrant, neuropters, reminding us strangely of the lower moths.

In fact, this entire order, excepting the few typical families, is made up of very varied forms, often strangely imitative of other and distant groups. Thus, the white ants or termites, are neuropters, which, in social developments and even in appearance, greatly resemble the true ants among the hymenopters. The little damp-lice, that infest our books and cabinets, and are generally mistaken for true lice (which are hemipters), are, in reality, wingless members of this order. The delicate "lace wing" fly, the foe of the aphis and consequently, the friend of the gardener, and its next of kin, the myrmeleon, the parent of that cunning ant lion, of whose wonderful pitfalls every child has read, are more readily recognizable as belonging here, but even among these, we find the characteristic tendency to aberration from type strongly exemplified. Packard quotes an instance of a great South African myrmeleon, which, in the appearance of its wings, as well as in its manner of flight, resembles a huge moth, instead of a delicate cousin of the dragon flies. Packard, moreover adds to the heterogeneous characters of the order, by including in it two families that are frequently grouped into an order (called the *Thysanura*) by themselves. Every one knows the little silvery scaled, wingless fish-insects, with three bristles as a tail, that are to be found in dark and damp recesses, and amongst sugar and sweetmeats. One would scarcely imagine these *Lepismæ* to be neuropters, yet Packard considers them as such. Be this as it may, we may well ask what is the meaning of this difficulty we have in fixing the limits of the neuropterous order? Why is it that we are obliged to include in it so many forms that seem to belie their natural affinities? It is because this order is the lowest among the true insects, and thus tells us of an early stage of insect existence, when the characters that now serve to distinguish the various orders were still held in common by the general insect type; and when the latter itself had not yet become so distinctly marked out from the rest of the Articulate sub-kingdom. As each order was developed, it was so by its members becoming more and more specialized, adopting some characters to the exclusion of others.

The reader may infer from this that, geologically speaking, the neuropters are an ancient order, and he will not be wrong. Long before either this continent or Europe had assumed its present outlines, (although these were even at that early period already foreshadowed), we find that neuropters must have abounded in the swampy forests, from which our coal was formed, and even in those that preceded them, on the shores of Devonian seas. What a ray of sunshine, of aerial life and reality, does not the finding of the impression of the delicate wings of huge flies, claiming kinship with our graceful and brilliant acquaintances of to-day, cast upon the dimness of that distant time! But to the naturalist, these wondrously preserved imprints are of great significance. The strange combination of characters which they present, puzzling him not merely as to their family position, but frequently leaving him in doubt even as to the order to which they belong, is what he has to expect. Each newly discovered fossil insect that comes to light is another link in the mysterious history of life upon the earth.

While writing the conclusion of this paper, a living specimen of one of our common large dragon flies (*aeschna heros*) was brought to us. Wishing to show her mouth organs in operation, we offered her a house fly. Although held between our fingers, no sooner did she grasp the morsel between her jaws than she set to to devour it. That fairly masticated and swallowed, a second was tendered to her and disposed of, and twelve were thus very readily taken without intermission! As her appetite did not seem to abate, and as she was about two minutes disposing of each, we declined to serve our *demoiselle* with "another dozen," and let her go. To our surprise, she took wing without apparent discomfort after such a prodigious meal. If this was an instance of their normal appetite, it is clear that these creatures must be great benefactors to mankind.

METAMORPHOSES OF THE STONE FLY.

Sleep Talkers.

An addditional element of interest is presented in those cases in which speaking is concerned, the somnambulist either talking or hearing what is said to others. Many writers mention the instance of a naval officer, who was signal lieutenant to Lord Hood, when the British fleet was watching Toulon. He sometimes remained on deck eighteen or twenty hours at a time, watching for signals from the other ships; he would then retire to his cabin, and fall into a sleep so profound that no ordinary voice could wake him; but if the word "signal" was even whispered in his ear, he was roused instantly. Dr. James Gregory cites the case of a young military officer, going with his regiment in a troop ship to a foreign station in 1758, who, when asleep, was peculiarly sensitive to the voice of his familiar acquaintances, and powerfully influenced by anything they said to him. Some of the other young officers, ready for any pranks, would lead him on through all the stages of a duel, or of an impending shipwreck, or of a sanguinary battle: each sentence spoken by them turning his dream (if it may be called a dream) into a particular direction; until at length he would start up in imaginary danger, and, perhaps awake by falling out of his berth or stumbling over a rope. In 1815, public attention was called to the case of a young girl who sometimes fell asleep in the evening, began to talk imagined herself to be a clergyman, uttered an extempore prayer, sang a hymn much better than she was accustomed to do at church, carried on rational discourse, and knew nothing about it when she woke. One of the somnambulists, or rather sleep-talkers, who have come under the notice of physicians, was a young lady accustomed to talk after she had been asleep an hour or two. If leading questions were put to her by any one in the room, she would narrate all the events of the preceding day; but her mind, sleeping or waking as we may choose to consider it, disregarded all questions or remarks except such as belonged directly to the train of thought. When she awoke, she knew nothing of what had occured. The Times, in 1823, gave an amusing account of the somnambulism of one George Davis a youth in the service of a butcher in Lambeth. He fell asleep in his chair one Sunday evening; soon after he rose up in his sleep, with his eyes closed, fetched his whip, put on one spur, went to the stable, failed to find the saddle, and got up on the unsaddled horse. Some members of the family, watching him, asked what he was about to do; he answered that he was "going his rounds." With some difficulty they stopped him but could not stop his train of thought; for he entered into a wrangle with an imaginary turnpike man for giving him short change, saying, "Let's have none of your gammon!" Although now dismounted, he whipped and spurred vigorously as if really going his rounds.

For the fabrication of an article called sponge paper, lately patented in France, evenly and finely divided sponge is added to ordinary paper pulp, and this is worked as in the common paper making apparatus, into sheets of different thicknesses. It is said to have all the peculiarities of sponge, absorbing water readily, and remaining moist a long time. It has been used as dressing for wounds with considerable advantage and is capable of several important technical applications.

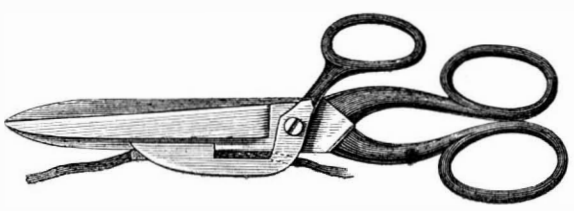
Traction Steam Engine Races.

A novel competition as to speed between traction engines was recently inaugurated by the Royal Agricultural Society at Barnhurst, England. A course had been staked out, 3,168 yards, or 1⅘ miles, long, the greater part of which was rough and uneven, with three or four ugly "dips" and circuitous lines to render the competition as severe as possible.

Messrs. Aveling and Porter commenced the race with their 10 horse locomotive boiler traction engine, having 10 inch cylinder, and 12 inch stroke. The engine weighs 8 tuns, and to facilitate its locomotive powers over soft ground, the tires of the two main wheels are studded with "clips" and "spurs," to give the wheels a firmer hold, and prevent their slipping. The engine was driven and steered round the course by a youth named Hillman, about seventeen years of age, and he accomplished the whole journey, including the necessary stoppage, in 28¼ minutes. The same firm afterwards ran an engine called "The Sapper and Miner," being typical of the class of engines used by the artillery and engineer corps at Woolwich. It is 6 horse power, having a 7¼ inch cylinder and a 10 inch stroke, and its total weight is a little over 5 tuns, 4 cwt. The lad Hillman again acted as driver and steerer, and from starting to finish the time occupied was 21 minutes. Mr. Charles Burrell, of Thetford, Norfolk, was the next competitor, and he sent on to the course an engine of 8 horse power, with locomotive boiler, and having ordinary road wheels. It was driven and steered by two men—one to each duty—and the time occupied in going round the course was 29 minutes. The same engine made a second run, and accomplished the distance this time in 22 minutes and 25 seconds. Mr. C. Burrell afterwards tried an engine with vertical boiler, fitted with the elastic tires known as Head and Thompson's patent. These consist of a thick band of india rubber, cased on the outside with a kind of serrated armour plating, or cross tires of iron. During the progress of this engine, the driver received a sharp blow on the mouth from the handle of the wheel. This unfortunate mishap caused a considerable delay, including which the distance was accomplished in 27 minutes. A second run was made with the same engine, when it accomplished the journey in the shortest time occupied during the day—namely, 15½ minutes. The firm of Ransome, Sims & Head came next with one of Thompson and Head's engines, made by themselves; the wheels were fitted with the elastic tires, and the engine bore the name of "Sutherland," from the fact of its having been made for the Duke of Sutherland. The engine was of 8 horse power, and was driven by one man, with Mr. Head himself in front as steerer. Time, 24¾ minutes. In a second run, over the same course, the distance was accomplished in 23 minutes. After this, Messrs Fowler & Co. ran their three wheel engine, with locomotive boiler, 6 horse power. The engine was driven by two men, and went round the length of the course in seventeen minutes. Messrs. Amies and Barford followed with an 8 horse locomotive (made by Messrs. Tuxford, of Boston), driven by two men. The engine made an excellent start, and was traveling at a uniform good pace, but being steered too close to the soft bank of a ditch, it stuck fast, and after several endeavors to draw back, it was found impossible to continue the race with any hope of success. The victory in the contest was awarded to the second engine, driven by the lad Hillman, and belonging to Messrs. Aveling & Porter, in whose employ he has been for the last five years.

COMBINED SCISSORS AND BUTTON-HOLE CUTTER.

We illustrate in the accompanying engraving a combined scissors and button-hole cutter, invented by J. A. Althouse, of New Harmony, Ind. The button-hole cutter is formed by



a third blade, as shown, and its operation is sufficiently explained by the engraving. It seems a very useful addition to a lady's workbasket.

Science in Plain English.

William Rushton, of Qneen's College, Cork, writing in *Nature*, under the above heading, says: "The learned will have to revise the method of teaching. There is a well founded suspicion that the course commonly pursued has been wrong in principle. The teachers proceeded from generalities, constructed very pretty systems, and dealt largely in refinements. Many people now believe, on the contrary, that we ought to begin with individual instances, then lead the pupil to construct a broad outline, and gradually to fill up the picture as his knowledge advances.

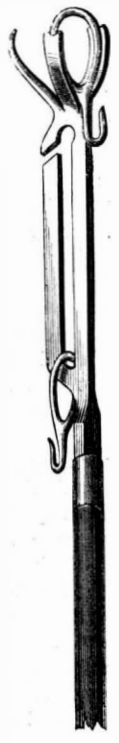
"Or, take another illustration. If a man works his way up the mountain side, he meets with many difficulties, but at length, when he reaches the top, he enjoys a fine prospect all around. Now, if that man wishes to guide others up the mountain, it is not sufficient for him to harangue from the top, or to dilate upon the fine prospect which he enjoys. He must come down again to the valley; he must take others by the hand, and lead them by the way he took himself, or very nearly by the same way.

"Until recently, elementary treatises on science were written from the top of the mountain. The authors, enjoying an expanded prospect, were disposed to take general views; and to discuss principles which, however interesting to themselves, had little or no interest for the pupil. There was a want of sympathy with the learner. For example, the writers on geography began with the globe, and expounded the elements of spherical trigonometry and astronomy, talking of meridians, parallels, the tropics, the equator, and the ecliptic. At present the best teachers of geography to young children begin with the place where the pupil lives and dwells; thence they proceed to the surrounding districts, to neighboring countries, and end with the globe.

"Bacon says that 'wherever it is possible, knowledge should be *insinuated* into the mind of another in the manner in which it was first discovered.' If this principle were fairly carried out, it would work great changes in our methods of teaching."

DEVICE FOR SUSPENDING AND ATTACHING ARTICLES.

In many kinds of business it is necessary to hang articles at a considerable elevation for purposes of display. This is particularly the case in retail stores, where a great variety of goods are sold, the upper ceiling being often made to answer the purpose of a show case to exhibit the wares of the proprietor. It is inconvenient to climb a step ladder every time one of these articles is to be reached or replaced. The inventor of the device illustrated herewith has provided an instrument for the detaching of articles from their supporting nails, hooks, or shelves, and replacing them again, which will obviate almost wholly the employment of the step ladder, and while it is cheap, must also prove very serviceable.



It is a hooking rod, having a hook-receiving socket for the elevation of the hook to its place of suspension, or clearance therefrom when suspended, in combination with a detaching horn, and hook keeper, all attached to a common handle, as shown. It is the invention of Wm. C. Lane, of Greenpoint, N. Y.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Mechanical Equivalent of Zinc.

To the Editor of the Scientific American:

Dr. Vander Weyde, in discussing my article on the mechanical equivalent of zinc, goes over the old stereotyped formula so familiar to every student of electro-dynamics, and after thus occupying a column of your paper, comes to what he styles my *experimentum crucis*. As this was the only legitimate matter at issue, as far as I was concerned, he begs the whole question when he makes the plea that if I am right, then zinc is cheaper than coal, as an agent of power.

The reason I say 120 magnets, and not 2,000,000, is because such a magnet as I describe requires just the 120th part of a second to attain, under the action of the specified battery, a lifting power of fifty pounds. In using 2,000,000 magnets, the current would only have $\frac{1}{2000000}$ of a second to magnetize the limbs, not a sufficient time, I should think, to do the required duty. Are you answered?

Why will you, Doctor, under a great parade of figures, attempt to cover up plain facts? I do not write for "amusement," but in defence of myself, and in behalf of common sense and rational progress. See now, how easily I will expose the quackery of your analysis of my article.

The magnets in question acquire, in the 120th part of a second, a lifting power of 50 pounds. The perturbations induced by breaking the circuit require seven seconds of time to come to rest. Now any attempt to repeat the lift on the group of 120 magnets in less time than seven seconds, will result in failure, as the perturbations will interpose. But if we arrange seven groups of 120 magnets each, under such conditions that the current passes successively through each group in one second of time, it will be perceived that each group will have its rest of seven seconds, and the process can be continued as in any other motor.

It is not "absurd to think that the consumption of zinc will not increase with the labor performed." It is not absurd to think so, because it is the truth. Place a galvanometer in circuit with your electro-magnet; if there be any vibration of the needle on the approach of an armature under resistance, it will indicate a reduction of battery force. The fact that more zinc has been consumed in doing work than when not working, is due, not to the necessity of calling on the battery for more currents to do more work, but to the wrong construction of the engines, which generate forces antagonistic to, and destructive of the battery.

To show you, Sir, how entirely out you are as to battery duty, I will cite an experiment of an eminent electrician. (You will obtain his name from the Editor of the SCIENTIFIC AMERICAN.) He was trying some experiments very lately with a voltameter. With a very short circuit, he obtained a given result; without any modification of his battery, but by simply increasing the length of his circuit, he nearly doubled the result; or, in other words, the more work done, the less zinc consumed.

Newark, N. J. H. M. PAINE.

Atomic Motion.

To the Editor of the Scientific American:

It is now generally supposed that the atoms of all bodies are in constant motion, the speed of which can be calculated approximately for bodies which are in a gaseous condition. In gases, this speed is fully independent of the pressure of the gas, but varies in different gases inversely as the square roots of their specific gravities. Heat decreases the specific gravity by expanding the gas, therefore heat tends to increase the speed of the atoms, following the law alluded to, as air or gas with higher temperature may be considered as another gas with less specific gravity. The velocity of the atoms of hydrogen at a temperature of 15° Cent. is 2,409 meters, using for the calculation the co-efficients from Zeuner's "Wärmetheorie." If we compare these results with those obtained by experiments on the speed of sound, we find a striking similarity.

The speed of sound is independent of the pressure of the air or gas by which it is transmitted, but increases with the temperature; and, in different gases, it increases inversely as the square roots of their specific gravities.

At 15° Cent., the velocity of sound in common air is 340 meters, and as the specific gravity of hydrogen is 0·06926, the sound is transmitted through hydrogen of 15° Cent., with a speed of 1,292 meters, this being about half the speed of the atoms.

Hydrogen being probably the most permanent gas, I thought it preferable for this comparative calculation. I would ask therefore the following questions:

Has the speed of sound any relation to the speed of the atoms? Can errors during experiments account for the difference, 1,292 not being exactly half of 2,409? Does the increased speed of transmission of sound through water and solid bodies indicate a greater speed of the atoms in those masses?

I think an investigation on this subject would not be without interest. FENGO BILGRAM.

Philadelphia, Pa.

Cast Iron Wheels.

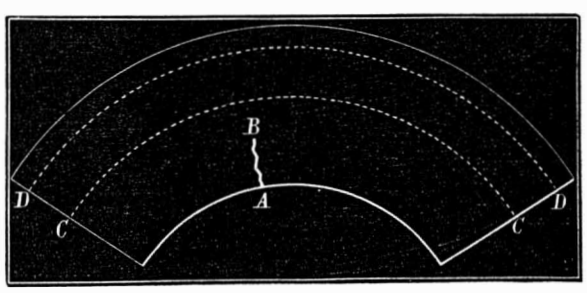
To the Editor of the Scientific American:

In your issue of July 8th, a querist, L. A. P., says that the cast iron wheels he is making, all burst asunder after being taken out of the sand, and when quite cold.

