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Colt's Armory Testing Machine.

This machine has just been completed at Colt's armory, Hartford, Conn. It was designed by Mr. Charles B. Richards, the engineer of the Company, who is already well known to engineers as the inventor of the steam indicator which bears his name. The idea, of using an ordinary platform scale to measure the strain upon a specimen, is claimed to be original by Mr. Richards, and all of the details of the apparatus have been worked out by him.

The Company was led to build the machine, first for its own convenience and necessities; and, secondly, on account of the apparent need of an accurate testing machine in inquiries into causes of boiler explosions, strength of materials for bridges and other metal constructions, and in general for measuring the strengths of American iron and steel and other materials.

We give herewith an engraving which, with a detailed description of the machine, will sufficiently explain its principles and mode of action.

A is the platform of a fifty tun scale, of which B is the weigh beam, with its sliding weight, C. Upon the platforms, a cast iron frame, D, about ten feet high, is placed to receive the fixtures for holding the upper end of a specimen intended to receive a tensile strain. The platform is five feet long by three feet wide, and has an oblong opening in its center, through which two long screws rise about two feet above the platform. One of these screws, E, is shown in the engraving, the other is hidden by the frame, D. The screws carry a strong crosshead, F, which can be raised or lowered by two nuts, one of which can be seen in the engraving. The screws and crosshead are not connected with the platform until the specimen is placed, and the specimen makes the connection.

The crosshead receives the fixtures for applying strains of all kinds to specimens of every shape. The lower ends of the screws, E, are attached to the short arms of a massive forked lever (not shown in the engraving), which is beneath the floor, and has its fulcra supported by the bed plate which forms the foundation of the scale. The long arm of this lever is coupled to the differential system of levers, G and H, the coupling being nearly in line with the fulcrum of the lever, G. The connections, between the lever, G, and the screws, E, which carry the crosshead, are so arranged that, by depressing the free end of G, the crosshead is pulled downwards, and by raising the fulcrum of G, the same result is produced.

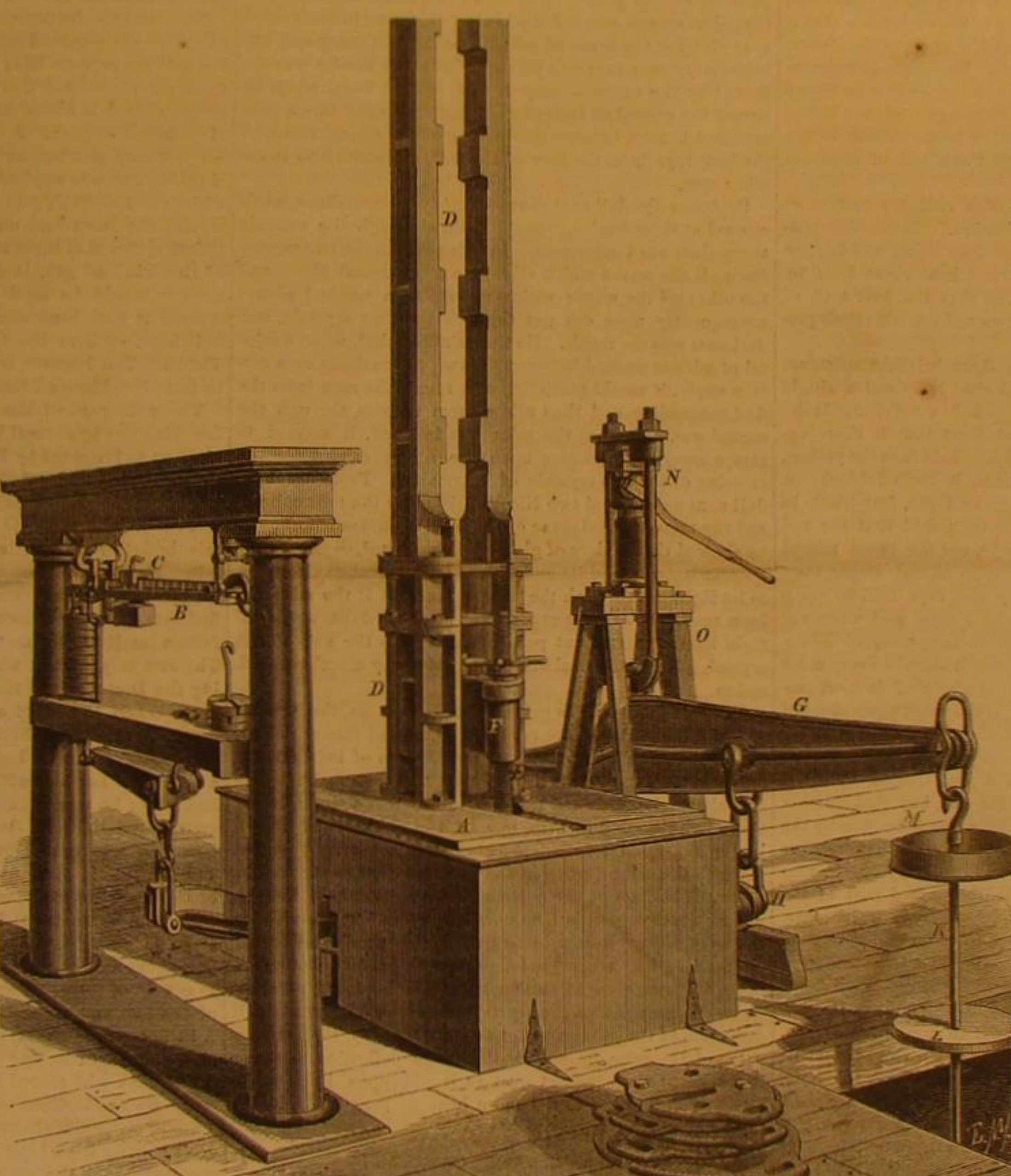
The weight to produce a strain on the specimen is applied at the free end of G, and a rod, K, is there suspended, to which plates and pans, L and M, are attached to receive weights of various values.

To raise the fulcrum of the lever, G, a small hydraulic jack, N, is used, to which the fulcrum is suspended. The jack is fixed upon a cast iron frame, O, erected upon the scale foundation.

If the foregoing description is understood, it is evident that if one end of a specimen, a rod of iron, for instance, be attached to the frame, D, above the crosshead, F, and the other end be attached to the crosshead, the rod may be stretched by bearing down the end of the straining lever, G, for the crosshead will thereby be pulled downwards. The arms of the levers are so proportioned that one pound applied at K will exert a strain of 120 pounds on the specimen, so a strain of 100,000 pounds will be exerted by the application of 800 pounds at K, and this strain will be measured by balancing the weigh beam.

The specimen is supported on the platform, A, and any weight which pulls it down will be indicated on the weigh beam with great accuracy. This result cannot be obtained by using straining levers alone, because the motion which takes place in the specimen requires a very great angular motion in the straining levers, which introduces several errors into calculations based upon the weight applied to the straining levers to produce the strain. Now in this machine it does not matter whether we know the weight applied at K, or not, the strain will nevertheless be always accurately measured by balancing the weigh beam.

As the sources of error mentioned above are common to testing machines in general use, we think this will prove to be more accurate than any that has been used.



COLT'S ARMORY TESTING MACHINE.

The crosshead, under the action of the straining weight, can be moved more than one inch without requiring readjustment. Any metallic specimen can, therefore, be stretched beyond its limit of elasticity in this machine.

For transverse strains, the frame, D, is removed, and the specimen is supported at each end upon the platform, beneath the crosshead, and the straining weight is applied by a knife edge fastened to the under side of the crosshead. To crush a specimen, it is supported on the platform, and subjected to the pressure of the crosshead, under which it will stand. Torsional strains can be applied to shafts by using the necessary fixtures for the platform and crosshead. [See advertisement on back page.]

THE Banking Committee of Congress has reported a bill requiring the officers of national banks to stamp all altered or counterfeit bills which pass their counters under any circumstances whatever. The bill is a good one and should be passed; it is one of the surest safeguards against the circulation of spurious notes.

IN the bitter cold of the arctic regions, 40° to 66° below zero, Fah., iron breaks like glass—so says Dr. Kane.

Railway Power Brakes.

Within the last two or three years, the inventive fraternity have brought forward many new devices for controlling railway trains, independent of hand brakes, and some few of these have achieved quite a success. The Boston and Providence Railway has now in experimental use no less than three different kinds of power brakes, one train each being fitted and operated by each of these devices. Included in this number is the Westinghouse atmospheric brake, which we have heretofore described somewhat at length, giving some account of its successful trial on the Providence road, and of its adoption on quite a number of important roads in different parts of the country, after full and repeated trials and proof of its efficiency. The good character of this device seems to be settled in this country, and the inventor is now in Europe introducing the device there.

Next on trial is the Steinard steam brake, which was first introduced on the Flushing and North Side Railway, and has been in successful operation there on its passenger equipment for some months. In the last volume of the *Railway Times*, we gave some account of the details of this device, which, we understand, is working very favorably on the Providence road.

The last of the three is the electric brake, which, though less known, is said to have proved quite successful on one of the interior roads, and so far worked favorably on the Providence. One of the noted features of the management of the Providence road, for many years, has been its liberality in the trial of all new devices in railway machinery; and to this liberality the public is indebted for many important improvements, without which they would have never been publicly recognized. We are glad that this liberal system of experiments is still continued, and we hope that Mr. Superintendent Folsom will, after this competitive brake trial has been fully carried out, give the public the results of his experience. There is hardly anything more important in railway machinery than efficient means for controlling the movement of trains from the foot board of the engine. The power should be certain and ample, and graduated in intensity to suit the emergency that may arise from possible collision, from unexpected obstructions on the track, and for stopping promptly but easily at stations. In the economy of railway operation, the engineer of the locomotive exercises a most important influence. If he is an intelligent person, he will understand that, in starting, if he throws the throttle valve open with a jerk, he takes a good many dollars, possibly hundreds of dollars, out of the wearing value of the rolling stock; and the hand brakemen, often of the most ignorant and unreflective class, can do the same injury by applying the brake so hard as to skid or slide the wheels, thus grinding out of a true circle, and making the wheels instruments of discomfort and possible danger, to say nothing of the needless expense. In making the engineer responsible for the *movement* of the train by enlarging his duties, as must be done by the use of power brakes, he will be likely to take a more decided interest in the ease of the movement of the train, whether in starting or stopping; he will take some pride in becoming an expert, if not an artist, in these matters, and if he is the man for the place, can save the company a good many hundreds and even thousands of dollars annually in the wear of rolling stock and rails. We are fully committed to the adoption and use of power brakes, for a great many good and sufficient reasons, and when there are so many good devices of steam, air, and electricity brought forward to meet this want, the railway managers ought to put themselves to some trouble to decide which is the best; and they can only do so by following the lead of the managers of the Providence road, and giving all these devices an intelligent trial.—*American Railway Times.*

INTERESTING LECTURE BY PROFESSOR TYNDALL---THE IDENTITY OF LIGHT AND RADIANT HEAT.