This is quite a common occurrence, and does not speak very well for the constructing departments of engineering establishments. And had your correspondent employed some competent engineer to construct his wheels, he would no doubt have been spared the vexatious trouble of casting them over and over again, and have saved considerable expense, and added to the reputation of his establishment. Of course it was bad proportioning which caused them to break, or, in mechanical parlance, "strain" in cooling; for although they did not break until they were taken out of the sand, as he says, "quite cold," the mischief was done before; and although he might have prevented the breaking by properly exposing the thick parts while quite hot, the strength of the wheels would have been greatly impaired, in fact, nearly destroyed; and therefore the wheels would not be safe in use. It is well known that we cannot remove all strain in any wheels or segments of a circle; but by proper engineering we can reduce it to a minimum, and thereby render them practically safe.

This subject, although very important, seems to be utterly disregarded in a great number of small shops, and hence the trouble fo L. A. P.

In experimenting with a segment of a ring, of any mode-



rate thickness, and broad in proportion, like the annexed figure, we shall find that it contracts in lines parallel with the arc or circumference. Therefore if cast in very hard metal, it will be sure to crack as shown at A B; but if we reduce by cutting it at the dotted lines, C C, and cast it with the same kind of iron, the crack will scarcely be visible, perhaps not at all, till we plane it and apply some acid; we may then repeat the experiment at the lines, D D, and no trace of the crack may be found; but still, the strain is not destroyed, only reduced, for if the segment be broken and carefully examined, even by the naked eye, it will be found very different at the outer part of the section than at the inner. This subject is of great importance to our trade, and this letter might be extended but for fear of trespassing on your valuable space. E. M.

Mansfield, Ohio.

Co-operation.

To the Editor of the Scientific American:

We are running our establishment on the co-operative plan. We pay each of our employés the full market value for his services, and, in addition, we divide among them 10 per cent of the profits of the concern each year.

The system works admirably. If you were to call at our place, we think you would be warranted in saying that you had seen men working by the day as you had never seen men work before. A. S. CAMERON & Co.

New York city.

The Marine Aquarium at Brighton.

To the Editor of the Scientific American:

The population of Brighton, or "London super Mare," as it is sometimes called, has reached over one hundred thousand. This is certainly a fair number, when we consider that Brighton is neither a seaport nor a manufacturing town, but simply a sea-side resort, or summer and autumn residence. It was originally a fishing town; indeed its coat-of-arms consists of two dolphins. During the eleventh century the rents or "manorial tithes." were paid in herring or mackerel.

Whatever else may have contributed to its present size and prosperity, certainly upon fish is based its foundation. It is but just, therefore, that the inhabitants should pay particular attention and respect to the marine fauna, and this they are endeavoring to do in a most laudable manner by building a marine aquarium, which, besides being an ornament to the town, will serve for all time as a magnificent monument to science and art. This novel structure, now fast approaching its completion, is 715 feet in length, and has an average width of a hundred feet. It occupies the entire available space between the Chain Pier and the pleasure grounds known as the "Steine." The foundations have been laid below the level of the sea, so that the roof of the building is far below the level of the public promenade on the cliff.

The entrance to the main building is effected by descending a noble flight of granite steps 23 feet wide. These steps terminate in an open court, the dimensions of which are 60 feet by 40 feet. The front elevation of the building, which is 18 feet high, consists of five arches, with coupled *terra cotta* columns, cornice and mosaic frieze. The columns have red and buff *terra cotta* caps. Sculptured figures of sea nymphs ornament the keystones of the arches, and the appearance of the whole front is exceedingly chaste and appropriate. This court is flanked on the left hand by a dining saloon 45 by 35 feet. From this the visitor will enter the aquarium proper, and into a large hall, 80 by 45 feet in size, having a vaulted brick roof, supported by ornamental iron columns, the light proceeding from the roof. This is a truly palatial abode, where, in tanks and reservoirs filled with salt water, the fish tribes may be seen displaying their beauties and propensities, surrounded by the finest specimens of architectural designs in the way of carved marble and stone, and of all the glittering embellishments of varicolored tiles and bricks, of *terra cotta* and encaustic.

The aquarium proper is divided into three corridors. The first is divided again into nineteen bays, which are roofed over with bricks, groined vaulting of red and black or red and buff, alternately. The arches, ribs, and bosses are of Bath stone. The extreme length of the corridor is broken most effectively by a central square 55 by 45 feet, the groined vaulting forming a sort of cloister around the square, while the central portion is covered with an elaborate ornamental iron roof, partly glazed with antique colored glass.

But let us return to the corridor. The tanks are arranged on either side, twenty-eight in number, averaging in size from 11 feet by 20 feet to 55 feet by 30 feet. The whole front work of the tanks is of Portland stone, ornamented with appropriate devices of fish, shells, marine monsters, and aquatic symbols. These fronts are inclosed by plate glass of great thickness, secured to the stoneworks by waterproof cement. The surface of water to be shown in rear of the glass is 9 feet wide by 5 feet high.

A remarkable feature must here be noted, namely, that the light of the corridors will only be transmitted through the water, thus affording to the visitor the sensation of being under water without the inconvenience of a wetting. At the eastern extremity of this corridor, which is 220 feet in length, the visitor finds before him the entrance to a fine conservatory. This entrance is at the junction of the first and second corridors; the latter, running north and south, forms right angles with the first corridor. The conservatory is 160 feet long by 40 feet wide and 30 feet high. The ornamentation of this apartment is in keeping with that of the other parts of the building. It is chiefly intended for a sort of subterranean promenade; it will be ornamented with plants, ferns, small aquaria, etc. Adjoining it will be constructed a kind of grotto, which, when filled with rock work, will form a pleasant variety to the other part of the exhibition. On the north side of the conservatory, or the present cliff wall, additional rock work is to be placed. In front of this will be arranged a series of shallow tanks to illustrate the culture of salmon.

From the conservatory we return to the second or transverse corridor. The size of this apartment is 80 by 23 feet, with the same architectural details as those in corridor No. 1. No tanks will be found here, its chief use being as an approach to the third corridor and a means of access to the terraces, which are built over the corridors, and are reached by flights of stone steps from the corridor, as well as by a similar flight from the entrance hall. These terraces may be used as promenades, if any one chooses to encounter the glaring hot sun above, and its reflection on the sea in front. Corridor No. 3, which is approached from No. 2, is of the same length as the conservatory, contains twenty tanks, some intended for fresh water, others for salt water, fishes. The fronts of these tanks are constructed of Ransome's patent stone.

At the end of this corridor are located the engines and the store tanks, boiler, retiring, and naturalists' rooms, and another flight of steps leading to the terrace.

The water for the tanks will be supplied by means of pumps, from reservoirs beneath the floor of the building; and, by a most complete arrangement of pipes and pumping, the water will be kept constantly in motion throughout the aquarium. To the south, the aquarium is sheltered against any encroachments of the sea by a substantial stone sea wall, which now serves as a public promenade.

The whole extensive work will be finished and opened before the close of 1871, at a cost of $250,000.

G. F. CANTINI.

Brighton, England.

Electro-Motors---The Paine Engine.

To the Editor of the Scientific American:

It is no theory, but a fact, well known in telegraphic circles for the last fifteen or twenty years, that a perceptible time is required for the charge and discharge of electro-magnets, and the larger and longer the core, the greater the time necessary for its full action. Flat cores have been tried, and quite a number of hollow ones were used some twelve years ago; but all have been found subject to this same law of time. For this reason, principally, magnets in use at the present day are smaller than those formerly employed. Still the action of these is not instantaneous, as any of your readers may see for themselves by visiting a telegraph office, and getting the operator to make some of the following experiments:

1. If, during the transmission of telegrams from any point, he will gradually increase the tension of the spring which draws the armature from the magnet attached to the main circuit, a point will be reached where not a single dot will appear, but every dash will make itself known on the sounder or register. The duration of the current for the dot is fully one twelfth of a second, yet here every one may see the naked fact, that this is not sufficient time for these small magnets to acquire their full power. The time the current is applied for the dash is about one quarter of a second, and it is also a fact that this produces a stronger magnet than when the current is applied only one third of this time.

2. If the line can be found idle, let the operator resume the ordinary tension of spring, so that dots will appear when the key is manipulated with the usual speed. Now if he will close circuit by giving his key a quick strike, no matter how hard, the magnet will again fail to move its armature, because too little time has been allowed it to charge.

3. Notice the sound made by the armature of the register or sounder when the current is opened and closed in the usual manner. Now hold this armature away from the magnet until the circuit shall have been held closed for a second or more, then let it slip quickly out of the grasp, and the sound thus produced will be found to be two or three times as loud as that made by currents of much shorter duration.

4. Moisten the thumb and fingers of one hand, and hold them on the binding screws of the local magnet, while the operator sends a series of rapid currents through it. Shocks of greater or less severity will be experienced, but they will be found much more powerful when the current is opened and closed slowly, as the magnet, in the latter case, becomes more highly charged, and consequently by its discharge generates a current of greater intensity. (The current from the battery gives no shock).

Any one who will take the trouble to witness such facts can easily see through the fallacious reasoning that Mr. Paine wishes to be accepted as "clear and unmistakeable" proof. On page 36, current volume of the SCIENTIFIC AMERICAN, he argues that because a magnet will lift fifty pounds, it will therefore perform the same labor in the 120th part of a second. This is a bare assertion, not only wholly destitute of logic and fact for its support, but the truth of which is positively disproved by the *fact* that the smaller and quicker acting magnets on telegraph lines become only partially charged in the twelfth of a second, or ten times the time he allows the slower magnet he speaks of. He might, with just as much logic and truth, say that because a man can lift a barrel of flour at his leisure, he can therefore raise it in the 120th of a second, or 7,200 barrels per minute. With equal sense and truth he might argue that because one closing of a circuit, continuing a second, consumes one grain of zinc, 120 closings a second consumes 120 grains. Now it is not the *beginning* of the current that wears the battery, but the *continuation* of it; and so it is the proper *duration* of the current, and not a great number of mere beginnings per second, that results in much power. This is no theory; it is the universal declaration of magnets themselves.

The assumption that time is not required in electro-magnetism, leads to another absurdity worthy of note. It is a fact, not theory, that the greater the velocity of any body, the greater its momentum and the greater the force that sets it in motion. Therefore, when we see a magnet move fifty pounds one tenth of an inch in the 120th of a second, we know that magnet has more power than when it moves the weight in the 100th of a second. Mr. Paine thus gives to the world this new law in physics: "The shorter the duration of the electric current, the greater its magnetic effect."

It will be seen from this law that whenever any electro-magnetic engine, of whatever form, once begins to increase its velocity, it must keep on increasing until torn to pieces by its own force; for the greater the speed, the shorter the duration of the current; the shorter the current, the greater number of them per second; so that we not only multiply the number of electric impulses, but the power of each and every one in the same ratio.

I wish the readers of the SCIENTIFIC AMERICAN would carefully compare Mr. Paine's article, on page 36, with the following, and see what it is that he has proved by it.

Last winter I was permitted to see the wonderful Paine engine perform. In driving a circular saw through a spruce stick three or four inches thick, it ran faster than when only overcoming its own friction. Mr. Paine admitted the fact, explaining that as the labor reduced the speed of the engine, it gave the magnets more time to charge. He represented this little more time (though I could not see that the speed was first reduced at all) as enabling the magnets to gain enough more power to spring the strong circular cast iron frame in towards its center, thus bringing the two sets of magnets nearer each other, in consequence of which they attracted with greater force.

In a future communication I shall mention other little eccentricities of this engine, and relate my experience in experimenting with three others modeled after it.

J. E. SMITH.

Easton, Pa.

The Depths of the Sea---No. 3.

To the Editor of the Scientific American:

In the waters around the equator, which are more quiet and warmer than waters of higher latitudes, the *polypus* species, especially those known by the name of *Madreporæ*, are, in truth, building gigantic works. *Caryophillea, Meandrinæ*, and *Astræ*, species of *Madreporæ*, absorb muriatic calcareous earth, contained, in a fluid form, in sea water, and form firm, rocky reefs and cliffs of it. The *Madreporæ* choose generally the elevated plains of submarine mountains for their abode, because they cannot live when exposed to a very heavy pressure. Here they first build a range of cells, which the next generation covers with a second layer, and so they build on, layer upon layer, until the whole gigantic structure reaches the surface of the ocean. Here the work of the *Madreporæ* stops. In finishing and raising these reefs above the level of the sea, Nature displays another wonderful activity. Around the new formed reefs the ever toiling surges nibble incessantly, wash off parts, which then float towards the center of the cliffs, and in this way become enlarged by contributions from the outside. Sea plants torn off from the shores, during flood, branches and trunks of trees, eradicated by rapid streams, and carried along in their course, gather and accumulate on these vast nets of stone, putrifying here gradually; and thus are forming the first traces of a layer of earth favorable to vegetation. Grains of seed, carried hither by the waves of the sea, are landing, from every direction, upon this new soil; ferns, grasses, moss, lichens, etc., cover the sides of the rocks with a green garment; other plants are suddenly sprouting forth from under the first named species, among others, perhaps, the cocoa tree, owing its appearance perhaps to the playing hands of a child, who threw down the seed from a high cliff, many miles distant. Thus is gradually rising, like an oasis in the desert, in the midst of the sea, a new island—on which sea birds are building their nests, where flocks of seals come to warm themselves in the rays of the sun—a new and beautiful island, only waiting for man to give it a name, and a diversified life, to deliver its treasures to the coming generations.

Upon all the submarine mountain chains, from the western coast of America to the Cape of Good Hope, the *Madreporæ* are building myriads of small isles, all of them nearly extending to the level of the sea. They surround Australia, like a gigantic wall, and form on its eastern coast an immense reef, with a length of about 600 miles, which hinders the passage of any vessel, and threatens to make gradually a considerably larger extension. Another *Madreporæ* bar is nearly uniting New Guinea with the Fifth continent (Australia), leaving only a space of a few hundred miles between them; and the time when this madrepore isle will form a part of Australia is easily to be foreseen.

Another work of the *polypus* species commences in the Indian Ocean, near the center of the coast of Malabar, from the archipelago of the Laccadive and Maldive isles, and is extending beyond the equator down below the Ischagos islands, etc. In the midst of the Pacific Ocean, the *Madreporæ* are working with extraordinary perseverance, on the formation of a new continent.

Thousands of islands which constitute the highest peaks of submarine mountains, owe their origin to these diminutive animals; and from day to day the space, which separates one of these isles from another, grows smaller. The inhabitants of these numberless groups of islands can already come from the extremity of one to that of another, by following the reefs, which, in many places, form broad high roads on the surface of the water.

The inhabitants of the Feejee isles travel on such madrepore reef roads in the midst of the ocean, to the Samoan isles, by putting up at night on those peaks, which tower above the water.

But a great many other mediums, besides the *polypus* species, are active in the formation of new continents from ruined ones. Violent earthquakes, shaking the depths of the sea, finish the work set in motion by those feeble animals. It is a known fact, that sometimes in the midst of the sea, vast pillars of fire and smoke are rising, which are lava masses issuing from submarine volcanoes. It is also well known, that earthquakes are much more frequent on the bottom of the sea than on the firm land; and that, during such earth revolutions, small isles often rise above the level of the sea, while others disappear.

The surface of the madrepore works is formed undulatory, or towered up to hills or real mountain chains, when standing upon a soil under which such shocks of earthquakes take place. Some of the horizontal layers change their position into vertical walls, and form now picturesque elevations clothed in green; breaking the violence of the storms, attracting the clouds passing over them, and thus producing the fountains of the forests, brooks, and creeks, which unite to form streams; and now breaking their beds through the mountains, fertilizing the soil, and supply man with sweet, wholesome water.

The Maldives, Marquesas, Paleos, and thousands of other

islands, are works of the *Madreporæ* and other *polypus* species, which were assisted by earthquakes. The soil of all Australia is of this formation, and we may therefore justly expect that its area will grow larger every year. The *polypi* do not only form new continents now-a-days; we still owe to them important tracts of soil in older countries of our globe. Remains of shells and madreporic formations of stones fill, almost everywhere in the primitive rock, large basins, which are regarded by our geologists as the primitive bottom of the sea, filled up mostly by *polypi* and testaceous animals. Such immense aggregates and the incessant work of these microscopical creatures, which are designated to change the shape of the surface of the earth, yes, even transpose the ocean's bed, are worth the most earnest, profound study and investigation. One day all the thousands and thousands of islands in the Pacific Ocean will be united by the incessant work of the *Madreporæ;* one day an immense new continent, larger than all hitherto known, will rise in the Pacific, to which continent the inhabitants of our present world may sail, perhaps 5,000 or 15,000 years hence. to save themselves from the ice and water, which advances more and more from the north.

Of course such an epoch cannot be determined minutely; in Nature, centuries, thousands and millions of years are like the seconds, minutes, and hours of an hour glass!

AMALIE PFUND, *née* JANSSEN.

"Is the Brain the Origin of Thought, Intellect, or Mind?"

To the Editor of the Scientific American:

Under the above cited question, there appeared an article in your issue of May 16th. I have waited till now for an abler pen than mine to discuss the answer given by the writer of that article. My disappointment may therefore stand godfather to the request to give the following few words a place in your valuable journal.