Dr. John Tyndall, F. R. S., recently lectured at the Royal Institution, London, on "The Identity of Light and Radiant Heat." There was a very large attendance, the theatre of the Institution being full to overflowing, so that many of those present could find standing room only. Sir Henry Holland, Bart., M. D., F. R. S., President, occupied the chair.

Professor Tyndall said that it was long a question in the scientific world whether light and heat were the same thing, or whether there was something very different between them. Melloni, in some of his experiments, found that light would not produce heat with his thermopile; but he forgot that the human eye is a very delicate instrument, capable of being excited by an amount of light which, when resolved into heat, would give so little increase in temperature that no thermometer in the world would detect it. Principal Forbes, of St. Andrew's, found that radiant heat, like light, could be polarised; and other philosophers have done much to establish the absolute identity of light and radiant heat. Mr. Faraday showed that the magnetization of a ray of light had its strict parallel in the magnetization of a ray of radiant heat; and he did this with delicate instruments—so delicate that it needed the utmost care and caution on the part of the observer in the laboratory to see the effects. Since then instrumental means had been increased, and so much so that he hoped that evening to be able to show, to the large audience before him, many effects which had hitherto been confined to the observation of those who discovered them and of students who followed in their footsteps.

Heat was sometimes associated with ordinary matter, so that it passed through it by "conduction." In another condition, heat flies through space just like light, and is then called radiant heat. Light and radiant heat come both together to the earth from the sun, so that the first task of the investigator is to separate the two and examine their properties.

Professor Tyndall here threw a short brilliant spectrum upon the screen, by means of the electric lamp and a single bisulphide of carbon prism. He then held a red riband in the red part of the spectrum, and pointed out that it there appeared of a brilliant red color; when he held it to the yellow, green, blue, or violet of the spectrum, it looked black. A green riband looked green in the green light, but black in all other parts of the spectrum. He then said that the red riband was not heated by the red rays, nor the green riband by the green rays; but when they were placed where they looked black, they were warmed by the rays falling upon them, because they absorbed the said rays, and wherever there is absorption there is increase of temperature. Black absorbs all rays, and it is black because it absorbs every color of the spectrum. Only where light is absorbed is heat produced by it, and the heat produced is the exact equivalent of the light absorbed. If a black riband could speak, it could say in what part of the spectrum it felt warmest; and it would say that it grew warmer as it was carried from the blue end of the spectrum towards the red, but that further on still, beyond the red, where nothing was to be seen by the eye, it felt warmest of all. It felt warmest when there were no rays competent to excite vision at all. Every eye in that theatre was receiving, from the non-illuminated part of the screen beyond the red end of the spectrum, rays which, measured by the force they were capable of exerting, were a thousand times more powerful than the rays from the part of the spectrum which was seen by the eye.

The lecturer added that he wished to prove this. He substituted a small round hole for the slit in front of the lamp, thereby producing a narrower spectrum with curved ends. He then placed a piece of red glass in front of the hole, whereby all the visible rays of the spectrum but the extreme red were cut off, and a small round circle of red light was seen upon the screen. He then brought a thermopile so near to the red circle of light that, although it manifestly did not touch or encroach upon the red rays, yet it caught the invisible heat rays beyond the red and was warmed by them. The consequence was that the needle of a large galvanometer connected with the pile swung round in the sight of all the observers, thereby proving the presence of heat. He then cut off all the visible rays from the lamp by means of a glass trough filled with a solution of iodine in bisulphide of carbon, yet the needle swung round as before when the thermopile was placed in the track of the invisible waves. These experiments, he said, proved that radiant heat was refracted by a prism just like light.

He also explained the nature of the thermopile, telling how it was built up of little bars of antimony and bismuth soldered together at alternate ends, and how, when one end of the pile was made warmer than the other, in even an excessively slight degree, an electrical current was set up, the effects of which could be measured by a galvanometer. The thermo-electric pile is the most delicate instrument known for indicating slight changes of temperature.

Professor Tyndall next proved that radiant heat was reflected from plane surfaces like light. Parallel rays from the electric lamp were thrown, upon the surface of a plane mirror placed at an angle of forty-five degrees, so as to reflect the light upwards towards the roof of the theatre. A lens above the mirror brought the rays to a focus, which could be plainly seen because of the illuminated dust in the air. The opaque solution of iodine in bisulphide of carbon was then placed in front of the lamp, so as to cut off all the light; but, when the thermopile was then placed where the brilliant visible focus had been, it was proved that dark radiant heat from the lamp still came to a focus there, as the needle of the galvanometer was powerfully deflected.

Above the lens used in the last experiment, he so placed a prism as to totally reflect the upward beam of light or heat, making it take once more a horizontal direction. When the light was cut off by the interposition of the opaque solution as before, heat rays vere still reflected by the prism, as proved by the thermo-electrometer. This radiant heat is reflected like light by a right angled prism.

The lecturer next proved that radiant heat is reflected like light by curved mirrors, and can be brought to a focus like light by lenses. In each case, after showing the experiment with light, he cut off the visible rays by means of the iodine solution, and then by means of the thermopile showed that a radiant heat focus occupied the place where the light focus had previously been.

In the next experiment, he proved that crystals of Iceland spar which split a beam of light into ordinary and extraordinary rays will do the same with rays of radiant heat. A little circle of light was thrown upon the screen, and this, by the interposition of a piece of Iceland spar, was transformed into two little circles of light a few inches apart. When the thermopile was placed before either of these circles, and while all light was cut off by the trough of iodine and bisulphide of carbon placed in front of the lamp, the needle of the galvanometer was deflected as before, owing to the Iceland spar dividing the beam of radial heat into ordinary and extraordinary rays, just like light. While the needle was deflected by the extraordinary ray of radiant heat, when he turned the crystal of Iceland spar halfway round the needle returned to zero, because the turning of the crystal removed the heat rays from the face of the pile, and sent them to another spot.

Professor Tyndall next showed that two tourmalines, when crossed at right angles, stop all light, although the crystals themselves are transparent. In this position the one crystal stops all the waves which vibrate in a horizontal plane, and the other all the waves which vibrate in a vertical plane; consequently none can get through the two crystals, and darkness was the result. He then showed that, when a crystal of mica is pushed between the two tourmalines at a certain angle, it would partially twist round the rays from the first tourmaline, and thus allow them to pass through the second one. Thus, as the mica was inserted, it seemed to scrape away the darkness upon the screen caused by the crossing of the two crystals of tourmaline. Professor Tyndall next substituted two Nicol's prisms for the tourmalines, and the mica enabled some of the light to pass as before; and he showed that a piece of glass when squeezed, so as to throw a strain upon it, had its molecular arrangement so altered as to let light get through the prisms, much as if the mica had been used. In another experiment he showed that a piece of right handed quartz, cut perpendicularly to the axis of the crystal, gave a beautiful display of colors by circular polarisation.

While the two Nicol's prisms were in position, the lecturer placed a lens to bring the rays to a focus, and then cut off all the light by the interposition of the solution of iodine in bisulphide of carbon. Then he placed the thermopile where it could receive the dark rays, and there was a slight deflection; he proceeded to turn one of the prisms, and then a larger deflection resulted, showing that more heat passed through the crystal when in one position than when in another. This fact of the polarisation of radiant heat, he said, destroys many speculations once prevalent. It shows that waves of radiant heat vibrate transversely; polarisation has no meaning with respect to longitudinal vibrations, but where there are transverse vibrations there is a power of polarisation. He then placed the crystals where they gave a small deflection of the galvanometer needle; then by the interposition of the mica he obtained a large deflection, showing that it acted upon radiant heat as it did upon light. The pressed glass also allowed more heat to pass through the crystals.

MAGNETIZATION OF HEAT.

Next he performed Faraday's celebrated experiment of the magnetization of a ray of light, and followed it by the magnetization of a ray of radiant heat—one of the most delicate and complicated experiments ever shown to a public audience. First he took a parallel beam of light and heat from the electric lamp, then quenched the light by the bisulphide solution. The dark rays thus obtained were then passed through a Nicol's prism, and afterwards through a piece of Faraday's heavy glass, placed between the poles of an electromagnet; next they were passed through a second prism and were finally received upon one face of the thermopile, which they warmed. Rays of radiant heat from a tube of warm water were then allowed to fall upon the other face of the pile, and the heating power was regulated by a square disk, which could be placed so as to cut off more or less of the rays at will. Thus the two faces of the pile were brought to the same temperature, and then there was no deflection of the galvanometer needle. Under these conditions, when the electromagnet was excited by the passage of an electric current, so that the piece of heavy glass was placed in a powerful magnetic field, at once there was a deflection of the needle showing that some influence had been exerted on the radiant heat by the magnetism. This experiment was all the more complicated because a very small and sensitive galvanometer had to be used. Professor Tyndall, therefore, had to illuminate the little dial of the galvanometer with one of his electric lamps, and to throw an enlarged image of the dial upon the screen by means of a lens and a plane mirror placed at an angle of forty-five degrees; thus the movements of the needle were made visible to everybody present.