The writer, while admitting the brain to be the seat of thought and intellect, considers them as the *secreta* of the "immaterial" mind. "The functions of the brain cells consist," he says, "in secreting thought from the immaterial mind." In diseases of the brain, that "immaterial mind remains as perfect as ever," and is "unharmed by disease of the material substance."

The writer further says: "People also generally regard the mind and soul as identical. If they were, then, of course, that would settle the question as to the brain being the origin of the mind. It could not be, for then it must be the origin of the soul. But that is impossible, as the brain is destroyed at death and the soul lives on forever. That which is mortal could not be the origin of that which is immortal."

The word soul, if it signify anything, can only be used as a collective name, to designate the sum of all psychical actions taking place in an individual; and while all psychical processes have their seat in the brain, so the brain must be the seat of the soul.

In an inseparable alliance with the body, the soul of men has to go through all the stages of slow development. The comparative empirical psychology of the animals shows to a certainty that, between the souls of the highest developed animals and the souls of men of a low scale of intellectual development, the difference is only a quantitative, not a qualitative one.

The doctrine of evolution of Lamarck and Darwin is the death knell to the artificial heterogeneity of power and matter, of soul and body, of the old dualistic philosophy. The foggy pictures of a mythological diction will disperse before the sunshine of scientific scrutiny, and the traditions of 1,000 years of ignorance and stupidity will sink into the dust before that mighty conqueror who has established his throne in the gray substance of the brain.

A new era dawns, which will bring us intellectual liberty, and the moral perfection of the human race, the contradictions and lamentations of a hard dying hierarchy to the contrary notwithstanding. M. S., M. D.

New Orleans.

The Application of Steam on the Canals---Method Used on the River Elbe.

To the Editor of the Scientific American:

While making the tour of Europe with my father, we found ourselves in Dresden, the beautiful and elegant capital of Saxony, in July of last year.

A most novel feature of transportation on the river Elbe, calculated to arouse the attention of every observant traveler, is the method of propulsion employed on the steam tow boats of that celebrated stream.

The freight boats that are there employed are usually either sloops or schooners, with their masts so arranged as to be readily lowered in passing the many bridges that span the river at Dresden and other cities on the shores. These sloops and schooners usually float down the river, from its highest navigable points, to the vicinity of Hamburg, simply by aid of the current; seldom spreading a sail before reaching tide water and a channel sufficiently wide to enable them to "tack" and beat to right and left. These vessels, then, are not only able to navigate the lower Elbe by means of their sails, but are freely used as coasters, and are often engaged in trade with England and other foreign countries.

On their return trips, up the Elbe, the narrowness of the river and the tortuousness of the channel render sails useless, and steam is ever necessarily employed, and it is to the method of its application here that I would draw your attention.

From six to a dozen of these sailing vessels are towed up the Elbe by one steam towboat, that is furnished with neither a paddle nor a screw. An immense chain, some seventy miles long, with its upper end fastened to the bottom of the river channel, many miles above Dresden, and its lower end secured in the same way, many miles below the city, passes through a roller or pulley at the bow of the towboat, or tug, is then wrapped around a large drum near the middle of the deck of the tug, and then passes back and through another roller or pulley at the stern of the tug, and thence into the water.

The steam power is applied to this drum, and the revolution of this simply winds the tug up stream, with all the boats that are temporarily attached to it; and all of this is accomplished with satisfactory speed, and without any commotion of the water of the river. As the current is considerable on the Elbe, and boats readily float down stream with the current, the towboats are here only used in towing up stream, and only one chain is employed; but, in a canal, on which vessels would have to be towed each way, two chains would be required, and this is the only difficulty in the way of the complete success of this method that I can imagine, even if there be this one.

The seventy miles of chain passing Dresden is divided into sections, stages, or relays, I think of even distances, and a tug or towboat is assigned to each section, although the chain is entire and undivided. When a brig arrives at the upper end of her route, she shifts the boats she is towing to the towboat that meets and relieves her from above.

I think what I have written will be readily understood by any one who feels an interest in this subject.

GEORGE T. ALLEN, JR.

Springfield, Ill.

Paine's Early Electro Experiments.

To the Editor of the Scientific American:

During the summer of 1857, Mr. H. M. Paine had a boat of twenty-two feet keel and four feet beam, with a stern wheel, running on a small lake in this vicinity. I have frequently been one of a party of ten or twelve persons in the boat when it was making six miles per hour. The motor was an electromagnetic engine which was easily brought from Mr. Paine's residence at the head of the lake by two men, and placed in position in the boat, and the battery, which consisted of nine Grove's cells, was set up under the stern sheets.

Since reading Mr. Rowland's letter in your paper, it has occurred to me that Mr. Paine might have had a concealed battery in the pond, or a trained turtle, or a muskrat.

In the spring of 1857, Mr. Paine occupied our City Hall during five consecutive nights in giving illustrations of electromagnetic power. He had shafting so arranged as to operate a large engine lathe, a card machine, and a small printing press, which were all operated by the same engine used in the boat, and the battery used consisted of eighteen Grove's cells. At the close of the last evening, he threw off the machinery and battery, and made a connection with the telegraph wires from Providence, R. I., which passed by the hall window, and got quite a rapid motion on the engine.

Now is it not possible that the operators in Providence or somewhere on the line may have been in collusion with Mr. Paine, and extra battery applied?

I most decidedly insist that Mr. Paine shall not be allowed to do such things without taking me, or somebody who knows as much as I do, into his confidence. And I call on your, friend Rowland, to go on with the good work.

Worcester, Mass. A. G.

Fast Steam Plowing.

A recent competitive trial of steam plows took place at Barnhurst, Eng., under the auspices of the Royal Agricultural Society.

In class I, for the best combination of machinery for the cultivation of the soil by steam power, the first prize was £100; 2nd, do. £50. Messrs. Fowler & Co. (Leeds) commenced, with two twenty horse engines and a thirteen tined cultivator. The pace at which the latter moved was 7 miles per hour, although penetrating to a depth of 7½ ins. The style of the work was splendid. In the short time of 41 minutes, a plot of three acres was finished to the perfect satisfaction of all who witnessed the operation. The following are particulars of the engines with which this work was accomplished:—Diameter of single cylinder, 13 inches; stroke of ditto, 14 inches; total heating surfaces, 278 square feet; average steam pressure, 100 lbs.; number of revolutions per minute, 130; speed of plowing rope, 2¾ miles; speed of road motion, 2 miles; driving wheels diameter, 6½ feet, breadth, 22 inches. The weight of engine complete and in working order, 17 tuns. After this, Messrs. Fowler experimented in another field with a 12 horse double set, and a 9 tine cultivator. In 58 minutes three acres were got over with this tackle, the average depth being 7½ inches. The third set of the same firm consisted of the clip drum tackle, with a 12 horse engine. The weight of the whole machinery was under 10 tuns, the boiler and working parts being made of steel. In this system the engine, instead of having its coiling drum beneath it, has its drum with a single V groove composed of small movable clips to prevent slipping. On the opposite headland, a self-moving anchor on 6 disk cutting wheels travels along as the work proceeds. The cultivator is hauled between engine and anchor, and *vice versâ*, by an endless wire rope passing round the clip drum of the engine, and the sheaf of the anchor. Three men and two boys worked this tackle, and three acres were accomplished in 90 minutes. Messrs. Fowlers' fourth set comprised an 8 horse single cylinder engine, fitted with two winding drums, one 6 disk anchor, 1,200 yards of rope, and 16 rope parters. The construction of this engine is peculiar, the tank and driver's place being over the fore wheel, the crank shaft being above the hind axle at the smoke box end. The boiler and main working parts were of steel, the total weight not exceeding 12¼ tuns. The style and rapidity with which the work was performed were alike satisfactory.

Messrs. Howard, of Bedford, had entered, in Class I, a pair of traction engines fitted up with their new safety tubular boilers, and considerable excitement had been caused by the hope of seeing the great rival firms of Howard and Fowler in earnest competition, but unfortunately for Messrs. Howard, and to the great disappointment of the public, it was discovered that several cogs in one of the engines were broken. The stewards offered to allow Messrs. Howard to substitute another engine for the disabled one, but the firm decided to withdraw from the contest. The only remaining competitors were Messrs. Barrows and Stewart, who had a 12 horse engine, a 5 tine cultivator, and an improved Woolston tackle. A three acre plot was turned up, to an average depth of 8½ inches, in 2 hours and 59 minutes. It will be seen that in this competition Messrs. Fowler came off with "flying colors."

Improved Photographic Process.--Dry Plates with no Preservative and no Washing.

The following are the leading particulars of a new collodion process, requiring no preservative and no washing of the plate until after the development. I have obtained some good negatives in this manner.

The collodio-bromide emulsion must contain an excess of nitrate of silver. All the soluble bromide in the collodion must be converted, and there must remain as large an excess of nitrate of silver as the collodion will contain. About six grains of bromide of cadmium and eleven grains of nitrate of silver to the ounce of emulsion will not be found bad proportions.

When all the materials used in the collodion are of the best quality, so that the emulsion is neutral or nearly so, one or two minims of glacial acetic acid to the ounce may be added with advantage; otherwise no addition of acid is necessary. There need not be more acid in the sensitive film than there is in an ordinary wet collodion film.

The plate is to be coated with the emulsion in the usual way, and then put into the dark slide or plate box until required for the exposure.

Under the best conditions of the film—that is to say, when it contains the minimum of free acid and the maximum of free nitrate—the sensitiveness will be about the same as that of good wet collodion.

The image is to be developed with a common acid iron developer, rather strong, and containing as much alcohol as is found necessary to enable it to flow properly over the dry film. This quantity will, of course, be greater than that which is commonly added to the developer in the wet process.

The image comes out very quickly, and must now be treated in the usual way as regards intensifying and fixing. The negative is indistinguishable, when finished, from a common wet collodion one.

This process offers great advantages to the tourist, because it requires no nitrate bath, no troublesome washing of the plate, no preservative, no subsequent drying, and no wetting of the plate before development. The emulsion may be kept in two separate parts—one consisting of the collodion with the bromide of cadmium, the other being an alcoholic solution of nitrate of silver; these may be mixed as required for use. The film adheres well to the glass without any preliminary coating, and there are no troubles with blisters, or wrinkling, or tearing of the film.

It must not be supposed that this process is a modification of Mr. M. Carey Lea's chloro-bromide process with alkaline development, for the two have not a single feature in common. It is a modification of one very much older than Mr. Lea's, and to which it bears an exceedingly close resemblance, namely, that of Captain Dixon, which was patented about ten years ago, and which I had the pleasure of working with him. The only marked difference between this process and his consists in his emulsion being composed of collodio-iodide, and mine of collodio-bromide, of silver.

I have only to add that no special pyroxylin seems to be necessary for this process any more than for wet collodion.—*Thomas Sutton, A. B., in the British Journal of Photography.*

Laws Relating to Newspapers.

We have been asked to give the law, as it stands, relating to newspapers and subscribers:

1. Subscribers who do not give express notice to the contrary are considered wishing to continue their subscription.

2. If subscribers order the discontinuance of their periodicals, the publishers may continue to send them until all arrearages are paid.

3. If subscribers neglect or refuse to take their periodicals from the office to which they are directed, they are held responsible until they have settled their bills, and ordered them discontinued.

4. If subscribers move to other places without informing the publishers, and the papers are sent to the former direction, they are held responsible.

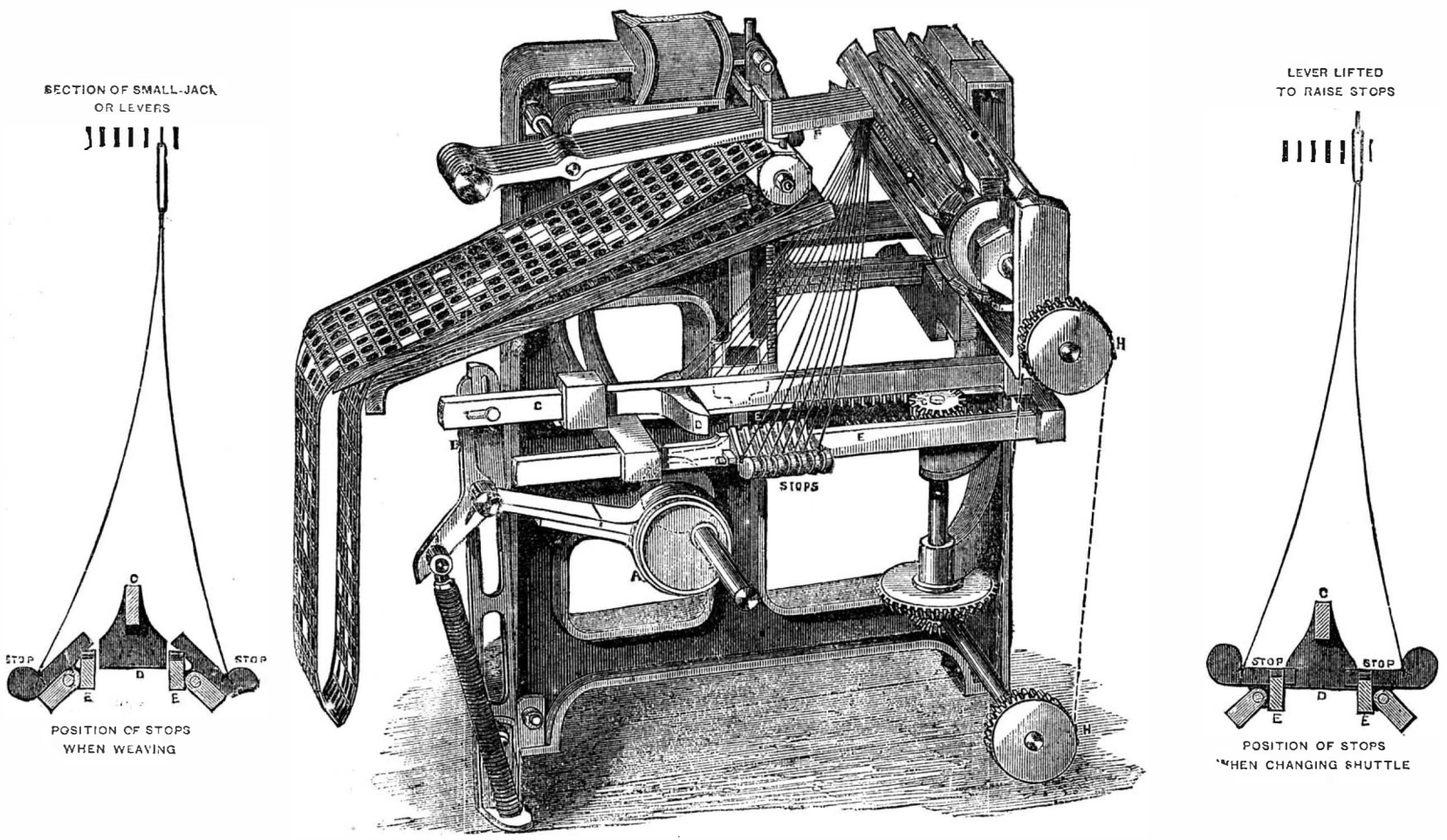
5. The courts have decided that refusing to take periodicals from the office, or removing and leaving them uncalled for, is *primâ facie* evidence of intentional fraud.

6. Any person who receives a newspaper and makes use of it, whether he has ordered it or not, is held in law to be a subscriber.

TO CLEAN BLACK CLOTH.—Dissolve one ounce of bicarbonate of ammonia in one quart of warm water. With this liquid rub the cloth, using a piece of flannel or black cloth for the purpose. After the application of this solution, clean the cloth well with clear water, dry and iron it, brushing the cloth from time to time in the direction of the fiber.

Circular Shuttle Box Loom.

The loom illustrated in the annexed engraving manufactured by Messrs. J. Harrison and Sons, of Blackburn, England is what is known as a circular shuttle box loom, with skipping motion, six shuttles and loose reed; and it is the means employed for actuating the circular shuttle box, so as to bring any one of the six shuttles into operation as required by the pattern, which forms the object of the invention. The circular shuttle box is mounted in the usual manner on an axle at one end of the sley, and has a positive revolving motion given to it, when required to change a shuttle, by a chain actuated by gearing in connection with two racks, the amount of motion being regulated by tumblers connected to jacks or levers governed by Jacquard cards

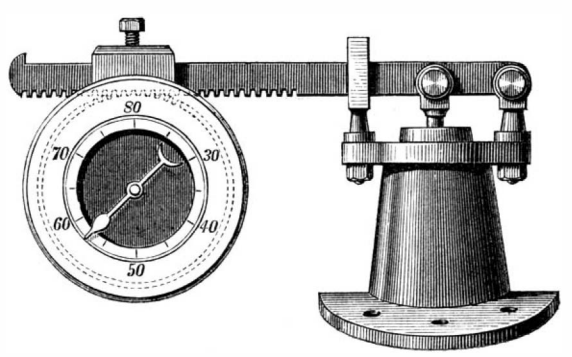


CIRCULAR SHUTTLE BOX LOOM.