The lecturer then said, in conclusion, that the thing called radiant heat was part and parcel of the radiations from luminous bodies. At the other end of the spectrum, beyond the violet rays, there were some feeble rays of radiant heat; but in the short range of the visible spectrum lay all that wealth of color which is the chief source of beauty in nature and in art. If they asked him how came the light to be thus composed, and how it is that external nature so sifts this light as to give to the flowers of the field and the leaves of the forest trees their wealth of beauty, and how it comes to pass that we have a sense of the beautiful which has grown up in the midst of these agencies, and how it is that man derives perfection and elevation of mind from the contemplation of this beauty, he would answer that the cause must be left for philosophers to discover. He thought, nevertheless, that they would be able to give but an approximate solution, and that the real root of the matter would forever lie beyond them.—*William H. Harrison, in the British Journal of Photography.*

Laughing Gas.

Dr. Colton recently lectured in Brooklyn, giving some practical illustrations of the peculiar effects of nitrous oxide or laughing gas, which is composed of a mixture of two parts of nitrogen and one part of oxygen.

Now, said the lecturer, the air we breathe is composed of oxygen, hydrogen, and carbon. Any gas that will extinguish fire will not support life; therefore, if oxygen were removed from air we should die. This Dr. Colton illustrated by a couple of jars, in one of which was pure air, and in the other air without oxygen. A number of experiments followed. An ordinary gas burner was lighted, then gradually some laughing gas was applied to the common gas, producing a white and remarkably powerful light, making the gas lights around the room and on the stage appear quite dim. Dr. Colton stated that three miles of piping, for the conveyance of this kind of gas, is down in New York, and in a short time it would be used opposite the Fifth Avenue Hotel. Abroad it had been used some time to light large public buildings, such as the Grand Opera Houses at Paris and Vienna. The lecturer believed that, after a while, it would be introduced into all large cities.

The next part of the exhibition was the inhalation of laughing gas by several ladies and gentlemen who were invited on to the stage by Dr. Colton. Just sufficient was given to exhilarate. Since 1844, Dr. Colton had given the gas to 55,923 persons for dental operations, and none of them had felt the worse for it. He inhaled a small quantity daily, and felt the better for it. They had removed nineteen teeth from a Brooklyn lady that morning, and she never felt the slightest pain; indeed, she was astonished, when she awoke, to find that her teeth were out. Dr. Colton then gave the gas from a small bag to two or three ladies and ten gentlemen. The first lady danced with ease and even elegance, clutching the Doctor round the waist and making him dance with her. When the effect of the gas was off, she stood in the center of the stage, looking at the audience, and wondering, apparently, what she had been doing. She ran to the couch and covered her face with her muff. Then a tall gentleman had a try; he was talkative, and said, "You know how it is yourself—delightful! beautiful! delicious!" His speech, however, was cut short by a pitch forward towards the audience, and, had it not been for the ropes placed in front of the stage, he would assuredly have fallen over. A small dark man came next; he was pugilistic, and cleared the stage in no time. Then there was a dancer, who threw his legs about as if they did not belong to him, and had a desire to get rid of them; he was most amusing under the influence of the gas, and the audience were convulsed with laughter. A little boy was put to sleep for a minute, and laid out flat upon the stage; he was quite insensible. After this came a young man who snored like a pig while he was taking the gas. He was inclined to make a speech, commencing thus: "Happy—wonderful—worth seven miles of travel—happy don't express it—a little more—would go fifty miles." Other gentlemen took the gas, and the effect was similar.

Native Coke.

Messrs. Litman and McDowell, editors of the *Genius of Liberty*, Uniontown, Pa., send us a curious looking mineral with hair upon it, termed among the miners "coal with hair on." They ask us for further information. It is a beautiful specimen of *native coke* or fixed carbon. The "hair" or filiform structure is sometimes seen in artificial coke. It originated in the action of heat on bituminous coal. The long line of outcropping old red sandstone, brought up by the rising of Chestnut Ridge, and stretching from Indiana county, Pa., to Marion county, Va., crossing Fayette county diagonally, is proof of igneous action. Very likely a trap dyke exists in the vicinity of the coal bed. Native coke also occurs near Richmond, Va.

AN esteemed correspondent, M., of Princeton, N. J., sends us a letter in which he states that, some years ago, he picked up a number of the SCIENTIFIC AMERICAN in the office of a rolling mill. His attention was caught by an article entitled "How to make a toy steam engine;" and in company with a schoolmate, he began to construct one, and ultimately succeeding, his course in life was determined. From this circumstance, he attaches particular importance to practical scientific instruction, and rightly considers its general dissemination to be the chief element in our modern progress.

THE NEW YORK FIRE ALARM TELEGRAPH.

A visitor to the central office in Mercer street is surprised at the amount of delicate and costly machinery which is crowded into the small room devoted to the use of the telegraph. Three sides of the apartment are completely filled with the apparatus—some of it so intricate that it must be kept covered with glass, to exclude the least dust or grit, which would at once interfere with its movements. At the end of the room facing the entrance may be seen the wires, which center here from all parts of the city to the number of nearly two hundred, each with its little brass key with which it is thrown "into circuit." To the right of this frame of wires stands a large "annunciator," similar to that used in hotels; this is surmounted by a Morse magnet and a small gong. Below and in front of the annunciator is a printing machine, and on each side of this a "dial machine" and pointer, similar to those used in the station houses. On the opposite side of the room a very beautiful piece of mechanism stands on a table, covered with glass and always ready for use. At the first glance, one would say it was a rather complicated musical box or a small barrel organ; for it has six drums with the stops and steel combs, and its operation is somewhat similar. To this instrument is entrusted the work of conveying an alarm to every engine house from the Battery to Harlem, which it does with "neatness and dispatch."

To illustrate, let us suppose that an alarm is struck on the gong. The number rung is 256; instantly the annunciator uncovers this number, and the printing machine writes it down three times and the gong repeats it twice. The wires are thrown at once into "circuit" by an operator, while another places a brass button bearing the same number on the spindle of the machine in the glass case, touches a spring, and off starts the automaton operator, striking 2—5—6 on every fire-gong in the city, making a pause of five seconds, and then repeating the 2—5—6, and yet again repeating the numbers after a similar pause. While this is going on, the same operator throws the wires to the bell towers into circuit, and the alarm is thrice sent to them; and, in less time than it takes to read the description, the bells are heard, and if the fire is near the office, the engines rattle by.

The next step is to make a record of what apparatus is at the fire, which is done by pulling out, from their receptacles in a neat frame, cards bearing the numbers of the engines and trucks which respond to a first alarm. This is scarcely done before 3—3—3 is rung on the gong. This is a private signal, sent from some box by a fireman, policeman, or perhaps one of the commissioners who has not heard the alarm distinctly, and wants to know where the fire is. The number of the box whence the alarm came (2—5—6) is at once sent to the box designated by the annunciator, where it is rung on a little bell. Occasionally this inquiry comes from half a dozen boxes.

By this time, the bells in the office have ceased their tinkling, the automaton has given its alarm, the record of engines out is made, and the operators sit down to compare notes as to what buildings are in the neighborhood of the box giving the alarm, and the probabilities of a large fire. But any apprehensions are allayed very soon by the signal 2—2—2——6, announcing that engine No. 6 has returned from the scene of the fire, proving that it was either a trivial affair or a false alarm. No. 6 is returned to its place in the register, showing that the district is no longer unprotected. The other engines announce their return in a similar way. In a few minutes after the last one has returned, a report of the property burned, the cause of the fire and the probable loss is received from the police station in the district, all of which is registered.

At some time during the night, or perhaps two or three times, the roll is called, to ascertain if the tower men are at their posts and awake. This is done by throwing all the tower wires into circuit, and giving the private signal, which is responded to by the watchers striking the numbers of their respective towers on the gong in the office. As an instance of how acute the sense of hearing becomes by constant training, it may be mentioned that an operator can almost certainly tell by the manner in which the numbers are struck whether the reply comes from the proper tower, or another watcher is answering. For instance, if tower No. 6 answers for itself, and then attempts to answer for No. 9, the difference in the manipulation for the longer signal will be detected by the operator at headquarters. In this case, or should no reply be received, a messenger is despatched to find out why the tower is without its occupant.

Of course, where instant action is required, it is necessary that the circuits be complete, the batteries all in working order, and the machinery without fault. To secure this, the aid of music is very ingeniously obtained. A number of magnetic coils are attached to the hammers of a harmonicon, and they, with the plates of the instrument, form the opposite poles. To prove that everything is in proper order this harmonicon is thrown into connection with the other machinery, and if everything is right a complete octave from C to C is performed. Should anything be out of order one or more notes will be dropped, and the missing tone indicates where to look for the trouble.

Like all other telegraph lines, accidents will happen to the wires occasionally, and here another very ingenious contrivance is brought into use. Should there be any break in the line running up Third avenue, for instance, instead of sending a man to examine the wire from the central office to Harlem and back again, the circuit is made complete, a little instrument attached, and a current sent through the line, which travels until it meets the break, where, of course, it stops; and this point is indicated so exactly that the operator can tell almost the particular block in which the repairers must look for the trouble.—*New York Evening Post.*

THE YALE EXPLORING EXPEDITION OF 1871.

FOSSIL SEA-SERPENTS—A CURIOUS SWIMMING BIRD—REMARKABLE REMAINS—THE GREAT WATER FALLS OF THE SHOSHONE.

At a recent meeting of the Connecticut Academy, in the library of the Sheffield Scientific School in New Haven, Professor Marsh gave a sketch of the Yale exploring expedition of 1871. The New Haven *Palladium* gives the following summary of his remarks:

"The object of the expedition was to ascertain the character of the three great basins of the West; that of the plains west of Fort Lawrence in Kansas, that of the Bridge basin, just west of the main range of the Rocky Mountains and north of the Winter Mountains, and of the basaltic region still farther west, through which flows the Snake river, and, farther to the north, the Columbia. The party was in the Kansas basin in July, and worked there five weeks. The region is a parched, barren country, covered with buffalo grass, no trees, with but few streams, and what there were were very low at that season of the year. The heat was intense, ranging from one hundred to one hundred and twenty degrees Fahrenheit. The method of work was to start about sunrise and continue the examination of the country until about 10 o'clock, and then keep perfectly quiet during the heat of the day. Many of the party were unable to endure the heat; the guide, an old army scout, was completely used up, and the Professor confessed that he never suffered so much in all his life. There was constant danger of sunstroke, and at every step each man crept under his horse for a moment's shelter. The results of their work were most satisfactory. Several tuns of valuable fossils were gathered. They were mostly remains of great reptiles, corresponding to the popular idea of the sea serpent. One they exhumed measured ninety feet in length. They found also fossils of huge winged reptiles, one of which must have measured at least twenty-four feet across the wings. The largest found in Europe of equal perfection measures only three or four feet. The most curious of all their discoveries here was a fossil bird, five feet long, which is like nothing ever seen before. It appears to be a swimming bird, but has features widely different from anything known. They also made some discoveries about the extent of this great lake basin, and fixed its northern boundery.

The next region was the Bridge basin in Wyoming. Here they found another vast bed of fossil remains, that the Professor estimates at a mile in depth. It is like the eastern basin in its deposits, but the animal remains are totally distinct. The eastern has nothing but tropical animals. The only reptile found there is a turtle, and there are no fishes, but a large number of ruminants. In the western basin, on the contrary, are nothing but reptiles. It seems to have been an immense lagoon swarming with reptile life. They found five species of crocodiles, six of serpents, and many lizards. They discovered also mammals of the tapir family. In every tenth layer of the deposit may be expected a different series of animals. The deposits in which they are found are mostly sand. The scenery is very peculiar, as it is the region of cañons. The rivers have cut it through in deep gorges, subdividing this deposit, and the tops of the intervening masses have been washed down, leaving a region of conical hills with deep valleys between. He should say they found in that basin at least fifty species of animals entirely new to science. It was a much more interesting country, as regards its life, than the plains, for there was plenty of game. The scenery of the Winter Mountains is very fine, the peaks being very high, reaching fourteen thousand feet, and the lowest pass is eleven thousand feet above the sea. From this region the party went to Salt Lake, where they made some observations on the past level of the lake. The Professor concluded that at one time it must have had an outlet toward the Columbia river, through the mountains that form the northern rim of the Salt Lake. Going northward, the country changes, becoming a great basaltic plateau extending hundreds of miles. Here they visited the great Shoshone Falls of the Snake river. They are higher than Niagara, one fall being two hundred and ten feet, and the gorge is much deeper and grander. There are two falls, and a stretch of fearful rapids. A curious feature of the scene is that the traveller perceives no indication of a river till he is close upon the ravine. The country is a land of desolation. The only vegetation is the sage brush, growing about four feet high, and making travel difficult. The remains found in this country were discovered in the strata of fine clay at the base of the cañons, and were all of fishes.

From this country they proceeded north to the Blue Mountains, a range but little known, and which they had no time to explore, as it was already the middle of November. From this range they struck the head waters of the John Day river and followed it to the Columbia. The upper part of the John Day valley abounded in fossil remains of horses. They were found of all sizes and all kinds, some three-toed, some like those now living. This northern country is the grandest volcanic region of modern times. The clay strata show the effects of volcanic action, being tilted up in all directions, while in the Bridger and eastern valleys they are horizontal. They followed down the Columbia river, and at last crossed the Cascade Mountains into the Pacific slope. The scenery on the Columbia river, he thought to be the finest of the kind in the world. On reaching San Francisco, the party broke up, most of them coming home by rail, the rest, with Professor Marsh, taking the Panama route. In Central America, a large number of antiquities were collected, including a full series of pottery and some of the famous golden idols. In the explorations in the west, also, many valuable curiosities relating to the Indians were gathered for the new museum of archæology. Professor Marsh was listened to with the greatest interest, and left the impression that the expedition was one of the greatest importance and advantage to science."

PRINTING THE PATENT DRAWINGS.

We are indebted to the Hon. L. Meyer, M.C., of Pennsylvania, for a report of a recent discussion in the House of Representatives on the bill, to provide funds for the publication weekly of the drawings of patents, recently alluded to in our paper.

The project of the Commissioner, which is to publish an abstract with the drawings of all the patents, in the *Official Gazette* at $5 a year, meets with general favor and has passed the House. It now goes to the Senate for concurrence. In the course of the discussion Mr. L. Meyer, among many other reasons for advocating the publications of the drawings, said;

"By placing every particular relating to our patented inventions before the people at the earliest possible moment, many a man will desist from mental labors which he may find have been anticipated, and turn his genius into other channels; while on the other hand, by a close study which only this information and especially these illustrations will permit, many scientific and valuable improvements will be given to mankind. The project, I think, must commend itself as a most judicious one. Certainly it will have the approval of the people, and I hope there will be no dissenting voice upon its passage.

"The publication of discoveries generates in others the desire and the ability to add to the inventive arts. These inventions should be placed before the country in the cheapest manner, but, at the same time, in such form that not only justice shall be done to the genius of our inventors, but credit and honor secured to the country."

The Hon. Mr. Hoar, of Massachusetts, said:

"There are inventors all over this country who are engaged either in perfecting old machines or inventing new ones, and to whom a lifetime of laborious industry of mind and body may be saved by a prompt and perfect diffusion of this work.

"These gazettes, if deposited in the public libraries of the country, will be in a place where inventors will know where to find them, and they will keep themselves posted in regard to particular inventions, and they can send to the Patent Office for particular sheets which contain the lithographs and drawings and the printed statements of the inventions in which they are especially interested.

"Now, sir, this is a matter of immense importance to the people of a district like mine. It is of importance not only to the people of that district, but also through them to the people of the whole country. To show how important is this matter of inventions, even to the agricultural districts where not many mechanics live, I have only to relate one fact to the House. Ten miles from where I live, within the limits of my district, was born a man who by a single invention doubled the value of every acre of land producing cotton throughout the entire South. Twelve miles in another direction lived the inventor of the sewing machine, which has had an almost equal effect upon the industries of the country. Ten miles in another direction was born the man who practically introduced chloroform to the knowledge of mankind, which for the entire world has lightened the pains of death, removed the pangs of labor, and made surgery a blessing instead of an agony to the patient.

"Now, sir, each one of those three men—and I might introduce several other instances of almost as much importance—was a benefactor to the entire civilized world. Each of those men would undoubtedly have found an arrangement of this kind of immense benefit to him in his study of inventions."

SIMPLE DISINFECTANTS.—As a simple method of employing carbolic acid, C. Homburgh, of Berlin, proposes to saturate sheets of coarse millboard with the disinfectant in question. The sheets may be hung up in the rooms requiring purification, or a small piece may be torn off when a small quantity only of carbolic acid is wanted. Sheets of millboard, having an area of about seven square feet, and containing about one fifth of a pound of carbolic acid, are sold in Berlin for a shilling a piece. Dr. Hager gives the composition of a disinfecting paste for use as a washing powder. It consists of 100 parts of white clay, 1,000 parts of distilled water, and thirty-five parts of ordinary nitric acid. The mass thus obtained is allowed to stand for a few days, being stirred frequently. The supernatant fluid is then to be poured off, and the clayey mass thoroughly washed with distilled water. Five parts of permanganate of potash are now to be added, and the composition, when dried, is made up into tablets and wrapped in paper saturated with paraffin.

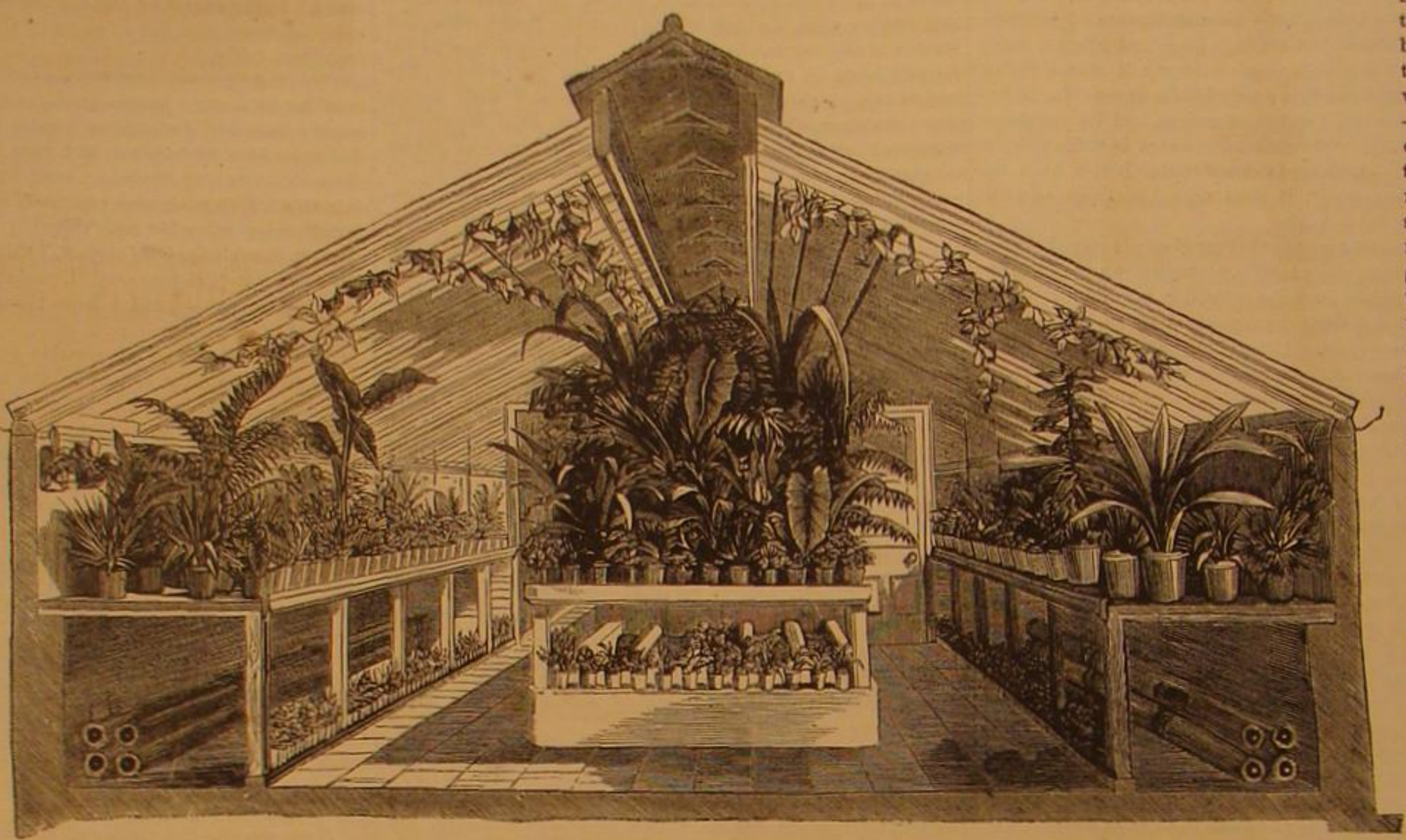
WHEN DOCTORS DISAGREE, ETC.—The temperature of the sun, according to Secchi's calculations, is at least 10,000,000° C; and, according to Mr. Spœrer's, 27,000° C.; while Pouillet placed it between 1461° and 1761° C. Mr. Vicaire, in a note to the French Academy of Sciences, objects to Secchi's use of Newton's law of radiation, because applicable only in case of low temperature, and accepting that of Dulong and Petit, arrives at the more probable conclusion that the temperature does not exceed 3000° C. (5400° F.). He observes that the greatest heat of the oxyhydrogen blowpipe is 2500°C. (4500° F.), and the highest furnace heat is not above 2000° C. (3600° Fah.