A is an eccentric connected to a lever, B, for giving motion to the sliding bar, C, furnished with projections, D, which act upon tumblers E when they are lifted by the cards connected to the jacks or levers. F, which is whenever there is a blank in the part of the card opposite to the jack or lever. When these tumblers are lifted they fall into slots in the racks, and being caught by the projections, D, the racks are carried forward and the pinion, G, turned; this gives motion to the upright shaft and bevel wheels, through them to the chain wheels, H, one of which is on the axle of the shuttle box. Each jack or lever, except the two end ones, is connected to two tumblers, one on each rack; and as the racks are on opposite sides of the pinion, the tumbler gives motion to the rack on one side, and the other tumbler acts as a stop, and regulates the exact distance that the opposite rack and consequently, the shuttle box moves.

SAFETY VALVE LEVER.

William Henry Bailey, of Albion Works, Salford, England has patented the neat arrangement of weight and safety valve lever of which we give a sketch. According to this plan, the underside of the lever is formed into a rack, and as the weight is moved outwards or inwards on the lever, this rack gives motion to an indicating finger which shows the pressure per square inch to which the valve is loaded in each



position of the weight. The patent also includes a claim for "marking on the dials of pressure gages the temperature corresponding to the various pressures indicated by the said gages.

The last claim cannot, we think, be sustained, as we are certain that it is not a novel feature.

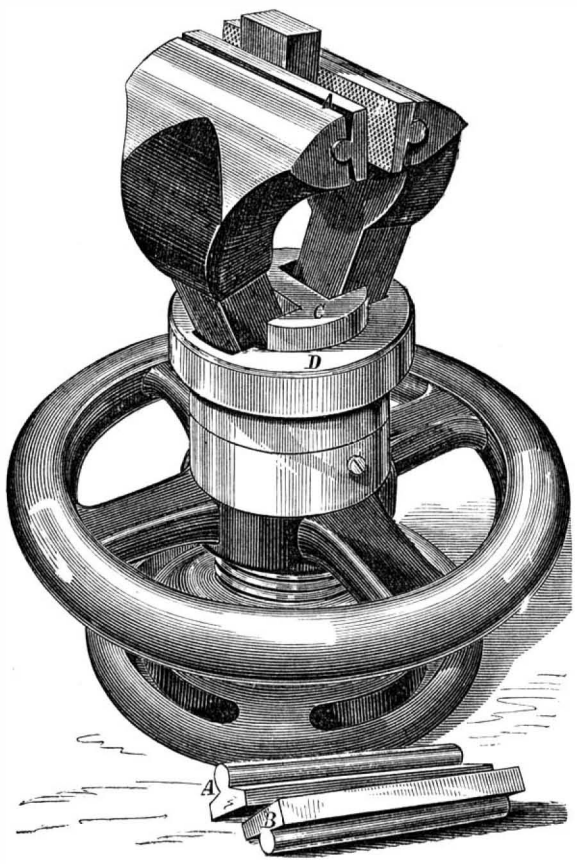
New Musical Instrument.

Among the recent patents is one granted to Thomas Atkins and Henry Drewer of Cincinnati, Ohio, for a novel musical instrument, which is highly spoken of by those who have examined its construction and listened to its tones.

The sounds are produced by the hammers striking upon steel hooks of a peculiar construction. These hooks have three prongs, the centre one being used to attach the hook firmly to a metallic support. The outer prongs differ in length, and herein lies the value of discovery. When struck, the hook gives out not only a pure sustained tone, but a perfect harmonic. It is said that the high notes have all the brilliancy of strings, but, in descending the scale, the tones approach the *timbre* of wind instruments, like the organ. The purity of tone throughout makes other musical sounds comparatively coarse. It is continued and singing, and its volume is regulated by the touch of the player and the pressure of the pedal; its only harmonic is the octave. Its simplicity, durability, quality of tone, and possible cheapness of construction, point it out as a useful instrument.

HILDRETH'S UNIVERSALLY ADJUSTABLE VISE.

Among the most important of bench tools must be ranked the vise. With the hammer, the cold chisel, the file, square, and rule, it forms almost the very foundation of the outfit for the machinist, while it is equally important in other branches of mechanical industry. Any improvement there-



fore, calculated to widen its sphere of usefulness, will at once arrest the attention of all mechanics.

We illustrate in the accompanying engraving an improved form of this implement, by which its usefulness and convenience are very much increased, through exceedingly simple and compact devices. In this improved form, objects may be held in any position most convenient for the workman in thread cut in the standard, C. The gripping power of the vise is thus compounded from the principles of the screw and inclined plane, by which means it obtains an extraordinary holding capacity.

The lower portions of the jaw levers are so constructed that by running down the nut, closing the jaws, and turning the collar partly round to release them from the slots in the collar, they will turn sufficiently on their vertical axes to adjust themselves to wedge shaped bodies placed horizontally. When thus used, the collar is forced up by the nut, in the same way as when the jaw levers are placed in their proper slots in the collar, and the vise is employed for holding objects with parallel sides.

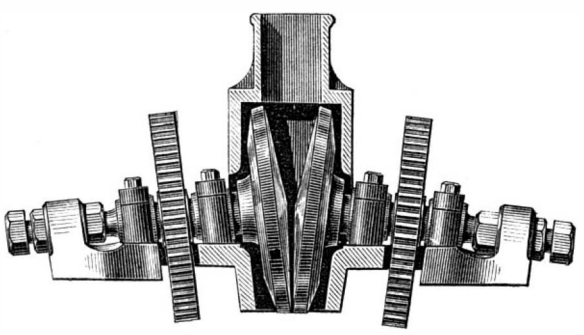
Finally, the entire vise can be adjusted on its vertical axis by loosening the bolts which attach it to the bench, and turning it into the position required, the base plate which supports the standard, C, and the other working parts being slotted concentrically to receive the bolts.

The convenience of these several adjustments will be obvious to every practical mechanic.

Patented through the Scientific American Patent Agency, November 1, 1870. For further information address the patentee, R. S. Hildreth, Laurens, N. Y., or Bent & Goodnow 490 Washington St., Boston, Mass.

ORE AND STONE CRUSHING MACHINE.

The annexed engraving is an illustration of an ore and stone crushing machine, patented by Ferdinand Oliver Cam-



roux, of Deptford, and George Oliver, of Wapping, England. It consists of two conical faced disks, keyed to inclined shafts, having powerful set screws to adjust the width of space between the disks. The ore or stone is fed into a chute, and, falling between the inclined disks, is subjected to pressure as it passes into the gradually contracting space, and is thus crushed.

NATURE—the living garment of God.—GOETHE.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

PATENT LAW REFORM IN ENGLAND.

At a recent meeting of London patent agents, the following resolutions were adopted:

First.—That the chief defects of the patent laws have arisen from a want of appreciation of the *natural* rights of inventors to the sole use of their inventions, an unreserved recognition of which rights must pervade every equitable patent system, and the true aim of patent legislation is to harmonize these individual rights with the material interests of the State.

Second.—That the grant of patents to mere "first importers" is an injustice to inventors, an injury to society as it induces the "pirating" of inventions, and the reason for these grants no longer existing, legislation should confine the issue of patents to actual inventors and their representatives.

Third.—That, in view of the benefits inventors confer on the public, and the expenses incident to the completion and introduction of new inventions, a patent for fourteen years is an inadequate compensation, and we deem it expedient to grant patents for a term of twenty-one years without the privilege of extension.

Fourth.—That the patent laws impose *penalties* upon inventors in the form of excessive fees, which justice and public policy demand should be reduced to the amount requisite to defray the expenses of an efficient administration of a simple patent system, and fees of ten pounds for the entire term—now one hundred and seventy-five pounds—would yield more than sufficient for thepurpose.

Fifth.—That the defects of the present practice should be remedied by the adoption of equitable "regulations," and the introduction of the system of granting patents, at the risk of the applicants, without any official supervision of the specification or preliminary investigation of the merits of the invention.

Sixth.—That the rights of patentees should be determined by a competent tribunal, excluding all technical objections to the validity of the patent, and we deem it expedient to dispense with jurors and "scientific experts" in patent suits.

Seventh.—That these resolutions, signed by the Chairman, be forwarded to the Parliamentary "Select Committee on Letters Patent," and such other publicity be given them as he may deem conducive to the success of a liberal measure of patent legislation.

The above resolutions have been sent to us with a special request from the chairman, Mr. Haseltine, to give them space in our columns, and express our views editorially upon the subject, as it is the desire of the London agents to lay the opinions of the press before the members of Parliament. We take pleasure in complying with the request.

While we are in favor of patents, and are thoroughly convinced that no civili ed nation can at present afford to abolish them, we see no reason why the real nature of the patent system in general should not be plainly stated.

We think that the London patent agents who, in the above first section, have resolved that the chief defects in the British patent laws are due to a want of appreciation of the natural rights of inventors to the sole use of their inventions, will have to revise their observations. There is no legitimate connection between the said rights and the said defects.

In every community the good man has an inalienable right to life, liberty, and the pursuit of happiness; he is also under natural obligations to contribute, by all that in him lies, to the welfare and prosperity of his fellow men. From these obligations no class of individuals is exempt. Therefore, to assert that inventors have a *natural right* to the *sole use* of their inventions is sheer nonsense. They have no such right.

The fact that one man makes a hat or a coat or any other device, in a new and peculiar way, gives him no natural right to interfere with the liberties of others in doing the same thing.

No man has a natural right to be a monopolist. The few have no natural right to lord it over the many.

Private monopolies, special privileges of all kinds, are created and enforced by the exercise of tyrannical power. They are antagonistic to the spirit of liberty, and in general, as history proclaims, damaging to the prosperity of any people.

But in some communities special monopolies are enforced as temporary expedients or conveniences, by which to secure certain important public benefits. Patents are of this character. They are nothing more nor less than special monopolies, granted, not because any man has a natural right to them, but simply as expedients to tempt men to study out and develope inventions, which the whole people may be free to use and enjoy. In this way the progress of the useful arts is encouraged, new productions, new industries, and new sources of wealth are created; and the public advantages therefrom derived are supposed to counterbalance the evil effects of those temporary infringements of liberty which we call patents. The practical result of the issue of patents in this country has been, and still is, to promote the material and moral progress of the nation to a wonderful degree. This fact is recognized by everybody, and there is not a corporal's guard on this side the Atlantic who would wish to have the patent laws abolished.

The remaining resolutions of the London agents are, for the most part, sensible and practical. The fifth resolution is especially appropriate to the state of things here, and the reforms which it contemplates, we think, might be applied to our own patent system as well as to that of England, with great success and advantage.

VENTILATION OF THE NEW YORK STATE LUNATIC ASYLUM.

It was our good fortune recently to inspect the admirable system of heating and ventilation in use at the above celebrated institution at Utica, N. Y. The accomplished superintendent, Dr. John P. Gray, has given the subjects of warming and ventilating large buildings a great deal of careful study which, added to observations made during a long experience in the asylum, have resulted in the adoption of a model method. We have visited a great many hospitals, almshouses, and other institutions in which large numbers of people are constantly gathered together, but we do not hesitate to say that we have never entered a more perfectly ventilated building, large or small, than the Utica asylum.

In the course of a long perambulation through the various wards, under the gentlemanly guidance of Dr. Judson B. Andrews, second assistant physician, we met with none of that peculiar hospital smell almost universal in institutions of this kind. There was a constant supply of fresh pure air, without sharp drafts anywhere, and though each ward is provided with the usual water closet accommodations, their presence was not indicated by any offensive odor.

In a conversation with Dr. Andrews, we gathered some general facts relative to ventilation which are worthy of careful consideration. The tendency of the time is toward the erection of large buildings for the accommodation of many rather than small ones for the accommodation of few. Hotels of gigantic size, tenement houses for the poor, etc., are annually built of increasing capacity, and it is a lamentable fact that by far the greater part of these buildings are better calculated to collect and retain the emanations of the kitchen, laundry, and water closet, than to speedily discharge them and supply their place by pure, well tempered, health giving air.

The experience of Dr. Gray in his attempts to perfect the ventilation of the Utica asylum, points clearly to the fundamental fact that no very large building can be ventilated with currents of air produced by heat alone. Artificial currents produced by mechanical power must be employed. The means used in this institution are a large and powerful fan wheel, driven by a fine Corliss steam engine. By its constant action every nook and corner of the vast building was kept in a delightful state of coolness on the day of our visit, though the thermometer indicated 80° Fah. in the shade. A large volume of air was constantly flowing through the various wards, yet there was no perceptible current.

Another fact elicited was that a perfect system of ventilation requires each room or ward to be independently supplied with air, which, after having remained sufficiently long in the apartment, must find independent egress. If two wards be coupled, it will be impossible to regulate the supply of air or warmth so as to make it uniform in each. One or the other will get more or less than its share. Those conversant with the difficulty in maintaining uniform pressure in a complicated system of steam or air pipes will be at no loss to assign a reason for this.

It has also been found that the conveyance of vitiated air from various passages out through a common exit flue, or the smoke stack of the heating apparatus, will not do in any extended system of ventilation. A diffused entrance and a diffused exit must be provided for in order to avoid sharp currents.

To describe the details by which the observance of these general principles has been attained in so effective a manner, under the supervision of Dr. Gray, would lengthen this article beyond its prescribed limits; we may perhaps do this in a future article. Those who are interested in the ventilation of very large buildings would find themselves rewarded by a visit to and a personal inspection of this institution which in its sanitary appliances must be, in every point of view, regarded as a model.

FOLLY AND IGNORANCE---FOLLOWED BY DEATH AND DESTRUCTION.

Many centuries ago, Solomon the wise penned his proverbs, denouncing ignorance and extolling wisdom. Yet could he in the flesh to-day visit this glorious land of liberty, he would be able to look upon as choice a crop of fools as ever were reared in his day, and would sadly retire to the spirit land, more impressed than ever that "all is vanity," including his efforts to induce the human race to make wisdom their first and only choice.

There lies before us a letter from a Water Valley (Miss.) correspondent, describing a destructive boiler explosion occurring under circumstances of such conspicuous foolhardiness as to render it worthy of record.

Four men were employed about the boiler, all of whom were instantly killed. The proprietor escaped, and to-day lives as an illustration of the old saw, that the choicest flowers are culled first. If destruction be the just penalty of wilful folly, surely the continued existence of this man is an example of the mysterious ways of Providence.

His story of the explosion is, according to our correspondent, as follows:

The day previous to the explosion the safety valve was leaking. Instead of grinding down the valve, he placed a piece of gum packing under it. This blew out. A new piece was put under, and then a brace was placed between the valve lever and the roof of the building to hold it down and retain the packing. Having thus got things well in train for a first class blow up, he got up steam, running the pressure up to 105 lbs. "*the last time he looked at the gage.*" He *thinks* there were two gages of water, but is not sure, as *two men* were pumping in water at the time of the catastrophe. That two men were required to work the pump shows that this was out of order. In short, there was no one about the establishment that seemed to know much about anything, more especially steam, and, as a consequence, destruction swiftly followed their silly tinkering.

How long will it be ere people learn that steam is a thing not to be played with? The dangers to which many are exposed by ignorance in the use of boilers and engines are positively frightful.

If a party of reckless ignoramuses should sport with nitro-glycerin in a thickly populated locality, they would be indicted. Why not make it penal for men who know nothing of steam to assume its management? We wish it were so everywhere, and the sooner the better.

LIGHTNING RODS.

In our paper for July 1, we gave an article on lightning rods, showing the proper sizes, arrangements, and earth connections, necessary for the complete protection of buildings from the disruptive effects of electrical discharges.

In that article it was shown that the grand defect of nearly all lightning rods, as commonly put up, is the lack of proper communication between the rod and the earth.

A building is undoubtedly safer without any lightning rod, than it is if the rod be not properly connected with the ground.

Mr. David Brooks, well known as the originator of the paraffin telegraph insulators, and a careful student of electricity, has lately published some useful observations concerning lightning rods, from which we gather the following:

When a cloud passes over the earth it becomes charged with electricity, and the earth directly beneath the cloud is charged with the opposite electricity; but discharge or lightning depends upon the amount of electricity accumulated, the tension of this accumulation, and the proximity of this cloud to the earth.

The cloud is sometimes charged positively, sometimes negatively, but whatever the amount of this electricity, an equal amount of the opposite electricity is accumulated in the earth or some neighboring cloud, or the opposite electricity may be divided or distributed among other clouds and the earth.

The quantity and tension of a thunderbolt is of such immense degree, that unless an adequate channel or path is provided as a conductor, disastrous results are likely to ensue

The effect of placing an iron conductor or rod between the earth and the cloud, is to facilitate the discharge of the electricity from the cloud to the earth. If the cloud be charged with positive electricity, the rod becomes polarized—that is, if the cloud be charged with positive electricity, the upper end of the rod is charged with negative, the bottom portion with positive, the opposite of the earth, which is negative.

The ordinary rods extend into the earth, but the connection is so poor electrically—that is, the connection has so small conducting capacity—that accumulation of electricity takes place, and violent discharge to any other neighboring object or conductor (as for example, to the building to which the rod is attached) is the result, to very nearly the extent, as if the rod were not touching the earth.

The only method of obviating this difficulty is to enlarge the metallic surface of the rod where it comes in contact with the earth far more than is ordinarily practiced.