INTERIOR OF A GREENHOUSE.

The annexed engraving represents a fine greenhouse lately constructed for William Bull, Chelsea, England, and is considered one of the most admirably constructed and conveniently arranged houses for plant growing of the present day.

The range is about 47 feet long by 20 feet wide, 4½ feet high at the sides, and about 11 feet from the paths to the apex of the roof. It is divided into two compartments, one being fitted for stove plants and the other as a greenhouse. Each division has a large center stage, and side stages with slate tops and wood supports. Under the middle stage, at each end, is formed a bed, in which are planted climbers, to be trained along the roof on light wooden trellis work. In the stove division there is also a hot water tank for evaporation.

The paths are tiled and bordered with cement curbs, on which upright supports of the stages are fixed. Ventilation is effected by means of iron boxes with sliding covers, built in the outer walls near the path level, and by an arrangement at the apex of the roof. This, as shown in the engraving, follows the form of the roof, and extends over the opening made therein sufficiently to prevent any chance of the rain falling or drifting into the side of the house. The ventilator is raised and regulated by a system of levers and quadrants, which being easily used gives greatly for maintaining the desired temperature in the house. In addition, the coal compartment has upright sashes in both sides; they are hinged at the top, and may be all opened when necessary.—*The Horticulturist.*



INTERIOR OF A GREENHOUSE.

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 January, 1871:

During the month there were 932 visits of inspection made, and 1,794 boilers examined—1,751 externally, and 491 internally—while 113 were tested by hydraulic pressure. The number of defects in all discovered were 1,291, of which 311 were regarded as dangerous. These defects were as follows:

Furnace plates overheated and contorted, 72—28 dangerous; fractures, 145—86 dangerous; burned plates, the strength being greatly reduced, 99—51 dangerous; blistered plates, arising from a want of homogeneity in the iron, 119—25 dangerous; sediment and deposit, 207—23 dangerous. These dangerous cases arose from the accumulated sediment preventing the water from coming in contact with the iron. The sheets were consequently overheated and buckled, and greatly weakened, unsafely so for the pressure carried. Incrustation and scale, 144—15 dangerous; external corrosion, 73—17 dangerous; internal corrosion, 30—5 dangerous. In these dangerous cases of external and internal corrosion, the boilers in places were worn so thin that smart blows of the inspector's hammer entirely penetrated the shell. We are aware that many old boilers are worked in a fearful condition. While the pump is sufficient to supply a little more water than leaks out through cracks and corroded spots, they are considered all right. Hence many steam users regard inspection of boilers as entirely unnecessary. They hold that a boiler will tell its own story, and give them due warning far better than an inspector. The boiler does frequently tell its own story, and it is one the steam user does not readily forget. As well might he neglect his house furnaces or stoves, and expect to escape accident and harm, as to allow a boiler known to be dangerously weakened to go unrepaired. Internal grooving, 9—1 dangerous; water gages defective, 44—17 dangerous; blow out defective, 9—1 dangerous; safety valves overloaded or out of order, 26—15 dangerous; pressure gages defective, 139—29 dangerous; boilers without gages, 4; cases of deficiency of water, 13—8 dangerous; braces and stays broken, 51—26 dangerous; boilers condemned, 13. There were 11 serious explosions during the month, by which 13 persons were killed and 18 wounded.

Fig Culture in California.

W. H. Haynie, at a recent meeting of the Sacramento Farmers' Club, gave his idea of the cultivation of the fig in California, in these words: The white Smyrna fig could be grown and cured as well here as in Smyrna or any of the countries on the Mediterranean. They cannot be imported at less than about twenty-eight cents a pound in bulk, and there are millions of dollars' worth sent to the United States annually. We should and could supply the market. Fig trees ten years old would give on an average one hundred and fifty to two hundred pounds of dried figs a year, and two hundred trees could be grown on an acre—making for the acre 30,000 pounds—which at ten cents a pound would give $3,000. On the same subject, J. R. Johnson said he had been raising figs and marketing them a number of years; he had twenty good trees over ten years old; they averaged him ten dollars a year per tree. Fig trees must not be crowded; they do better standing large distances apart, with the limbs trimmed horizontally, cutting the top of the tree off. They would run in this way like a grape vine, and one tree could be made to cover a quarter of an acre. The Italians dry their figs on dry sand. This giving a uniform heat, and they don't require turning, the sand becoming heated.

JONES' IMPROVED PROJECTILE FOR FIREARMS.

We illustrate, in the accompanying engraving, an improved projectile, patented through the Scientific American Patent Agency, Feb. 20, 1872, by Mr. Samuel E. Jones, of Santa Fé, New Mexico. The improvement is in that class of projectiles with which a sabot is employed.

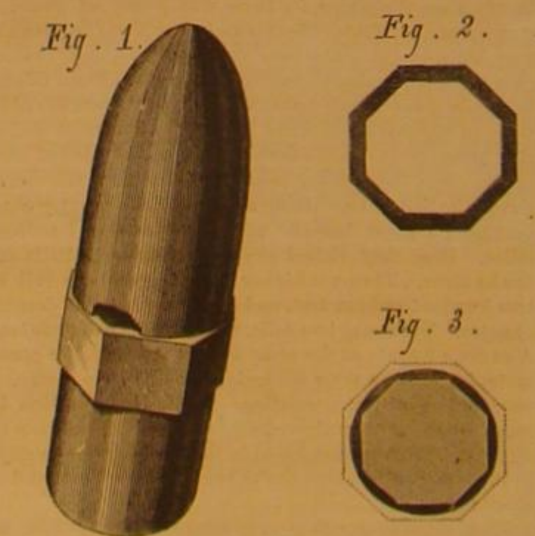


Fig. 1 represents the projectile with the improvement attached; Fig. 2 shows the form of the ring or band, which is a part of the invention; and Fig. 3 is a section of the projectile through the ring, showing the way in which the ring is applied, the patent covering an elastic prismatic ring, arranged in a prismatic groove of the projectile, this groove being made to correspond to the bore of the gun in which the projectile is to be used.

The prismatic groove is cut in the present instance so as to form an octagonal section, the perimeter of which is lower than the cylindrical surface of the projectile, indicated by the dotted outline in Fig. 3. The ring, shown in Fig. 2, may be of leather, rubber, or other elastic material, which, when slipped over the cylindrical part of the projectile, contracts upon the prismatic bottom of the groove, taking the same form exteriorly and interiorly, as shown in Fig. 1.

In this manner, the ring stands out on all sides of the projectile, so as to form a shoulder, practically enlarging the surface of the ball on which the powder gas acts.

It is claimed that in this way a light ball may be projected from a gun having a larger bore with greater velocity than from one which the ball accurately fits, owing to the difference in weight, friction, and surface of impact.

For further information address S. E. Jones, Santa Fé, New Mexico, or G. W. Coffin, North Springfield, Mo.

New Method of Copying.

A novel method of rapidly and economically copying manuscripts and designs, whether produced by hand or photography, has been invented and patented in England by M. Eugenio de Zuccator. An ordinary letter copying press is used for printing from the design, which is formed upon a varnished metal plate. This plate, which is of iron, is either coated with a shellac varnish, and the writing or design to be copied then traced thereon with a metal point—or it may be coated with gelatin and bichromate, and the design produced by means of photography with a transparent positive. In any case the lines are formed of bare metal upon a surface of varnish. To the bed of the copying press is connected one wire of an electric battery, and to the upper plate of the instrument the other, so that when the press is screwed down, and the top and bottom plates come into contact, an electric current passes. The varnished metal plate, upon which a memorandum has been scratched or otherwise produced, is covered with a few sheets of copying paper wetted with an acid solution of prussiate of potash, and then screwed into the press. As before stated, the characters or design upon the varnished plate are formed of bare metal, and in these parts, of course, an electric current is set up; this action permits of the union of the iron with the potash, and the consequence is that prussiate of iron, or Prussian blue, is formed in lines corresponding to those upon the varnished plate. Copies thus produced in blue ink may be printed at the rate of one hundred per hour.

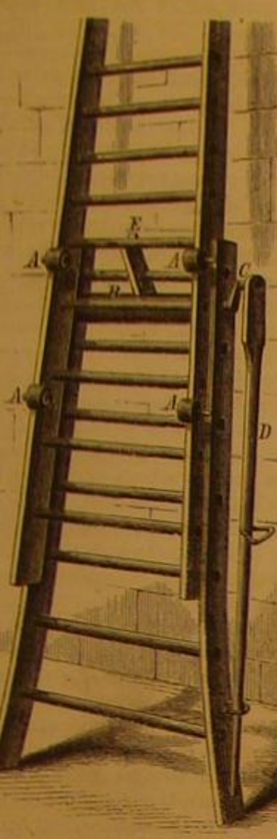
Value of Salt.

This substance is remarkable as constituting the only mineral eaten by man. Not only does it afford an indispensable and wholesome condiment for our tables, but it forms an essential constituent of the blood, and supplies to the human system the loss sustained by saline secretions. Its antiseptic properties are invaluable; but although it preserves, it ultimately changes and deteriorates the quality of the food to which it is applied, rendering the same innutritious and indigestible; for salt, notwithstanding its being a strong stimulant to the animal fiber, is not convertible into nutriment. This is the cause while sailors who subsist long upon salted provisions are subject to the sea scurvy. Its medicinal qualities are also remarkable. While all other saline preparations tend to cool, this but heats the body and engenders thirst. Some years ago, a medical man wrote a *brochure* in which he condemned the use of salt, attributing to it all the diseases to which flesh is heir. The poor fellow eventually committed suicide. Only lately, a book has appeared in which the writer, who is a physician, recommends salt as a sure antidote to the contagion of small pox. Doctors will of course disagree; but as *variola* is acknowledged to arise from a diseased or poisoned condition of the blood, the due use of salt may possibly form a safe and effective specific. Salt is not only an agreeable condiment, but also an indispensable requisite. When moderately used, it acts as a gentle stimulant to the stomach, and gives piquancy and relish to our food. In Africa, the high caste children suck rock salt as if it were sugar, although the poorer classes of natives cannot so indulge their palates. Hence the expression, in vogue among them, "He eats salt with his victuals," signifying that the person alluded to is an opulent man. In those countries where mineral salt is not procurable, and where the inhabitants are far removed from the sea, a kind of saline powder is prepared from certain vegetable products to serve in its stead. Indeed, so highly is salt valued in some places—such as Prester John's country—that from its very scarcity it is employed as a substitute for money.

THERE is a kind of granite, found in Finland, from which glass is made directly. Its composition is as follows: silica, seventy-four per cent; felspar, twelve; oxide of iron, three; lime, one; alkalies, with traces of magnesia, nine.

MILLENER'S EXTENSION LADDER.

The object sought in the construction of this improvement is to provide a ladder that can be used by firemen instead of two ladders hooked together. It is, so to speak, one ladder, although made in two sections, and is, it is claimed, fully as strong as an ordinary ladder of equal length. As it is capable of being made both light and strong, it will, it is claimed, be equally adapted to farmers' and mechanics' use.



In the engraving, A represents friction rollers attached to the stationary part by bolt irons. B is a roller placed between the two pairs of friction rollers, the movable part of the ladder working up or down between them, and the sides of this part being in contact with all the rollers and sliding between the side pieces of the stationary part.

The roller, B, is turned by the crank, C, either directly or by means of a rod or pitman, D, by the use of which the roller may be turned and the ladder extended by a person standing upon the ground, so that a person standing on the movable part may be raised or lowered, to the hight required, by those below. A self-acting brace, E, holds the parts extended in any required position.

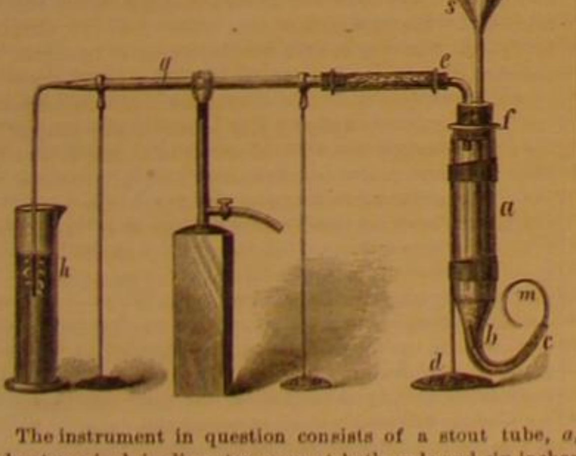
The friction roller bolts are fastened through the sides of the stationary part by screw nuts, so that there may be more or less friction on the movable part.

The invention was patented, through the Scientific American Patent Agency, Feb. 20, 1872, by Mr. Louis N. Millener, of Adams Basin, N. Y.

MAGNESIUM IN MARSH'S TEST FOR ARSENIC.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

The difficulty experienced in obtaining zinc free from arsenic, for Marsh's test, has led to the suggestion of the use of magnesium for this purpose. The latter metal is rarely to be found in any other form than that of strips or ribbons, which expose so large a surface to the action of the acidulated water as to render the evolution of hydrogen too rapid for the proper conduction of the operation. To meet this difficulty, I have contrived an apparatus in which the evolution of the gas is completely under control, and which also shows that the strip or bandlike form of the metal is well adapted to the purposes of this test.



The instrument in question consists of a stout tube, *a*, about one inch in diameter, open at both ends and six inches long, drawn down at *b c* to a caliber which will permit the free passage of an ordinary magnesium ribbon, *m*. The tube is attached by rubber bands to a paper file, *d*, with a stout iron foot or base which serves the purpose of a support admirably. At *f*, the supply tube, *s*, for the introduction of acid and other liquids, and the escape tube, *e*, pass air tight through a cork. The evolved gas is dried in a chloride of calcium tube at *e*, whence it passes through the hard glass tube, *g*, in which it may be subjected to the action of heat and finally escape through a dilute solution of nitrate of silver at *h*

When the instrument is to be used, it is dried and a column of pure mercury poured into the bend, *b c*. The cork carrying the tubes, *e* and *s*, is put in position and the reduction tube, *g*, properly supported. Pure dilute sulphuric acid (one of acid to six of water) is then introduced through the supply tube, *s*, and a strip of magnesium, *m*, being passed through the mercury into the acid, decomposition instantly takes place and hydrogen is evolved. The rate at which this goes on is indicated by the passage of the bubbles through the solution of nitrate of silver at *h*, and is completely controlled by the rate at which the magnesium is passed through the mercury.

The apparatus having been filled with hydrogen, a Bunsen flame is applied to the hard glass tube at *g*, and a measured length of the magnesium band slowly passed into the acid. The purity of the materials is thus tested as in the case of the ordinary Marsh apparatus, with the great advantage that the length of the strip consumed is known; and the quantity used in the test for purity of materials may be proportioned to that employed in the final examination. Freedom of the materials from arsenic and antimony being thus established, by the failure to produce any metallic stain in the reduction tube *g*, the solution supposed to contain arsenic is introduced through the supply tube, *s*, and the magnesium leisurely passed into the mixture. A few moments are required to expel the pure hydrogen from the apparatus, but the newly evolved gas finally reaching the heated portion of the reduction tube, metallic arsenic is deposited in its characteristic form and manner, and any portions of the arsenide of hydrogen that are not acted on by the heat pass into the solution of nitrate of silver at *h* and produce a dark brown precipitate.

The contact of the magnesium and the mercury with the acid causes the formation of an alloy or amalgam of the two metals, which, since it does not interfere with the detection of very minute traces of arsenic, is not of any moment and may therefore be ignored.

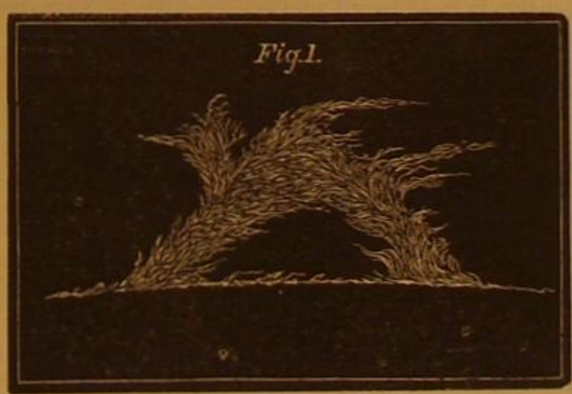
Correspondence.

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

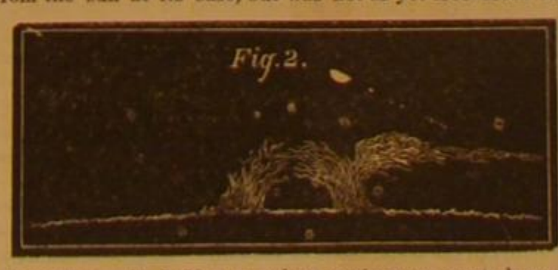
Observed Changes in a Solar Prominence.

To the Editor of the Scientific American:

While observing the sun on the sixteenth of February, I saw a prominence which, in the many changes it underwent, will illustrate the formation of the hydrogen clouds often seen floating above the sun. This prominence was situated on the western limb of the sun, five degrees north of west, and was first seen at 11:20 A. M. At this time, it presented the appearance of two prominences, which had shot up independently, and finally joined themselves together by the interlacing of the filaments of which their summits were composed. Its greatest hight was 40,500 miles; its breadth equaled about two thirds the length of the slit of the spectroscope, or about 108,000 miles. The two stems of the prominence joined each other about 13,500 miles above the chromosphere. The size and form of the prominence were not remarkable, but the changes which it subsequently underwent were various. The accompanying engraving represents the prominence as first seen.



At 11:40, signs of separation began to appear where, a few moments before, all seemed a compact cloud mass; and at 11:50 the two stems were only joined by thin thread-like branches. The northern stem had begun to separate itself from the chromosphere, and was only held here and there by straggling filaments; in a moment it cut itself entirely loose from the sun at its base, but was not as yet free from the



other stem. At 2:20 P. M., when again seen, great changes had taken place; the top of the northern stem had been blown towards the pole, and strikingly resembled the long streamers of smoke often seen issuing from the smokestack of a steamer at sea. The length of this streamer was nearly

150,000 miles. The other stem of the prominence had nearly faded out, leaving only a low stump slightly joined to the northern stem, which had sunk back again to the chromosphere. Increasing cloudiness rendered further observation impossible. The morning of the next day being clear, I again turned my attention to the spot, not expecting to find any traces of the prominence; but in this I was happily disappointed, for the northern stem still remained, torn, shattered, and bound to the chromosphere by one thin thread. Faint traces were left of its former attachments in the form of light thin shreds. The hight had not visibly increased; the breadth had, however, somewhat lessened. It was now 9:20 A. M., and the changes which occurred in its form were too rapid to sketch. Here and there a thread of cloud was seen to form, and as quickly disappear.

At 10:30 A. M., it announced its determination of leaving the chromosphere for good and all by a gradual twisting off of the only thread which held it captive to the sun. This it accomplished about 12 M.; I watched it for some time, until its increasing faintness rendered it a difficult object to make out.