All objects conduct, but in vastly different degrees. For instance, iron conducts only about one sixth as much or as well as copper. It has but one sixth the conducting capacity

They conduct directly in proportion to their sectional area, and inversely in proportion to their length.

A bar of copper, that has one square inch section, a foot in length, has the same conducting capacity as a bar of iron of six square inches section and a foot in length.

The conducting power of iron is fully one thousand million times greater than water. The ratio of difference is less in proportion as the water contains impurities; but if the moisture in the earth were sulphuric acid and water, in the proportion of one of water to eleven of acid, the best conducting liquid known, the ratio of conductivity of this solution, compared to iron, would be, by the determination of Dr. Matthiessen, as one to one hundred and sixty-six thousand; so that, making all due allowance for the impurity of the moisture on account of the acids and alkalies contained, the ground terminal of the rod should expose a surface in damp earth at least equal to the surface of earth over which the building stands.

ELECTROMAGNETIC MOTORS.

Almost coincident with the discovery of electromagnetism, the idea of its becoming a great propeller of machinery became a favorite dream of science. As its laws became more fully known, and the doctrine of the correlation of forces became established, this dream gradually faded from the minds of all but the visionary. Assuming the teachings of science to be correct, it was seen that until some far cheaper method of generating electric currents should be discovered, this force could not compete with steam in economy. The practicability of its employment, even for motors of limited power, has hitherto hinged upon the question of cost, and so far no successful electro-motor has been offered to the public, that could be economically applied to the propulsion of even a sewing machine.

Mr. Paine, whose statements are denied on scientific grounds by many, but backed by others who profess to have experimented and proved them true, asserts that science has hitherto been wholly at fault regarding this matter, and will shortly be obliged to revise its theories and correct them to square with facts he has discovered.

He maintains that the battery is not the source of magnetic power in electromagnets, but is simply a directing agent or indirect cause of the power developed in such magnets. That like the great store of heat in the universe, the stock of magnetism is a constant, and that all we can do with either is to transfer it, or rather to set in play a chain of causes which cause it to become manifest to our senses, and to perform work by its conversion into mass motion. That we have been and are skeptical in regard to these statements, we need not tell our readers, and we shall remain so till we have something more than strong assertions of results attained to convince us. That we, in common with many others, take this ground should neither surprise Mr. Paine nor his friends. They have no right to expect that thoughtful men will accept their assertions as scientific truth without other evidence. Those who say that they have repeated his experiments with like results have a right to believe, but the details of these experiments have never yet been set forth before the world, and we have, therefore, no means of judging whether right or wrong inferences are being drawn from them. That the stories told of marvellous results are deliberate fabrications we do not believe, but then we can say that much of many other marvellous stories which even Mr. Paine and his disciples would possibly discredit, though attested by men who will not deliberately falsify.

But whether Mr. Paine is self deceived or has really made some great discoveries which will revolutionize electric science, one thing is certain, the subject of electromagnetism as a motive force is now undergoing a more severe scrutiny than it has received for many years. The recitation and attestation of the extraordinary claims made by this gentleman have set people to inquiring and studying, and, as a result there probably never was so great activity in invention relating to all sorts of electric apparatus and machinery as exists at the present time. Applications for patents in this field are numerous, and will doubtless continue so for some time to come.

SCIENTIFIC INTELLIGENCE.

A NEW FLUORIDE FROM GREENLAND.

Professor Brush, of New Haven, has discovered a new mineral, associated with cryolite, from Greenland, to which he proposes to give the name *ralstonite*. The mineral is colorless or white, with a vitreous luster, and is harder than fluor spar. Not enough of it was obtained to make a quantitative analysis, but it appears to be essentially a hydrous fluoride of aluminum, with probably a small amount of calcium and sodium. The recent development of the Greenland mine has led to the discovery of crystallized cryolite, and of several new fluorides, called thomsenolite, pachnolite, and ralstonite.

OZONE STORED IN SOLUTION.

Among the queries addressed to us by our correspondents is one in reference to the possibility of storing ozone in solution. It would certainly be very convenient for medical and bleaching purposes if it were possible to do so, and we can suggest a path of research by which it may possibly be attained. Schönbein has shown that if an amalgam of zinc be shaken violently with water, binoxide of hydrogen is produced. We here have a compound that in many respects may be substituted for ozone, and is obtained in a very simple manner. If the process were continued for several hours, the water then filtered and the filtrate evaporated over sulphuric acid under the receiver of an air pump, we could probably obtain a concentrated liquid, suitable for the purposes to which the binoxide of hydrogen is now applied. The drift of experiments goes to show that it is better to prepare the ozone at the moment it is wanted. It is too easily destroyed to be stored in anything. For many purposes the permanganate of potash is the best agent to use for the generation of ozone, when required for bleaching. A small quantity of this salt placed in a bath, and a few drops of sulphuric acid added, liberates sufficient ozone to bleach engravings and even paper stock. And it is the nearest approach to the practical application of ozone to the arts of any that we have seen tried. We are aware that Wilde's electromagnetic machine has been used to furnish ozone for refining sugar and sirup; and the constant discharge of the electric spark by aid of the Ruhmkorff coil has been proposed for the same purpose. We adhere, however, to the belief that permanganate of potash will be found to be the best agent, on the whole, for procuring a supply of ozone at the shortest notice.

USES OF MICA.

The use of mica in the United States has attained greater proportions than elsewhere, and the attention of other countries has been directed to it. It is employed as a substitute for metal in the manufacture of shades for lamps. These are prepared of pasteboard and lined with mica. The light is thus reflected downwards, and the thickness of the board prevents the dazzling effect upon the eyes. There are great varieties of shades now made, and as they are very light and easy of transportation, they can be substituted for glass in distant parts of the country. Mica is also used for transparencies, candle protectors, stove and furnace doors, and in spectacles to shield the eyes of workmen exposed to dust, sparks, and splints. It is also used for the adulteration of bronzing powders and pigments, and when ground can be employed as a substitute for some kinds of mineral paints. Sheets of mica are also employed in the chemical lecture room, where the combustion of metals in oxygen gas is to be exhibited. There is no danger of the breakage of the apparatus from the heat, and the light effects are equal to those attained where glass jars are used. Exquisite colored films can be obtained on mica by employing collodion colored with aniline dyes. The pigment is dissolved in ether and alcohol in concentrated form, and added in small quantity to the collodion. The collodion film is rendered more elastic by turpentine, and can be removed from the mica and cut into various ornamental figures to be again pasted upon any object. If the mica be a little rough, the film of collodion will adhere very firmly. In this way, mica colored by aniline can be obtained, of a great variety of shades, and closely resembling the finest glass.

PURIFICATION OF SODA ASH BY OXIDE OF ZINC.

The crude soda ash of commerce is often contaminated by sulphide of sodium, holding sulphide of iron in solution, giving a dirty yellow color to the ash. To remove this impurity, it has been proposed to add freshly precipitated carbonate of zinc and oxide of zinc, by which insoluble sulphide of zinc is precipitated, and carbonate of soda or caustic soda takes its place. In a small way, this will afford a method for rectifying crude material, which is often too dirty for use.

PREPARATION OF PERMANGANATE OF POTASH.

Five hundred pounds of freshly prepared potash lye of 45° B. are mixed with 105 pounds of pure chlorate of potash, and concentrated by evaporation in an iron kettle; and then, under constant stirring, 182 pounds of finely pulverized black oxide of manganese are added, and the heat continued until the whole is fluid. It is then stirred until cold. The granular mass is again heated to redness in small iron kettles until it is half fused, and is then, after cooling, broken up, boiled with water in a large pot, and allowed to settle. The clear liquor is decanted and evaporated to crystallization. In this way, from 180 pounds of oxide of manganese, 98 to 100 pounds of permanganate of potash in beautiful long needles can be obtained.

NEW REACTIONS OF ANHYDROUS SULPHURIC ACID.

Only the salts of the alkali metals have been known, up to the present time, but Schultz-Sellack has succeeded in preparing the corresponding barium and silver compounds. Anhydrous sulphuric acid acts on the sulphites at 212° Fah., liberating sulphurous acid and producing sulphates; hyposulphites are not formed. When the chlorides of the alkali metals are exposed to the long continued action of the vapor of anhydrous sulphuric acid, double salts are formed, from which the anhydrous acid can be afterwards expelled by distillation. The fluorides, iodides, and bromides also absorb anhydrous sulphuric acid with partial decomposition. Anhydrous sulphuric acid reacts on sulphur, producing sulphurous acid; it also unites with iodine.

PATENT PROCEEDINGS IN LONDON.

An interesting law proceeding has lately taken place in London, in which the Bullock Printing Press Company, of Philadelphia, Pa., were defendants, and appear to have come off second best. This press is now extensively used in this country, and is rapidly being introduced in Europe where patents have been secured. We published an engraving of the invention some time ago. It is probably the fastest press in use, as it prints both sides of the sheet at once, drawing the paper from a roll, cutting off and delivering the sheets as fast as printed.

The trial referred to came before his Lordship the Master of the Rolls, last month.

It appeared that the Bullock Company had entered into an agreement with Messrs. Louis Simon & Son, of Nottingham, engineers, the plaintiff in the suit, whereby they had for very valuable considerations, become the sole licensees in England and on the European continent, for making the famous "Bullock" printing machines for the term of fourteen years, from July, 1869. That several thousand pounds had been paid by Messrs. Louis Simon & Son to the Company, in respect of machines sold to the *Daily Telegraph* and another newspaper proprietor in England, and that nothing was now due, under the agreement, from the plaintiffs, to the defendants. That in February last, a certain firm of solicitors, representing themselves to be acting for the Company, without assigning any reason, had given notice to the plaintiffs, repudiating the contract; and that when called upon by the plaintiffs' solicitors for an explanation, and for the grounds of the repudiation, they had declined to give any explanation whatever, but had since issued a circular, in reply to one of the plaintiffs, wherein they informed the public that the Bullock Company were now making arrangements to manufacture and sell their machines in England. The learned counsel characterized the conduct of the defendants as most "impudent," and, after pointing out that the defendants had received large sums of money from the plaintiffs, applied ex-parte for an injunction, there being no person in this country upon whom legal notices could properly be served.

His Lordship, the Master of the Rolls, after perusing the documents handed in, and remarking that the defendants had given the plaintiffs an express agreement for fourteen years, and upon the difficulty of the case, owing to the defendants not being in this country, granted an injunction against the defendants, their agents, licensees (others than the plaintiffs), and servants, until the hearing of the cause, or further order of the Court, from building or selling, and from authorizing or permitting any person or persons other than the plaintiffs, to build or sell in Great Britain or Ireland or on the Continent of Europe, the machines, in the plaintiffs bill mentioned, patented by the said company during the period of fourteen years, from the 20th of July 1869, or the period for which the English and French patents might last, and ordered that notice of his Lordship's order be served on the solicitors of the defendants in this country and America; the plaintiffs ordering to abide by any order as to damages if the Court should thereafter be of opinion that they ought to pay the same. The case was watched with much interest by the reporters and other gentlemen connected with the press.

Only one side of the story is given in these preceedings, as the Bullock Company put in no appearance.

[Special Correspondence of the Scientific American.]

EXTENSION CASES---SMITH'S PLOW PATENT---SLAWSON'S CAR FARE BOX---TEXTILE MANUFACTURES IN INDIA.

Washington, D.C., July 11, 1871.

Application for an extension of Arnton Smith's plow patent was made in 1868, and refused, but a re-examination was authorized by Act of Congress in January last. The only contestant was George Owen, who claims that Smith was not the inventor, and that the invention was surreptitiously obtained; that he agreed to manufacture to Owen's order; and assigned his interest in the extension before the patent expired. The question of priority of invention, as between Owen and Smith, had already been treated by the Office in 1863, and decided in favor of Smith, both by the Board of Examiners and by the Commissioner.

In such cases, in which a re-examination is granted by special Act of Congress, those parties who may have produced and used the invention in the period between the expiration of the patent and the date of the act have the right to continue the use of it.

The invention is one of great value, and consists in the mode of jointing together two plows (for the purpose of plowing out two rows of plants at a time) in such manner that one can move, to a certain extent, independently of the other. Two plows had been united, for the same purpose, before Smith's invention, but the connection was rigid. The Commissioner has not yet rendered a decision.

James B. Slawson's patent for a car fare box is an ingenious and much needed device, and consists of a box with two chambers, one above the other, separated by a tripping platform, the upper chamber having two of its sides made of glass, so that the passenger and driver can see the deposit. By tilting the separating platform, the fare is transferred to the lower chamber, which is locked. By the use of this device a railroad company saves the expense of a conductor, and a conductor's (supposed) stealings. The roads that have adopted the invention are necessarily obliged to find some means of making change, and it is usual to place in a box, accessible to the driver only, a supply of sealed paper packages, each containing one ticket and sufficient change to make it equal to one of the smaller currency issues; that is, a 10 cent, a 15 cent, a 25 cent, or 50 cent package. This arrangement removes the serious difficulty that would otherwise arise, adds but little to the labors of the driver, and causes the passenger, in case he has not in hand the exact fare, no more trouble than passing his currency to the driver through a small opening in the front door, receiving his package in return and depositing the inclosed ticket in the fare box. The extension was granted.

It was claimed by the party opposing the extension (Mr. R. D. O. Smith) that the patent was anticipated by English patents, and ought not to have been granted, but the two reissues must have fully tested this question. Mr. Slawson has received other patents for improvements on his original mechanism, and these are generally adopted.

The following extensions have also been granted: Patent to William M. Welling for a process for manufacturing artificial ivory, white and red, by the use of shellac, ivory dust or its equivalent, and camphor, suitably mixed and heated. This substance can be molded into any shape, and is extensively used for billiard balls, pianoforte keys, etc.

Patent to Isaac Hayden for a bobbin for roving and slubbing. The portion of the barrel of the bobbin which receives the second layer of roving is made larger than that which takes up the first layer, by which a uniform draft is maintained.

Patent to Charles Perley for a compound capstan. The windlass is so constructed that the shaft is constantly relieved of the weight or strain of the cable, and has simply to rotate the windlass when the two are in connection. The capstan can be used with or separate from the windlass, and also as a coupling for rotating it.

Patent to James R. Floyd for a retort cover made of malleable iron, and the patent to G. H. Halskamp for an improved pianoforte string bridge.

INDIAN TEXTILE MANUFACTURES.

It too often happens that scientific men, educated inventors, and manufacturers visit Washington without giving the library of the Patent Office the examination it merits. In

works on general science, and especially in those pertaining to all branches of technology, it hardly has its equal in the country, not only in the standard works, the classics of science, but also in the current, of England, France, and Germany. The foreign and American scientific journals alone form a collection of the greatest interest and value to those actively engaged in the practical arts. It is a feature of the present management of the library, as conducted by the learned and very obliging Librarian, Professor G. C. Schaeffer, that all the latest reliable works on the arts and customs of all countries, as already developed, and as developing under the influence of modern science, are procured. It is wholesome for the Anglo-Saxon that his conceit should occasionally get a sharp rap from the outside barbarians, hinting that possibly all wisdom and virtue will not die with him, and that even crude and Pagan notions can contribute something of value to the race.

Among the works recently added to the library is one issued by the English Government, containing much valuable matter, and illustrating the diligence of that country in strengthening its manufacturing interests as connected with its Eastern possessions. It is an official report, by Mr. J. Forbes Watson, to the Secretary of State for India, on the textile products of that country, the object being to furnish to the British manufacturers and merchants the fullest and most exact information in regard to these products, first, as a guide to the importer in filling his orders, and secondly, and of vastly more importance, as indicating the needs and tastes of the people of India, it being the policy of the Englishman to make his looms weave fabrics for the beloved East Indiaman as nearly as possible similar in quality and color to those worn and produced there for so many centuries.

And what do we find that the pagan Hindoo can accomplish with his needle and his rude hand loom and distaff? In the India Museum are collected samples of nearly 1,000 varieties of these fabrics, of which 700 have been selected and arranged in 18 large volumes, each accompanied with a full description, sufficient to enable the manufacturer to reproduce the article, if within the range of his power loom. Twenty sets of the 18 volumes each have been collected, and placed in the leading manufacturing cities of England for the inspection of those immediately interested, or rather 13 have been so deposited in England, and the remaining 7 at Calcutta, Bombay, and other cities of India.

The report of Mr. Watson, above alluded to, contains a description of each of the above specimens, together with many fine colored photographs of East Indian fabrics and costumes.

Let me add, in brief, a few items of general interest gathered from this volume.