This prominence was seen through the C hydrogen line in the telespectroscope used by Professor Young in the Dartmouth College Observatory. The prism train consists of five whole prisms and two half prisms, the light being sent twice through the train by a prism of total reflection at the end of the train, thus making the dispersive power equal to that of 12 prisms. The cloud prominences are often seen floating above the chromosphere, but generally have their origin in the chromosphere, and are the result of the ejection of matter therefrom. Father Secchi states that he has observed the formation of these clouds in the coronal atmosphere. I have many times observed these clouds, but have, without exception, been unable to discover any increase in their size; but, on the contrary, I have met with a gradual fading out and an ultimate disappearance of the cloud mass. This fact, as has already been suggested, may point to one of the sources from which the coronal atmosphere may draw its supplies of the matter whose spectrum of bright lines was first seen in 1869 and 1870, and which the observations made during the last solar eclipse so fully confirm. JOHN H. LEACH.

Dartmouth College.

The Abolition of Models.

To the Editor of the Scientific American:

Your correspondent "B" objects to the proposal of dispensing with the models on account of their supposed superiority for investigating as to the novelty of inventions. I fully acknowledge their usefulness, but contend that the drawings are much better for this purpose in most cases, especially as the models are very far from being complete, and thousands of them are so broken up that it is impossible to tell what particular patents they belong to; and in many instances it would puzzle an expert to state what class of machinery these fragmentary models are intended to represent. Of these broken and separate pieces of models, there are cartloads stowed away up in the room over the portico, which not one person in twenty frequenting the Patent Office for the purpose of examination knows anything about, to say nothing of those fragments which lie in their appropriate cases, as mentioned in my last letter.

Besides this trouble of broken models, there is another reason, that makes the drawings more reliable, which arises from the fact that the models frequently show only the bare outline of the frame or casing of the machine—the details of construction and the smaller parts, in which may consist the essence of the invention as patented, being entirely omitted and only shown in the drawing and specification. In many cases the drawing shows several modifications of the idea embodied in the model, some of them so radically different that no one would suspect that they had any relation to it, except that they belonged to the same class of machinery. I remember an instance of an excavator patent, having only a very simple model, of which the drawings show seventy-five figures, embracing twenty-six different machines for various purposes. How much could our friend "B." tell about the novelty of an invention from an inspection of that model?

That drawings are the readiest means of making an examination is shown by the practice of the examiners, who always use them in making searches and very rarely look at the models. Speaking for myself as an inventor who has had considerable experience, I know that an examination of the drawings, in nine cases out of ten, can be made in less than half the time necessary for viewing the models. That this is so is rather amusingly shown by the experience of one of our ex-commissioners, who, when in office, issued a very stringent order that no one should be allowed access to the portfolios of drawings without a special permit, which was only to be granted for infringement searches, etc. After this gentleman resigned his position, and had resumed his practice of attorney, he found "that it was a poor rule that would not work both ways," as it prevented him from examining the drawings now that he was only an outsider. This caused him so much trouble in his researches that, through his influence, an order was issued allowing ex-commissioners free access to the portfolios at all times, but retaining the rule in force against all others.

The incident brings up the question: Why should ex-commissioners have privileges denied to other people? Is there anything inherent in the office of commissioner that should make its temporary possessor a privileged character for life? If there is anything of this kind, the world should know it, and every ex-commissioner should wear a leather medal, a "feather in his hat," or some equally conspicuous insignia, for, otherwise, the common people—such as Ericsson, Morse, and other poor devils of like character—will never discover this "divinity that doth hedge" an ex-commissioner.

This question brings up another: Why should not inventors and their attorneys have the same privileges with drawings that they have with the models? I think that it is fully shown above that an examination of the latter is not sufficient to determine the question of novelty. Such a search may lead an inventor to suppose that the coast is clear, and cause him to spend hundreds or thousands of dollars in experimenting, only to find, when he applies for his patent, that his money, time and talents have been spent in vain, all of which might have been saved had he access to the portfolios of drawings.

Washington, March, 1872. INVENTOR.

Sulphite of Soda Not a Cure for Small Pox.

To the Editor of the Scientific American:

An article entitled "A Remedy for Small Pox, etc.," in your issue of February 24, was cut out and sent to me by a friend, together with your favorable notice of the same. Not long ago much agitation was excited by the vaunted cure of cancer by means of a drug called cundurango. The false hopes of cure by the many sufferers from this dreadful malady were dashed to the ground. Again, not a few persons were led, not by the advice of a physician, to an improper use of a new remedy for wakefulness by the name of chloral hydrate.

Not only is there harm created by improper use of remedies by those who know not the nature of disease, but there is also a great obstacle thrown in the way of those who are seeking to establish the science of medicine upon a sure and firm foundation. There is great source of regret that you were led to publish an article upon the subject named in the paper alluded to, trusting more to the candor of the writer than to his powers ot observation of Nature; and this has induced me to write these hasty lines, for fear that another agitation of a hopeless remedy has been thrown upon the public. The value of the contribution by your correspondent depends upon the following considerations:

1st. Can an eruption upon the skin, discovered the tenth day or eleventh day after exposure to contagion, be known as small pox? Can the constitutional symptoms referred to be only explained by supposing the child to have small pox?

2d. As physicians have often mistaken, in its early stages, one kind of eruptive fever for another, is it not possible that a non-professional as well as a physician might equally be mistaken as to the character of the eruption noted in the published case?

3d. Might not the suspicions that contagion might spread from the loaned muff suggest to an anxious parent that the child had an exaggeration of symptoms which would naturally be explained by him to be caused by small pox? When the writer of this present article was studying medicine, he was taken by his instructor to see a man who had a slight rash, accompanied with pains in the back, vomiting, etc., which might possibly turn out to be small pox, to which the man had been exposed. The student was cautioned never to state that a given case was small pox, until the peculiar vesicle of that disease was developed, on about the sixth day from the appearance of the rash. After waiting a week and without any remedies except a harmless *placebo*, the rash had disappeared and the man was well.

4th. Does one swallow make a summer? Or does one apparently successful *cure* by a given drug prove that *post hoc, ergo propter hoc?*

The writer of this present article has been occupied, for the past eight years, in studying the action of drugs by experiments upon animals and by clinical observation at the bedside. His faith in the enthusiastic testimony of the success of a given remedy in the hands of well informed and educated physicians has been often shaken; and he believes that one of the greatest obstacles, to the establishing of the science of medicine upon an exact and firm foundation, is this accepting a theory and calling it a fact. If it is difficult for an honest physician of large experience to believe that his patient recovers because he gave him warm water to drink instead of cold, how much more difficult is it for a man of slight medical education and little practical experience to determine the success of a remedy in a given case?

Now observe how the enthusiastic candor of your correspondent has led him to make mistakes: He says "the United States Dispensatory gives in an ample detail the discussion of the valuable properties of this drug (*sodæ sulphice*), by the French College of Surgeons, in the thirteenth editorial article of the edition of 1871." There is no such edition of the work your correspondent refers to; and in the edition of this work for 1870, almost all the articles are "editorial" articles by Drs. Wood and Bache of Philadelphia. The name United States Dispensatory was given this book by these eminent writers; but the official organ of American physicians and apothecaries is the United States Pharmacopœia, a new edition of which is now being prepared.

On pages 826 and 827 of the thirteenth edition, to which I have referred, occur the words your correspondent has quoted in his article, but unfortunately for his candor, he has omitted sentences and words which modify the apparent statements of Dr. Wood, who would feel insulted if he were told that he had written as your correspondent would dictate.

For example, at the commencement of the third paragraph, the words "locally applied" are omitted, and in the last line the word "appear" is omitted. Allow me to furnish the correct text.

"Also, *locally applied, useful* in controlling suppurative ulcers, etc. . . . . . and in any disease in which purulent infection of the blood may be produced by the same cause, (parasitic or zymotic influences). They *appear* almost *to* act as specifics in such cases." "At *a* certain stage of cancer they operate *usefully* in the same way." There is no mention of a discussion of *sodæ sulphice* by the French College of Physicians and Surgeons, nor is there an association by this name in Paris. In 1865, there was a great excitement among physicians with regard to the use of sulphite of soda, but careful trial of it in a large variety of cases limited its action to a very small extent.

"On the whole, and not to occupy more space with a statement of claims which seem at present (April, 1868) to be excessive, we (Stillé, *Materia Medica and Therapeutics*) are disposed to adopt the conclusions of Semmola, Professor of Clinical Medicine at Naples, when he says: 'Diseases which have been attributed to morbid fermentation, such as typhoid fever, scarlatina, measles, and malarial affections' (of course including small pox) 'are in no wise influenced by the sulphites; and their grave types continue to be fatal, notwithstanding these remedies. Syphilis, malignant pustule, and purulent infection are equally unaffected by their operation." (*Bull. de l'Academie de Médécine*, XXIX, 1003).

It is unnecessary to quote from other authors who have tested, clinically, the use of this drug, as its failures in treatment are many times larger than its success in curing that class of diseases to which small pox belongs.

Crude petroleum, though very useful in the treatment of certain skin diseases, has caused death by its indiscriminate local application to the whole surface of the body.

The popular use of vaunted remedies is an exceedingly harmful matter, and occasions more work for the educated physician. It has often been truly said that the quack is the strongest ally of regular physicians. Though I have trespassed largely upon your space, permit me to point out another fallacy. The best application for the sting of an insect, or the poisonous bite of a snake, is ammonia spirits; though in snake bites it must be injected into the circulation. If your correspondent had made the local application of a strong solution of sulphite of soda, and omitted the alcohol and ammonia, he could have borne stronger testimony to the efficiency of sulphite of soda in "the sting of a male seventeen year locust."

Allow me in conclusion to state that some competent person should write a treatise upon the popular abuse of drugs, and scatter it far and wide. The effect upon the sanitary condition of our people would be marvellous.

EXPERIATUR.

Shaving with Pumice Stone.

To the Editor of the Scientific American:

I notice, in your issue of March 2, a communication on the subject of shaving, in which the writer suggests, and he probably considers it an original idea, the substitution of pumice stone for the time-honored razor and brush. Now, I do not agree with your correspondent when he claims superiority for what he suggests, as I have tested it, and the result was very unsatisfactory—a sore face.

As for the originality of the idea, I will state that, about the year 1850, an article resembling a file in shape, and which seemed to be made of a preparation of pumice stone, was patented in France, the inventor claiming that rubbing (or filing) the face with his invention was equally as good as shaving with a razor and soap. But the article did not meet with any success.