In early times, before the invasion of India by the Mahometans, cut and sewed garments were unknown, all articles of apparel, including the head dress, being worn as coming from the loom, usually in the form of a sash, the width, length, and arrangement depending on its use, whether as a covering for the limbs, or the body, or as a turban for the head. The prejudice against sewed garments is by no means removed, and to many Hindoos of the present day they are an abomination as vile as liquor drinking and drunkenness. Among the Hindoo women, the petticoat is not yet considered a legitimate garment, and ladies of rank who have adopted it lay it aside when they eat, cook, or pray. There was a period when India largely supplied England with textile fabrics, among which were the famous "long cloths," as they were called, and also calicoes, the word derived from Calicut, a town on the Malabar coast; but in shawls, carpets, and embroideries, England cannot compete with the East. The Dacca muslins also still remain unequalled for fineness and durability. At the London Exhibition in 1862, a few yards of English muslin were shown, woven from a thread ·00216 of an inch in diameter, but the finest Dacca thread is only one quarter the size; and there is this essential difference, that the finest European muslins have little or no durability, whereas the Dacca muslins, of far finer quality, are strong and lasting. This is in part explained by the fact that the thread of the India fabric, being made by hand, is more closely twisted and compressed, the number of twists to an inch in the best English being 68·8, the Indian 110·1. Will some inventor take note that the above figures seem to call for an improvement in spinning machinery? It is also said that the greater thickness of the fiber of Indian cotton may, in some manner, account for the difference.

One pound of the finest Dacca thread is 250 miles in length. The most delicate pieces are transported in bamboo reeds, and a tube eighteen inches long and one inch in diameter, will hold twenty-two square yards. A Persian ambassador to India, on his return to his native country, once presented the king with a cocoa nut shell, containing a turban sash sixty cubits long. The warp threads, in the best qualities, number from 1,000 to 1,800 in a piece one yard wide. Four square yards of some specimens weigh only 566 grains. The Emperor Aurungzebe reproved his daughter because, on a certain court occasion, the outline of her form could be distinctly seen through her dress. Her maidenly defense was that her covering consisted of seven garments.

The Hindoo's loom has a yarn beam, a cloth beam, heddle, swinging lathe, shuttle with an eye, treddles, and temple.

The Cashmere shawls are of two kinds—one made by weaving small pieces and sewing them together; the other by embroidering the pattern on a plain woven cloth. The real Cashmere thread is called *pashumeea*, and is made from the down, not the hair of the Thibet goat, which is raised in several of the most mountainous provinces of that country; but the wool or down is all carried to Cashmere for manufacture, the business being under the strictest Government control, and to such a degree that no real *pashumeea* wool can be sold or smuggled into any other province of India.

Fine shawls are made in the Punjaub and other provinces from goats' and sheeps' wool, and sold as genuine Cashmere, but are an inferior article. In Cashmere 100,000 persons are employed in the shawl manufacture. The weavers are all males, most of the spinners women. A female spinner earns about 75 cents a month. The weaving of a shawl of ordinary pattern occupies three weavers for three months, the more elaborate and costly for from twelve to fifteen months.

CANCER CURE.

If, as is claimed, the plant called "cundurango" is a specific for cancer, the world has received a blessing in the discovery which will rank with the introduction of anæsthesia in surgery. Where there is such room for skepticism, we may be pardoned some doubts that the new remedy is all that is claimed. If it be, however, the powerful specific alleged, it will outlive our doubts, and establish itself triumphantly. In a disease so hopeless, people will catch even at the shadows of hope, and so the new remedy will be sure to have ample trial.

The story is that an Indian woman in a province of Ecquador, attempting to poison her husband by the use of this plant, cured him of a cancer of long standing. This fact having become known to the American Consul, he obtained a sample of the plant and forwarded it to Washington to have its virtues tested. It is further said that about fifteen cases have been successfully treated with it, and that a large supply is on its way to this country. Without pretending to vouch for the truth of the above, we will say that St. Paul's advice, to prove all things and hold fast that which is good, if followed, will soon settle the merits, or want of merit, of the new cancer cure.

Vice President Colfax states that his mother, who was at the point of death with cancer, has been restored by the use of cundurango, and is now nearly well,.

The patentee of this new medicine, is Francis Baker, No. 120 Broadway, N. Y.

Steam Power on Canals.---A Scotch Device.

An esteemed correspondent sends us a description of a tow boat, used on the Forth and Clyde canal, Scotland, in the year 1847 and subsequently. The boat, built by William Napier, of Glasgow, under the superintendence of William Parlane, an engineer well known in the same locality, was about twenty-five feet long and twelve or fifteen feet in the beam. She had two propellers, forward under the bow, and a double round bottom or keel. The propellers were right and left respectively, and so threw the water towards the center, the water passing out of the stern by a passage made for the purpose. A rudder was dispensed with, the steering being accomplished by varying the relative speed of the propellers, which were driven by independent vertical engines. This arrangement was so effective that the engines, moving in different directions, would turn the vessel on its center, or, as we say, in its own length. On a test, the boat parted a hemp cable of two inches diameter without headway. This, our correspondent states, is equivalent to a seven tun strain. The vessel, named the *Puddock* (*Anglicè* "Frog"), towed regularly ten or fifteen deeply laden scows, at a rate varying from three to five miles per hour, with only a man and a boy to the whole train of boats. No difficulty was found in turning sharp curves.

Our informant questioned Mr. Parlane as to the most important point of the wash caused by the boat, and received from him an answer to the effect that she could be driven at seven miles an hour without any damage to the banks; but the scows of course would create a wash, varying with their shapes and sizes, as they do with horses or other means of propulsion. The Forth and Clyde Canal fell into the hands of a railroad company which now runs large propellers thereon; but whether the *Puddock* is still in existence is unknown to our correspondent.

Bessemer Cast Steel.

Mr. Bessemer has taken out in this country five patents for new processes in the treatment of iron and steel, construction of furnaces, etc. Of these, the most important novelty, and the one which will add most to Mr. Bessemer's renown as an originator, is the subjecting molten iron to atmospheric air at a pressure by which sufficient heat is maintained to keep the metal in perfect fluidity until it is poured into molds. This intense heat is kept up by the aerostatic pressure in the converter, which obviously continues a large supply of oxygen to the molten metal. A converter of great strength is provided for this special purpose, the mouth being made smaller than usual and lined with a ring of well burnt fire clay, or a composition of clay and plumbago. A pressure of from 15 to 20 lbs. on the square inch is necessary, and will require to be varied with the different kinds of iron.

CORRECTION.—WATER HEATER.—In our notice of a water heater designed for greenhouses, conservatories, etc., printed in our issue of July 1st, the invention was wrongly accredited to John Lynch only, whereas it should have been David Smith and John Lynch, of Boston, Mass.

KEROSENE applied with a cloth to stoves will keep them from rusting during the summer. It is also an excellent material to apply to all iron utensils used about a farm.

TO CLEAN CARPETS.—Salt, sprinkled upon the carpet before sweeping, will make it look bright and clean. This is also a good preventive against moths.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

BELTS.—I would say to J. B. L. and his informers, F. E. H. and S. G. D., that the running of a belt to the highest part of a pulley is owing to centrifugal force, which tends to throw the belt from the highest part, or where the diameter and velocity of the pulley is the greatest, and to the change in the line of direction between the driver and driven pulleys.—M. D. C., of Mass. [There is no doubt that centrifugal force plays a part in rapidly revolving pulleys, which tends to throw belts to the highest parts. But belts will run to the highest parts of pulleys when the latter run at speeds so low that practically the centrifugal force is nothing. The explanation of M. D. C. is not adequate. Previous explanations are correct. We shall publish no more at present upon this subject.—EDS.

SPECIFIC GRAVITY OF HYDROGEN.—S. F. asks specific gravity of hydrogen. Air being *one*, it is about .068 or .07, nearly. It would require about 2,100 cubic feet to sustain a weight of 140 lbs. A balloon thirteen feet in diameter, spherical in shape, would contain about that amount.—A. G.

LESSENING STRENGTH OF PAPER.—I think that C. C. will find, as I did, that sulphuric acid will serve the purpose best According to the thinness of the paper operated on, indigo should be added, as it diminishes the strength of the acid, gives color to the lines, rules smoother, and dries quicker. Use a gold or glass pen.—This is in answer to C. C., in SCIENTIFIC AMERICAN of July 15, 1871.—W. E. B.

SMOKE STACK.—I am running a 24 H. P. engine, driving a 12-stamp quartz mill. The mill is located so high up in the mountains that when the wind blows in a certain direction, I have little or no draft; would I have better draft by exhausting in the smoke stack?—J. A. L. ANSWER.—Yes, but if you have draft enough when the wind is in some quarters, you can probably secure the desired result by placing a revolving vaned hood on the top of the smoke stack, so that its closed end shall always turn to the quarter from which the wind is blowing.—EDS.

BORING CYLINDER.—In number 4, vol. XXV, G. S. R. wants to know why he cannot bore as fast as he can turn. Very few machinists make as good inside as outside work. It has been done, and is being done regularly in one shop, at least. The difference in the amount of work done is very slight indeed, if any at all, when proper tools are used. B. P. G.'s would by no means answer the purpose. There is no good reason why a 24 inch engine lathe will not bore a cylinder as large as can be got upon it, taking out as much as a half inch in diameter, if need be, the tool point moving at the rate of 20 feet per minute, with .2 inch feed. It is quite probable that G. S. R. would be convinced only by actual demonstration. He gives his cut as 1-16th, but does not say what his feed was. The fore-mentioned feed, .2 inches, is for first time through. Finish may be five times as much, 1 inch, certainly not less than 2½ times as much, or .5 inches. Only think of 83 turns to the inch! with ½th inch cut only! in good cast iron, and making not over 13 feet speed, week in and week out, too. In cutting tools there is needed the most thorough reform. A planer or lathe tool with nose an inch square to grind off, ought to be a thing of the past, though it is not, having seen several scraping away the past week.—A. M. S., of Mass.

BELTS.—I reply to J. E. G., volume XXV, number 4, query 10; the belt will incline to the lower end.—B. C., of N. H.

BELTS.—J. F. M. Always run your belts on the side they are made to run on, that is the head side of the rivet, but buy your belts to run on the hair side. I have had great experience in that line, I have often seen belts that would not pull on the flesh side, and I would turn them over and they would run with no trouble whatever. If you require a great strain on your belts, take some pulverized rosin and dampen it with a little oil. Set it on your boiler until the rosin is entirely melted, then put in a cool place until it sets. Use very little at a time; it will give you three times the power, preserve your belts and cost but a trifle.—G. A. Y.

RELATIVE POWER IN TURNING AND BORING.—G. S. R. I think the answer to this query is very simple to anyone that handles a lathe. Any machinist knows he can't bore as fast as he can turn, and that it takes more power to bore than turn. Although it is a difficult task for me to explain to G. S. R., I will do my best by simply stating, that in turning the tool acts on the circle like a cutter or a wedge; and in boring the circle is so that the tool backs the metal, and the cut is more of a break. He may use any tool he likes, and he can't bore with the same power and speed that he can turn with. If G. S. R. will fasten his dog or catch on the boring bar as much as possible under the leverage of his lathe pulleys he will gain all the power required.—G. A. Y.

TURBINES.—In number 26, volume XXIV, J.W. C. wants information about turbines. They no doubt act precisely the same when used at their full capacity, whether the gate is at the bottom of the wheel or at any other point, provided the opening is a proper one. They certainly are no more a reaction wheel on that account. I know of no thorough series of experiments to determine the efficiency at partial gate arranged in that way. Enough is, however, known to place a half dozen other arrangements very much above it.—A. M. S., of Mass.

SPEED OF SURFACE IN TURNING CAST IRON.—A. H. G., in number 25, vol. XXIV, asks for the proper speed of surface in turning unannealed cast iron, amongst several other metals. In one shop, where the writer is acquainted, the speed has been often observed below 8 feet per minute, rarely as high as 15 feet. In another, rarely below 18 feet, and he has observed fully 40 feet per minute, often 22 to 25 feet per minute. He considers 20 feet a fair average for cast, and 18 feet per minute for wrought iron. Very much, however, depends upon the style of tool used.—A. M. S. of Mass.

ELECTROTYPING ON WOOD.—Has H. W. L. tried coating the wood with copal varnish, and then blackleading it?—D. B., of N. Y.

COATING GLASS WITH METAL.—C. E. G. should make a varnish of two parts asphaltum and one part mastic, by melting together, and when cool, adding sufficient spirit of turpentine to make the compound of a sirupy consistence. Before applying the varnish, roughen the surface of the glass with the fumes of hydrofluoric acid. Deposit a good thick coating of metal on the varnish.—D. B., of N. Y.

TABLE CUTLERY.—R. S. S. H.'s difficulty is that his knives are made to sell, and not to cut with. Cutlery made by a trustworthy firm will not lose its edge easily, or become worthless when it does.—D. B., of N. Y.

POLISHING MEERSCHAUM.—A. R. will find meerschaum dust to be the best thing for this purpose.—D. B., of N. Y.

BELTS.—J. F. M. will find that his belts have more hold if he puts the flesh side next the pulleys.—D. B., of N. Y.

POUNDING PISTON.—You may depend upon it that if that piston does not knock anywhere, that the trouble is in the valve. It is leaking sufficient to make a lead, and thereby wrenches the engine on the centers. Cut off your lead entirely and let us know the effect.—G. A. Y.

CLEANING GUNS.—Seeing a query "how to clean guns or fire arms of any kind," I would say to all who have access to an engine, take the nipple or breech pin out, (or leave both in if the gun is not too foul), and put the muzzle to a cylinder cock, or a pet cock, and send a jet of steam through it. No one who has this opportunity can find anything better.—J. A. M.

FIXING PENCIL MARKS.—Lizzie and G. G. R. send directions for *varnishing* the paper, which is not what J. H. R. wants. The milk treatment is the best, as it does not affect the surface of the paper at all. D. B., of N. Y.

TO PREVENT LEAKAGE OF OIL BARRELS.—L. & B. In case any of my oil barrels leak through the seams, I simply use a glue size, painting the barrel well with it. I use a cheap comminuted glue.—G. A. Y.

HARDENING BRASS.—Annealed brass cannot be hardened, without hammering or rolling it.—H. J.

CULINARY UTENSILS.—Use block tin or heavy copper kettles well tinned, and when the tin is worn off, the kettle can be tinned over again at very small expense.—H. J.

J. S. T. asks: "Has a cannon ball ever been fired from Dover to Calais?" He writes:—I assert that it has not, but my opponents, "who will only take the decision of your paper as final," base their argument on the existence of a certain gun at Dover Castle with an inscription to this effect upon its breech." "Grease me well, and keep me clean, and I'll throw you a ball to Calais Green!" ANSWER.—The gun alluded to is evidently more mendacious than pugnacious. It seems almost silly to answer "no" to such a query, but we do it to oblige our correspondent, who evidently asks in good faith.—EDS.

J. B., of La.—There are many ways of carrying weights, suspended on wires, past the supports which sustain the wires. None of them can well be described without diagrams. Your second query is too indefinite.

C. E. M.—If you cannot understand that your method of getting the area of a circle is only theoretically approximate, nothing we can say further will convince you.

H. C. P.—Your statement is worthless as given. Show some proof that the answer to B. A. J. is wrong, if you wish attention.

A. M. W., of N. Y.—Your boiler, judging from the specimen of scale sent us, acts a concentrator of the dye stuffs held in solution by the stream which flows from the dye-works above. We see no practical remedy for the trouble, unless you can obtain your water from some other source, or can use a surface condenser.

R. F. H., of N. Y.—To run at the same speed up a river as down, a steamer's paddle wheels must of course make enough more revolutions to compensate for the velocity of the stream.

Queries.

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

1.—VARNISH.—What kind of varnish can I use for covering polished iron, something that will adhere and become hard? I have used shellac, but it does not answer the purpose.—J. H. W.

2.—SOAP MADE WITH SALT.—Can you, through your paper give me a recipe for making soap, as mentioned by Mr. Alex. S. Macrae, of Liverpool, England, on page 18, current volume?—C. F. M.

3.—FORCING WATER THROUGH IRON.—Is it possible, in testing a cylinder by hydraulic pressure, to force water through the iron so as to make it look like mist? Or is it more probable the water would be forced through the connecting joint to produce the same result?—J. C. C.

4.—FORCE OF GUNPOWDER EXPLOSION.—What power is gunpowder capable of exerting? and how is it ascertained? What are the obstacles in the way of using gunpowder as a motive power? How many pounds pressure to the square inch does it exert when exploded? Can the amount of pressure be regulated by reducing or increasing the amount of powder used? What other similar compounds are there to be used instead of gunpowder that would not leave so much dirt or residuum when ignited?—N. D. W.

[If N. D. W. will turn to page 297, last volume, he will find nearly all the information he seeks.—EDS.

5.—SMOKE CONSUMING.—I am annoyed by the smoke from a steam mill, near by, where shavings are used for fuel. Is there any method by which the smoke can be consumed? The proprietors are willing to bear the expense if it can be done. Their engine has a good draft, and there is a chimney about sixty feet high. The mill stands below me, but the smoke settles all about me. Is there any relief? If you can suggest anything, it would be a great favor.—J. F. M.

6.—CLOTH IMPERVIOUS TO SOAP AND WATER.—I wish a kind of cloth which will stand the action of soap and hot water without rotting, and which will not require cleaning, after use, to keep from decaying. The cloth should be thin and very pliable. Or can I saturate linen or silk with a solution to prevent the action of the soap and water? If so, with what?—H. L. P.

7.—WATERPROOF COVERING.—I want something that is fire and waterproof to cover the deck of my steamboat. I think I saw something advertised in your paper, felt or prepared cloth or paper, said to be adapted to such purposes.—C. M. S.

8.—OLD BOOTS AND SHOES.—To what purpose and where can old worn out boots and shoes be used?—L. S.

9.—JAPANNING ZINC.—I wish to know what will make japan (baked) stick on zinc or spelter.—E. M. D.

10.—OZONE.—Will some one inform me if ozone can be procured by heating the vapor of ether in a vacuum, or without the presence of oxygen?—C. E. S.

11.—GREASE SPOTS.—Please inform me what will remove grease spots from paper on the walls of a room without disfiguring or injuring the paper.—M. D. C.

12.—TELESCOPE.—Will some astronomical reader give directions, dimensions, etc., for constructing a telescope, the body to be square and made of wood? Please give diameter of lenses, distance apart, etc. I require it for the study of astronomy.—M. L. B.

13.—RETORT.—I have some steam heating retorts, worked under high pressure, and it is necessary to open and close them many times in a day. The doors or bonnets should have been recessed for gaskets, but are not. The gaskets bother me. What is the best thing to make them stick?—C.

14.—DECAYING OR SOFTENING GUMS.—Can some of your readers inform me what to do to harden my gums? The points of the gums between the teeth are detached, and the gums are inflamed. I have always used a brush after meals to keep my teeth clean.—W. W. G.

15.—FRACTURE OF IRON.—I have a gasometer supported by 8 iron columns 14 feet high, 12¾ inches diameter. They have been in position and doing duty fourteen years. Lately four of them have cracked, the crack showing itself about the center of each, and running lengthwise in the column. Each crack is from three to four feet long. They are hollow, so that no water could fill in and freeze. Can you or your readers tell me what causes the column to crack?—W. M. B.

16.—BELTS.—In your issue No. 3, Vol. XXV., S. G. D., of Pa., gives a good reason "why a belt will run to the largest part of a pulley." I ask him or any of your readers why a band saw will not do the same thing?—J. W.

17.—WATER WHEEL POWER.—I have a small stream, affording, on an average, forty square inches of water, with thirty feet head and fall. Is there a water wheel that will run with this amount of water under the given head, and drive one pair four feet stones, and a sixty saw cotton gin at full speed? If so, what wheel?—W. A. W.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

CURE FOR BEDBUGS.—J. L. M.

LUBRICATING OIL.—W. F. N.

ROACHES.—A. W.

SPEED OF CIRCULAR SAW.—J. H. M.

ARTICLES ON CANAL NAVIGATION, by N. L. C.—E. J. F.—T. M. B.—W. C. G.—W. W.—J. G. D.—J. B.—Mechanic.

OZONE GENERATOR.—P. A. R.

APPARATUS FOR DIVIDING POWDERS.—G. P. A.

BOSSES AND MEN.—H. ——

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

PRINTING TELEGRAPH.—David Flanery, of New Orleans, La.—This is a new telegraph instrument for printing messages upon strips of paper, which simplifies the electric as well as the mechanical appliances of the apparatus. The devices heretofore in use for the same purpose were generally either too complicated and costly to become generally introduced, or too slender in construction, and therefore easily out of order. The present apparatus requires but one main battery at the terminuses of each circuit or at one terminus, and employs no polarized or permanent magnets which are liable to change. It has but one series of wires, where heretofore two or three were required. It operates without requiring the reversal of the battery and without throwing excessive strain on the same. It consists in a novel arrangement and construction of electro-magnets; in a new arrangement and disposition of the wire which constitutes the circuit; in the application of the apparatus of resistance coils, whereby the course of the current is changed; and in the combination of certain keys for regulating and controlling the currents of electricity, and in a new combination of mechanism, which constitutes the printing machinery and the devices for feeding the paper.

STENCH TRAP.—Samuel Lawrence, of New York City.—This invention is an improved attachment for stench traps, which is constructed to prevent the trap from being drawn dry by the siphon action of the discharge pipe, and thus prevents any foul gas or odor from passing back from the discharge pipe. It consists in a combination of a valve attachment with the discharge pipe leading from the stench trap.

SHINGLE MACHINE.—Oliver A. Olmsted, of Sebastopol, Cal.—In this machine shingles are split from bolts, shaved, and jointed. The block or "bolt" from which the shingle is to be cut is placed in a recess on the carriage. The revolution of a wheel carries the carriage by means of a pitman. As the splitting knife is forced forward, it splits a shingle from the bolt, which shingle is guided by a spring on to a lower stationary bed. As the carriage returns, the butt end of the shingle is forced between stationary shaving knives, which are attached to and supported by the rods on each of the ends of the knives. As the carriage is drawn back for shaving the shingle, the knives are gradually forced toward each other by the carriage, which gives the taper to the shingle. The shingle, when shaved in this manner, drops down with the shaving from the upper side, while the under shaving is conducted down by a curved plate. In being shaved, the shingle passes over a roller, by which it is carried back after it leaves the knives. The bolt is held down by a dog. A knife for jointing the shingle in the bolt works vertically in an upright frame. A shingle is split from a bolt and shaved at each revolution of the driving wheel. The shaving knives are made adjustable by set-screws, so that they will shave the sides of the shingle evenly.

FRUIT GATHERER.—George Aldridge, Henderson, Ky.—A stand or table is used, resting upon legs, with a pivot bar passing through it, which bar is adjustable as to hight, and turns freely in the table or stand. The bar has a pulley in its top, on which the picking staff rests. A weight is attached to a cord, which cord is attached to the staff, and passes over the pulley. This weight prevents the staff from slipping back when the latter is used at an angle in picking the fruit. The picking jaws are attached to the end of the staff at one end, and pivoted together at their other end. The fruit is conducted down to a basket or other receptacle. A rod extends along the staff, where it is kept in place by small staples, and is attached to a thumb lever. A spring is connected with the rod pivot. When the rod is drawn down by pulling the thumb lever back, the arms of the jaws are drawn together and the jaws are closed. When the thumb lever is released, the spring recoils and draws back the rod and opens the jaws. It is claimed that the picking staff can be operated by means of the stand without fatigue, and may be turned laterally in either direction and adjusted as to hight by altering its angle or by readjusting the bar in the stand, and that by this arrangement the objections to the fruit pickers in use are obviated, as a boy may operate this picker, while it is very fatiguing for a strong man to pick fruit with those hitherto used.

OIL CAN.—This invention, patented by Paris Childs, of Northampton, Mass., is a device for regulating the amount of flow from oil cans. To this end, a threaded wire passes through a stuffing box at the bottom of the can, and reaches up into the interior of the conical nozzle of the can. By turning the wire by means of a milled thumb-nut, the wire is thrust upward or drawn downward, thus reducing or enlarging the area in the nozzle through which the oil flows.

TREADLE FOR SEWING MACHINES.—A foot piece, rock shaft, and spring, are constructed and arranged together, to enable the ankle joint of the operator to be always held in line with the center of motion of the treadle to save the waste of power in moving the entire lower limb at every vibration of the crank shaft. James W. W. Gordon, of Newport, Ky., is the inventor.

LOCOMOTIVE BOILER.—Samuel J. Hayes and Edward T. Jeffery, of Chicago, Ill.—This invention relates to an improved method of putting in the crown-bars employed in locomotive and other boilers for staying the crown-sheet. The invention is also applicable to stationary or portable or marine boilers when constructed with an inside furnace requiring crown-bars. The improvement consists in extending the crown-bars across the boiler to the outside sheets of the shell, and supporting each end of them on a bar or angle plate bolted or riveted to the shell, and also bolting the shell to the ends of the crown-bar. When necessary, the rods may be used extending across from side to side of the shell above or between the crown-bars.

AUTOMATIC CAR BRAKE.—Joseph R. Crabill, of La Crosse, Ill.—This invention has for its object to furnish an car brake. This is so constructed as to be applied by the running together of the cars as the engine is slowed, whichever end of the car may be forward. The suspension of the brake from supports pivoted directly above the axle of the wheels to which the brake is to be applied, so that the movement of the said supports in either direction will apply the brake to the wheel, is the feature of the invention, while the details of construction are also covered by the patent.

COLLAR PIN.—Joseph McGee, of Lancaster, N. H.—This is a combination of necktie and collar pin, and an improvement in fastening the collar. A neat and saleable invention.

STOVE PIPE DRUM.—Benjamin Webster, of Kingfield, Me.—Within the pipe is suspended a hollow inverted cone, of suitable length, its large upper end being of such size that around it sufficient space is left for the escape of smoke. To the lower end of the cone lead transverse pipes, which communicate with the outer air to conduct air into the cone. Larger pipes extend from the upper part of the cone to and through the sides of the pipe to convey the heated air from the cone to the room. The outer air entering the cone through the first named pipes becomes heated by the products of combustion which surround the cone, and escapes in such heated state through the other pipes. An air circulation is thus provided which does not add to the expense of heating, but greatly augments the effect. Semicircular dampers, arranged with their diametrical pivots close together above the cone, can be used for opening or closing the smoke space.

SAFETY SHAFT FOR VEHICLE.—Jonathan S. Tibbets, Brazil, Ind.—This invention has for its object the construction of shafts for buggies and other vehicles, so that should the horse become frightened or otherwise unmanageable the driver may readily detach him from the vehicle, and, at the some time, in such a way that he will not be liable to injure himself with the parts of the shaft that he carries with him; the shafts, when detached, being supported by suitable straps so that they cannot drop.

SEWING MACHINE TABLE.—John C. Cochran, Ripley, Ohio.—This invention consists in providing the machine covers and the tables with means for readily attaching the covers, when removed to use the machines, to the tables, whereby the capacity of the table is increased, and a place is provided for the cover, when removed, in connection with the machine, where it is always at hand when required for replacing. By this invention the box, which is of no use when the machine is in use, is utilized for a table extension with but a trifling cost, thereby affording the same result that is afforded by the folding tables, heretofore used.

WOOD PAVEMENT.—Blocks placed endwise are employed, sheet metal strips of U shaped section being used to separate the blocks and hold them down, the strips being let into grooves in the sides of the blocks and bolted down to sleepers bedded in concrete. James Judge, of New York city, is the inventor.

FEED WATER HEATER.—Hollow grate bars and a novel connection of the same with the feed pump and steam generator are the features of this invention. The arrangement is ingenious and practical in its details, and will doubtless prove economical in use. G. W. Jones, of Nashville, Tenn., is the inventor.

CAR COUPLING.—John W. Gillam, of Newton, N. J.—This is a double clutch coupling, having flexibility to adapt itself to the motion of the cars, and positive in its connection, which it makes automatically when the cars are run together. The uncoupling is accomplished by a chain winding upon the vertical shaft of a hand wheel placed on the platform of the car, so that the danger of being crushed by passing between the cars, as in the old method of coupling, is wholly avoided.

SAFETY STOVE FOR RAILWAYS.—This stove is provided with a weighted bottom and a combustion chamber above the firebox; also with a chamber at the top for containing material for extinguishing the fire, which material is automatically discharged upon the burning fuel in case of accidents. The devices by which this result is accomplished are ingenious, and the general idea of the invention is a good one. It deserves the attention of railway officials. Julien T. Evens, St. Louis, Mo.

STEAM ENGINE.—O. M. Pike, of Chicopee, Mass.—This invention pertains to the valve gear and method of reversing steam engines of all classes, but is more specially applicable to locomotive engines. A four ported oscillating valve is employed, over which a block called the valve block slides, a change in the position of this block relatively to the valve, by the reversing lever, changing the induction to exhaust ports, and *vice versa*.

IMPROVED ROOF FOR BUILDINGS.—Nelson G. Northrup, Bloomington, Minn.—The object of this invention is to supply a strong, cheap, durable roof, not liable to leak. The principal features of the invention are the construction of the ridge plate and the employment of boards jointed upon their edges in a peculiar manner, said boards being hollowed or concaved towards the middle from the edges, and the joints being covered by concavo-convex metallic strips or caps.

WATER WHEEL.—This invention is an improvement in scroll water wheels horizontally discharging, and is of a nature incapable of description without diagrams. The object is the construction of a powerful and efficient wheel, adapted to use under varying supplies of water, the wheel maintaining its velocity constant or nearly so, but of course decreasing in power with diminished supply.

CAR BRAKE.—John W. McGlashan, of Montreal, Canada.—This is an arrangement of levers, links, etc., whereby the brakes can be simultaneously applied to all the cars in a train by simply pulling a cord in any part of the train, the brakes being released by releasing the cord. The power for actuating the brakes is derived, through a friction wheel, from the axle of the car.

WOOD PULP MACHINE.—James Taylor, Luzerne, N. Y.—The wood is first cut into small pieces by a series of saws used in combination with the grinder, previous to being fed to the latter. The wood when thus cut passes into a water tank, whence it is carried to the grinder by means of an elevator, together with the proper quantity of water. An expansible and contractible shell is also used on the grinding mill, which enables compensatory adjustment for wear to be made.

DOOR.—Willard C. James, of Fisherville, N. H., has devised an improvement in doors, which consists in dovetailing the mortises and tenons in stiles and crosspieces and wedging them in a way to prevent their sagging, as do doors with the ordinary way of tenoning and mortising.

MACHINE FOR CUTTING GLASS GLOBES, GOBLETS, ETC.—John Thomas, of Turbury county of Stafford, Eng.—This machine is designed to supersede the use of scissors in cutting flint glass, and to obviate the necessity for the highly skilled labor now necessary in this process. The invention consists in a novel and peculiar way of setting a diamond to adapt it to use for the purpose named.

STEATITE PENCIL.—This invention relates to the combination with steatite of other substances to make a paste for the manufacture of steatite pencils, the paste being manipulated, kneaded, and molded by machinery specially adapted to the purpose. R. Langstrom, of Cincinnati, Ohio, is the inventor.

MACHINE FOR MAKING WOOD MOLDINGS.—J. L. Lane, of Darien, Wis.—This invention relates to machines for cutting spiral or rope moldings. The main feature of novelty is a hollow mandrel in two parts with a cutter head in each, and having detachable rings or dies in each end to hold and guide the strips of wood, which rings can be shifted to suit different sizes of moldings. Improved arrangement of knife stocks and adjusting devices is also claimed.

ADDING MACHINE.—Emery M. Hamilton, New York city.—This is a combination of various devices whereby the operation of adding may be accomplished, the machine carrying and automatically registering the sum totals of the numbers set off upon it. We judge it will compare favorably with other competitors in the same field of invention.

ROOFING BRACKETS.—James H. Look, Jr., Rochester, Mass.—This is an improved support for stagings for the use of carpenters and others in shingling roofs and for other purposes; and it consists in an angular metallic bar made adjustable by means of a screw, and having a hinged claw and adjustable supporting arms. In using the bracket, the claws or teeth penetrate the roof and prevent slipping. The bracket is made adjustable as to hight by means of the screw passing through a screw head. Arms stand at an angle with the screw, and brace the bracket laterally in each direction. This bracket is claimed to be cheap, safe, and convenient, and to possess advantages over anything of the kind in use.

PRINTER'S GALLEY REST.—John M. Murphy, Olympia, Washington Territory.—This is an improvement in an invention patented August 3, 1869, so as to make it simpler in construction, less expensive in manufacture, and more convenient in use.

STEAM WATER HEATER AND PURIFIER.—This is an apparatus composed of various parts combined, to heat water and purify it preparatory to its use in boilers. The construction is quite peculiar, and shows much fertility of resource on the part of the inventor. We judge it to be sound in principle and effective in operation. James Argall, of Mineral Point, Wis., is the inventor.

HAND BRAKE FOR WAGONS.—This is a combination of spring pivoted lever, brake shoe, stop block, etc., in such a way that compound leverage is secured while the brake is rendered double acting, the reaction of one part being utilized to operate the other part. Joseph S. Adgate, of Stevensville, N. Y., assignor to himself and Raymond M. Welles, of Towanda, Pa., s the inventor.

CHURN.—Jacob L. Rust, of Ketchburg, Ill.—This is an oscillating churn vessel with an oscillating reciprocating dasher, by which the inventor claims that the globules of milk are sooner broken and the operation of churning is sooner completed than with other churns.

MANUFACTURE OF HYDROCARBON GAS.—Frederick A. Sabbaton, New York city.—The object of this invention is to furnish a superior quality of hydrocarbon gas for illuminating or heating purposes at a cheaper rate than the ordinary gas has hitherto been produced; and the invention consists in utilizing the heated gases or waste gaseous products of combustion for that purpose, such waste gases being generated in the furnace or fire box beneath the retort in the ordinary process of manufacturing gas, or generated in furnaces employed for other purposes. It also consists in combining with such gases, in a retort, superheated or dry steam, and also in carbureting the hydrogen gas thus obtained in the retort by means of any carbonaceous substance or material, either solid or liquid, as coke, coal, petroleum, naphtha, oil, or any of the hydrocarbons. It is claimed that by this arrangement nearly or quite the whole of the gaseous products of combustion may be made to pass through the retort and utilized as far as the character of those gases will allow. The result of this improvement is a very important saving of fuel in producing a given quantity of gas, while the gas itself possesses superior heating or illuminating power.

TABLES, STANDS, ETC.—Daniel K. Barnhart, Gaines, Pa.—Metal sockets receive the tenons of the legs which may be secured in said sockets by screws passing in through the side of the said sockets and screwing against or into the tenon of the said legs. Upon the upper ends of the sockets are formed arms having holes formed through their ends to receive the screws by which the sockets are secured to the top or leaves of the table, the said arms thus giving to the sockets a broad base. The under side of the top or leaves of the table near the edge or edges has a groove formed in it to receive the edge of the rim, which rim may be made light and thin, and, if desired, strengthened by knees or brackets. In the case of square tables the side arms of the sockets may be extended so as to form bars, provided with holes to receive screws for securing the top or leaves in place. This improvement is designed to be attached to round tables, square tables, center tables, extension tables, stands, etc., and enables firm and substantial tables to be made without any frame.

LAMP BURNER.—Thomas F. Halley and John F. Livingston, Washington D. C.—This invention has for its object to prevent explosions from the overturning or breaking of lighted kerosene lamps, and to this end it consists in the combination with the burner of such a lamp, of a water tank whose contents, in case of accident, extinguish the flame at the wick before it can be reached by the vapor or oil in the lamp.

CLIMBING SANDALS.—Jacob A. and George C. Hanger, Churchville, Va.—This invention relates to sandals to be worn by those who ascend and descend telegraph poles, and it consists mainly in a device whereby a certain toothed jaw, which is placed on the opposite side of the pole from the sandal, may be drawn against or away from the pole, thus clamping the sandal or releasing it from the pole by the operator inclining his foot with the sandal on it more or less to the pole.

MACHINE FOR SHEETING DOUGH.—John H. Shrote, Baltimore, Md.—This invention relates to a machine for forcing dough, when placed in a mass in a receiver, out through a longitudinal slot in the bottom thereof in the form of a sheet by pressure applied from a follower to the dough in the receiver. The machine is so constructed as to remove the sheets of dough thus formed and otherwise economize labor.

BUTTER WORKER.—Luke L. Kellogg, Leon, N Y.—This invention relates to the combination of a vibratory sector shaped tray for receiving butter as it comes from the churn, with a corrugated roller of conical shape placed in stationary boxes for "working" such butter as the tray is vibrated beneath the roller.

AXLE BOX.—David Dalzell, South Egremont, Mass.—This invention relates to an improvement on the invention patented to the same party August 16, 1870. The improvement consists in connecting the two parts of the axle box, namely, the inner wrought iron tube and outer malleable cast iron tube, by means of a screw thread cut on the outside of the end of the tube, and another screw thread cut on the inside of the outer part, so that said parts can be screwed together; and also by means of a tapped hole cut through said outer part and tube, and a threaded wire screwed into said hole, and then cut off flush with the exterior of said outer part.

CANAL BOAT.—Robert Hooper, Baltimore, Md.—This invention consists of a canal boat having a divided introverted bow, that is to say, a bow divided into two parts by a central recess running lengthwise of the boat to any required distance from the stern, the outer parallel sides of the two parts being plane, and the inner converging sides being rounded or convex, as the outer sides usually are; the object of this construction being to prevent the bow from agitating the water, so as to enable the boat to attain a high rate of speed without subjecting the banks of canals to injury from the dashing of waves.

HARVESTER.—Solomon and Isaac Rawson, Almond, N. Y.—This invention consists in the combination of a caster wheel with the inside shoe of the finger bar of a harvester, by means of a spring, the caster wheel being placed in front of the shoe, and the function of the spring being to prevent the transmission, to the shoe and from thence to the finger bar, of shocks received by the caster wheel from striking stones or other obstructions. It also relates to the construction of the socket for the pintle or stem of the caster wheel, whereby said wheel may be adjusted laterally with ease and dispatch.

FURNACE GRATE.—Elijah F. Steele, of Wallingford, Conn.—The outer frame is made of metal, of rectangular or other suitable form, and built into the brickwork or body of the furnace in a suitable manner. The grate is made in two or more sections, each section extending from the back of the frame to the front end of the same. Each section has projecting trunnions, and is thereby hung in boxes. The sections can swing on their pivots or trunnions to be dumped. Each section of grate is composed of longitudinal ribs, and transverse grate bars, the ends of the latter being beveled, so that they will overlap each other. Cranks project from the front ends of the sections, and are connected by a rod, one end of which is pivoted to a lever. This lever is attached to the frame, and can be used to dump the sections simultaneously.

COMBINED CAP AND COLUMN FOR STILLS.—J. E. Morris, Baltimore, Md.—This invention relates to an improvement in the ordinary columnar still cap of cups placed one upon or one besides another, in each of which re-distillation takes place of the liquid condensed from the vapor vent up into the cap from the still. The invention consists in the means hereinafter described whereby a rectification of the spirit is made to take place in each cup of the columnar cap at the same time with the re-distillation above referred to.

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117,237.—COUNTERSINK.—S. J. Abbott, Deering, Me.
117,238.—STRAW CARRIER.—O. Abell, Witoka, Minn.
117,239.—TELEGRAPH.—G. L. Anders, Boston, Mass.
117,240.—RECORD BOOK.—H. Arden, Brooklyn, N. Y.
117,241.—TANNING.—A. T. Atherton, Lowell, Mass.
117,242.—LEVER STAFF.—W. E. Banta, Springfield, Ohio.
117,243.—RAKE TEETH.—J. B. L. Bartlett, North Jay, Me.
117,244.—WATER WHEEL.—J. Bell, Carrollton, Mo.
117,245.—GUN LOCK.—W. N. Bennett, Illyria, Iowa.
117,246.—BLAST FURNACE.—H. Bessemer, London, England.
117,247.—FURNACE.—H. Bessemer, London, England.
117,248.—CONVERTER.—H. Bessemer, London, England.
117,249.—CASTING METALS.—H. Bessemer, London, England.
117,250.—FURNACE.—H. Bessemer, London, England.
117,251.—BOILER.—N. L. Blanchard, Spuyten Duyvil, N. Y
117,252.—BLOWER.—N. L. Blanchard, Spuyten Duyvil, N. Y
117,253.—SPRING.—P. Broadbooks, Batavia, N. Y.
117,254.—BOILER.—G. H. Buckley, Quincy, Ill.
117,255.—GUTTER.—A. K. P. Buffum, Gardiner, Me.
117,256.—PRESERVING FRUIT.—J. W. Campbell, Phila., Pa.
117,257.—VEHICLE.—J. F. Cass, L'Orignal, Canada.
117,258.—HARROW.—J. C. Center, Mason City, Ill.
117,259.—SAWING MACHINE.—C. Collins, Jonesborough, Ind.
117,260.—LAMP SHADE.—M. H. Collins, Chelsea, Mass.
117,261.—STOVE LEG.—J. M. Corbin, Liberty, Mo.
117,262.—SEWING MACHINE.—T. Crane, Fort Atkinson, Wis
117,263.—GATE.—P. S. Crawford, Union, Ill.
117,264.—HARVESTER.—J. Crossland, Spencer Grove, Iowa.
117,265.—WASHING MACHINE.S. Decker, F. Ayres, Rahway, N.J.
117,266.—MOLDING MACHINE.—J. Demarest, Mott Haven, N.Y.
117,267.—MILLSTONE.—A. Dewey, Princeton, Ky.
117,268.—ELECTRIC INSTRUMENT.L.L. Duerden, Brooklyn, N.Y.
117,269.—TOBACCO CUTTER.—W. T. Farre, Montreal, Canada.
117,270.—KITE.—I. Ferris, Cincinnati, Ohio.
117,271.—TREATING RICE, ETC.—R. B. Fitts, Philadelphia, Pa.
117,272.—WIRE BLANK.—C. W. Goodhue, Lowell, Mass.
117,273.—PENCIL CASE.—F. R. Goulding, Boswell, Ga.
117,274.—BARREL HEAD.—S. S. Gray, Boston, Mass.
117,275.—WIRE FENCE.—B. Greening, Hamilton, Canada.
117,276.—FIREPLACE.—J. Hackett, Louisville, Ky.
117,277.—STOOL.—A. Hallowell, E. Elliott, C. A. Blodgett, Lowell, Mass.
117,278.—CORKSCREW, ETC. J. Harrigan, Ft. Wadsworth, N.Y
117,279.—CULTIVATOR.—N. J. Harris, Meredosia, Ill.
117,280.—MOTION.—J. G. Harroun, Sag Harbor, N. Y.
117,281.—INCENSE BURNER.—E. W. Hastings, Boston, Mass.
117,282.—REFLECTOR.—A. Haye, New York city.
117,283.—BOOT HEEL.—C. H. Helms, Poughkeepsis, N. Y.
117,284.—CLOCK.—G. Herrmann, Newport, R. I.
117,285.—AIR COMPRESSOR.—M. Hey, Philadelphia, Pa.
117,286.—PAVEMENT.—I. H. Hobbs, Philadelphia, Pa.
117,287.—SOLE.—S. H. Hodges, Lynn, Mass.
117,288.—RUB STICK.—A. J. F. Howard, Milford, Mass.
117,289.—VENTILATOR.—J. L. Howard, Hartford, Conn.
117,290.—EVAPORATOR.—J. Howarth, Salem, Mass.
117,291.—WRINGER.—C. H. Hudson, New York city.
117,292.—STOVE.—G. G. Hunt, Chicago, Ill.
117,293.—KNITTING MACEINE.—L. B. Hunt, Hyde Park, Mass.
117,294.—MANTEL.—D. K. Innes, W. W. Magill, Cincinnati, O.
117,295.—SOWER. G. Jessup, Shortsville, D. P. Sharp, Ithaca, N.Y
117,296.—CORN HUSKER.—J. F. Johnson, Carthage, Ill.
117,297.—DIGGER.—R. Jones, Cleveland, Ohio.
117,298.—EXCAVATOR.—T. Jones. Washington, D. C.
117,299.—KNITTING MACHINE. L. Kavanaugh, Waterford, N.Y
117,300.—WHEEL.—H. D. and J. T. Keith, Mansfield, Ohio.
117,301.—PAINT.—M. W. Kidder, Lowell, Mass.
117,302.—LOCK.—W. Kock, Cincinnati, Ohio.
117,303.—FORGE.—W. T. Kosinski, Philadelphia, Pa.
117,304.—CLAMP.—J. Kunstler, Collinsville, Conn.
117,305.—REGULATOR.—E. Lawler, Hartford, Conn.
117,306.—DETACHING HORSES.—G. B. Lumpkin, Lexington, Ga
117,307.—PLOW.—M. N. Lynn, New Albany, Ind.
117,308.—LOCOMOTIVE.—I. P. Magoon, St. Johnsbury, Vt.
117,309.—SADDLE TREE.—J. H. Martin, Columbus, Ohio.
117,310.—HEATER.—J. McConn, Philadelphia, Pa.
117,311.—STEAM BOILER.—J. McConn, Philadelphia, Pa.
117,312.—CRANK GEAR.—T. J. McGowan, Cincinnati, Ohio.
117,313.—PRINTERS' INK.—C. McIlvaine, Philadelphia, Pa.
117,314.—COPYING INK.—C. McIlvaine, Philadelphia, Pa.
117,315.—SETTEE.—H. T. Morse, Athol, Mass.
117,316.—WASHER.—A. C. Neall, Philadelphia, Pa.
117,317.—PLOW.—B. F. Neely, Yorktown, Ind.
117,318.—CAMERA.—O. W. Noble, Darlington, Wis.
117,319.—GRATE.—C. M. Northrup, New York city.
117,320.—CHIMNEY.—S. Oakman, Boston, Mass.
117,321.—BOOT RACK.—J. K. Otis, East Cambridge, Mass.

117,322.—DUMPING MACHINE.—M. Phillips, Springfield, Ill.
117,323.—NEEDLE WRAPPER.—J. Pitzler, New York city.
117,324.—NEEDLE WRAPPER.—J. Pitzler, New York city.
117,325.—FENCE.—S. S. Porter. Broad Ford, Pa.
117,326.—SAP SPOUT.—C. C. Post, Hinesburg, Vt.
117,327.—ROOF.—M. M. Price, Nether Providence, Pa.
117,328.—COUPLING.—F. B. Prindle, Southington, Conn.
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117,495.—BOLT CUTTER.—John Whittaker, Sandusky, N. Y.
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117,497.—LAND ROLLER.—W. Wimer, Freeport, Ill.
117,498.—CAR WHEEL.—J. A. Woodbury, Boston, Mass.

REISSUES.

4,479.—Division A.—TREATING COFFEE.—John Ashcroft, Brooklyn, N. Y.—Patent No. 113,832, dated April 18, 1871.
4,480.—Division B.—TREATING COFFEE.—John Ashcroft, Brooklyn, N.Y.—Patent No. 113,832, dated April 18, 1871.
4,481.—TRIMMING MACHINE.—E. J. Beane, Providence, R. I. —Patent No. 43,082, dated June 14, 1864.
4,482.—HAT LINING, ETC.—T. W. Bracher, New York city. —Patent No. 110,891, dated January 10, 1871.
4,483.—FIREARM.—William C. Dodge, Washington, D. C.—Patent No. 45,912, dated January 17, 1865.
4,484.—HARVESTER.—Ketchum Harvesting Machine Co., Buffalo, N. Y.—Patent No. 20,719, dated June 29, 1853.
4,485.—CULTIVATOR.—A. Kinyon, Amboy, Ill.—Patent No. 45,503, dated Dec. 20, 1854.
4,486.—MELODEON.—El Dora Lewis, New York city.—Patent No. 16,034, dated Nov. 18, 1856; reissue No. 2,498, dated Feb. 26, 1867; reissue No. 2,944, dated May 26, 1868; extended seven years.
4,487.—BUILDING.—B. M. Nyce, Cleveland, Ohio.—Patent No. 31,734, dated March 19, 1861; reissue No. 3,252, dated January 5, 1869.
4,488.—LOCK.—George Rosner, Rochester, N. Y.—Patent No. 30,092, dated Sept. 18, 1860.
4,489.—CULTIVATOR.—W. S. Weir, Jr., Monmouth, Ill.—Patent No. 46,285, dated Feb. 7, 1865.

DESIGNS.

5,133.—HAND STAMP.—R. B. Carsley, Chelsea, Mass.
5,134.—PAPER BOX COVER.—J.W. Carter, South Orange, N.J.
5,135.—HAND STAMP.—S. P. Cooper, Cincinnati, Ohio.
5,136.—CATTLE HORN KNOBS.—H. J. Frantz, Metamora, Ill.
5,137.—HAND STAMP.—W. B. Gorham, Boston, Mass.
5,138.—GARMENT MEASURE.—E. F. Harmon, Conneaut, Ohio.
5,139.—CARPET PATTERN.—W. Kerr, Philadelphia, Pa.
5,140.—HOLLOW TILE.—B. Kreischer, New York city.
5,141.—COOKING RANGE.—A. Richmond, Brooklyn, and S. G. Richmond, Norwich, Conn.
5,142 and 5,143.—GROUP OF STATUES.—J. Rogers, New York.
5,144.—GRATE.—N. H. Talbot, North Easton, Mass.
5,145.—BASKET RACK.—M. Tower, Boston, Mass.

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401.—BEVERAGE.—E. J. Williamson, St. Louis, Mo.
402.—TOBACCO.—Winfree & Loyd, Lynchburg, Va.

APPLICATIONS FOR EXTENSION OF PATENTS.

GRINDING AND POLISHING MACHINE.—Daniel Lovejoy, Lowell, Mass., and Elizabeth S. Butterfield, Rockingham, Vt., have petitioned for an extension of the above patent. Day of hearing, October 11, 1871.

MOWING MACHINE.—John P. Manny, Rockford, Ill., has petitioned for an extension of the above patent. Day of hearing, October 11, 1871.

CULTIVATOR.—Nicholas Whitehall, Attica, Ind., has petitioned for an extension of the above patent. Day of hearing, October 11, 1871.

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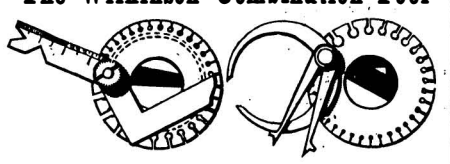

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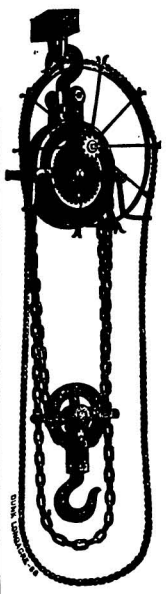

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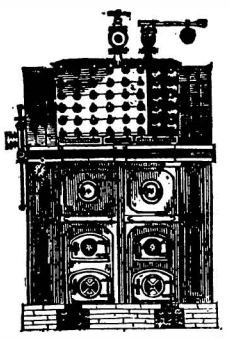

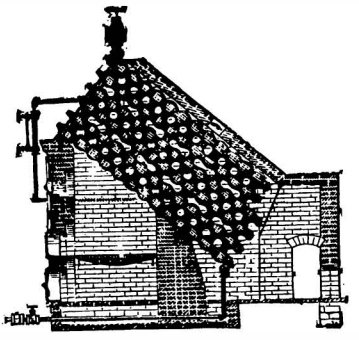

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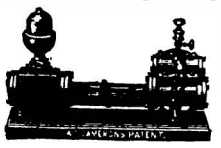

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