I have, on three occasions, imagined that I had become an inventor, but each time I discovered, through your valuable paper, that some one else had had the same idea before me. If your correspondent will only put his pumice stone theory in practice on his own face, he will probably be glad to resort to the usual mode of shaving. G. P.

Shaving with Pumice Stone.

To the Editor of the Scientific American:

I beg to enter my protest against the practical joker who rubs his face with pumice stone, and recommends it to those suffering with tender skin, cross grained beards, and dull razors. Now, I have experimented, from the Davenport tricks down to Solliday's paper windmill; and can truthfully assert that I have suffered nothing that can compare with this barbarous method of using pumice stone. I followed the writer's instructions to the letter, with the single exception that I rode no donkey or other hobby, for fear of aggravating the result; and what is it? The hair is off my face and the skin too, and he is laughing in his sleeve as he reads this. Yours in affliction, H. E. M.

A REVISION of the existing version of the Bible is now in in progress by companies of eminent divines, working conjointly, in this country and Europe. In about seven years the work will be completed, and it is expected that we shall then have a version embodying the best results of the most learned and accurate thinkers.

(For the Scientific American.)

THE COLOR OF THE GULF STREAM, AND ITS EXCESS OF SOLID MATTER ACCOUNTED FOR.

BY WILLIAM L. WALKER.

The Gulf stream differs in color from the surface waters through which it flows, its color being *blue*, while the others are green. It also holds in solution, mechanically, more solid matter than the latter. This difference in color and suspended matter is to be accounted for as follows:

"Color," as observed by Tyndall in his researches on the color of sea water generally, "resides in white light, appearing generally when any of the constituents of the white light are withdrawn. The water attacks the visual rays with different degrees of energy. The red are attacked first and extinguished; as the solar beam plunges deeper into the sea, the orange and yellow disappear; next the green, and next the blue; and if water were dark enough, and contained no suspended matter, it would work the absolute extinction of the solar beam and become as black as ink. But, in all natural water, matter is held in suspension, and a modicum of light is thrown back to the eye before the depth of absolute extinction is reached." The color, therefore, results from the relation of the solids. *The stream*, by reason of its greater expansion through its higher temperature, relatively contains less solids, thus cutting out the green, and leaving the blue.

It is more difficult to account for this physical difference in the stream, and why, with an excess of solid matter, it does not sink, but continues to float upon the surface.

There is a difference, generally, between the waters at the surface of the sea and those at its greatest depths, the latter being heavier, colder, and containing more suspended matter. Since all admit that an entire circulation of the oceanic waters must occur, the cold, dense waters which exist below must be hot to the surface, and *transformed* by some process into a surface current such as found in the stream. We will now attempt to point out the principle upon which this takes place.

Aside from gravity, it is heat which causes all the surface and submarine movements of the sea. The continued expansion at the equator and chilling at the poles cause the expanded particles to flow through this and similar streams on the opposite side of the globe into the polar basins. A weight added to one end of an equally balanced beam will cause that end to go down; but, at the same time, the other end must go up. In the equipoise of waters as they exist in the sea, if 1,000 cubic miles of water is carried daily through this and similar streams into the polar basins, an additional weight is thus added to the end of the beam; and, as this must go down from a loss of temperature, an equal amount must go up at the other end (the equator), through an increase in temperature. In both instances, it will be observed that the movement takes place from a change in the molecular motions in the water, a loss at the one end, and an equal gain at the other. In the polar basins, as each particle loses its temperature, it loses its buoyancy; and when it reaches its lowest temperature it attains its greatest density, and, as a matter of course, sinks to the lowest depths, where all such particles aggregate into masses and pierce their way by a slow submarine movement to the equator. These cold, dense particles, now resting upon the lowest depths of the sea, must each be expanded by heat before an upward movement can begin, and transform themselves into a current also. Two agencies operate directly in effecting this change.

First, the direct rays of the sun, as they fall upon the surface of the equatorial sea, perform the following mechanical functions: "The vast body of the thermal rays," as observed by Tyndall, "are beyond the red, being invisible. They are absorbed close to the surface of the sea, and are the great agents in evaporation." The other rays follow, and are severally extinguished; and at a very limited depth, not exceeding a few hundred feet at most, are totally absorbed. But these rays have performed their functions in expanding the particles near the surface, giving rise to a lateral movement, and in turn enabling those at the bottom to move upward; but, before any movement of this kind can begin among these particles below, they must receive some expansion by heat directly imparted from below, since the sun's rays cannot reach them. The slightest change in the specific heat, or increase in the temperature of the particles by reason of the excessive pressure and constantly diminishing weight of the column, also, by the action of the sun's rays expanding the surface, will enable them to ascend and reach the surface in a deflected motion caused by the earth's rotation, and be thrown into a compact current, such as we now find it, moving into the polar basin.

In this transformation of the dense cold water from the lowest depths of the sea into a surface current, it will be observed that no change has been wrought in its physical properties. It is the same in all respects except that it has become buoyant from expansion, and now floats upon the surface as all bodies do which are relatively lighter than the liquid in which they are immersed. Bulk for bulk, of the same temperature, the water in the stream is 15 per cent heavier, but, with its increased temperature, the stream is lighter.

It follows that no mechanical application of the sun's rays alone can produce the movement; and that the heat from the interior is related to it, is an induction from established laws.

FOR distinguishing benzole, which is made of coal tar, from benzine, which is made from petroleum, Brandberg recommends us to place a small piece of pitch in a test tube, and pour over it some of the substance to be examined. Benzole will immediately dissolve the pitch to a tarlike mass, while benzine will scarcely be colored.

[Reported for the Scientific American.]

THE PROGRESS OF STELLAR CHEMISTRY.

A very able and interesting lecture was delivered, not long ago, before the Liverpool Scientific and Philosophical Society, by Professor E. L. Davies, upon the subject of the progress of stellar chemistry. The writer of the subjoined was present on the occasion, and from notes taken at the time has given us the following:

Though it is only within the last eight or nine years that stellar chemistry has developed itself into what may now be called almost a distinct science, it is necessary, in order to thoroughly understand the discoveries of modern times, to go back, nearly two hundred years, to the time when Sir Isaac Newton first discovered the compound nature of white light. In 1675, Newton first announced this discovery. He allowed a beam of daylight to enter a darkened room through a round hole in the shutter, and interposed, in the course of the light, a prism of glass. The light thus treated he found to have undergone refraction, and moreover that it had not been equally refracted throughout, but that certain of its elementary rays had suffered a greater deviation from their original course than others, and that, as a result, instead of the image of the hole in the shutter being formed on a screen placed behind the prism, there was produced a colored band; and this colored band Newton called the solar spectrum.

This spectrum is found to consist of rays of light of the following colors: red, orange, yellow, green, blue, indigo, violet; of which the red suffered the least refraction (that is, was bent the least from its original course), and the violet, the most, the others being intermediate in the order named. Newton also found that if one of these colored rays, the green, for instance, was separated from the others, and again passed through a prism, that it did not undergo any further any further decomposition, and that it was therefore monochromatic. From these experiments, he concluded that while a daylight beam was composed of rays of different degrees of refrangibility, and also that rays that differ in refrangibility also differ in color.

Little more was done until more than a century after, when Wollaston further investigated the subject; and by admitting the daylight through a fine slit instead of a round hole, he observed that the solar spectrum was crossed by a number of fine black lines; and in 1814, Fraunhofer, an optician of Munich, further examined these lines, and counted and mapped nearly 600 of them; but he did not account for their presence except by a vague suggestion that they were in some way caused by absorption, a supposition which has since proved to be correct. To account for the appearance of these dark lines, and also for that of other bright ones which are found in the spectra of incandescent gases, it is necessary to examine the effects of heat upon matter in its two states of solid and gaseous. If we gradually heat a non-volatile solid body, and examine the light which it emits, we find that it first gives off red rays, or in other words, becomes red hot. On slightly increasing the heat, it gives off yellow rays, becomes yellow hot, and as the heat is still increased, it emits successively green, blue, indigo, and violet rays, which by their combination form white light, and the body is now said to be white hot; and when the light from this white hot solid is examined by a prism, it is decomposed into all the colors which go to make up white light; and the spectrum thus obtained is perfectly continuous, and not crossed by lines. And this being true of all solids, the spectra of solids are in every case identical, and cannot be distinguished from each other.

With gases, however, it is different; if we heat, for instance, the vapor of soda, it never becomes red hot, but at once gives out yellow rays, and however greatly the heat is increased, it never evolves rays of a higher refrangibility than the yellow; and if the emitted light of incandescent soda vapor is examined by a prism, it appears in the yellow part of the spectrum as a bright band occupying a definite and unalterable position. If, however, instead of heating the soda vapor to incandescence and using it as a source of light, we interpose a stratum of cooler soda vapor between the source of light and the prism, we get the spectrum instead of the bright yellow line, and, occupying exactly its place, a black one caused by the absorption of the yellow rays by the atmosphere of soda vapor, through which they passed before reaching the prism. And so with other gases, each gas having the power of absorbing light of the same degree of refrangibility as that which, when incandescent, it gives off. This fact at once affords an explanation of the black lines which appear crossing the solar spectrum. They show that the solar atmosphere contains certain substances capable of absorbing light; and, by the exact coincidence of these black lines with the bright lines produced by certain terrestrial elements, we are fully justified in concluding that many metallic and other elements with which we are acquainted on the earth recur also in the atmosphere of the sun. The elements which have in this manner been recognized in the solar atmosphere are sodium, calcium, barium, magnesium, iron, chromium, nickel, copper, zinc, strontium, cadmium, cobalt, hydrogen, manganese, aluminium, and selenium. Since the moon and planets shine by reflecting the light of the sun, the spectroscope can afford no information as to their composition, but it is able to afford some clue as to the presence or absence of an atmosphere; and the results of spectroscopic observation tend to show that the moon has no atmosphere, but that this is present in the case of the other planets. The fixed stars being self-luminous, give characteristic spectra, and, as in the case of the sun, many of the dark lines correspond with those of terrestrial elements. Stars, moreover, differ in color; those which are bright to the naked eye show generally a tint of red, yellow, or orange, and with the telescope we may discover, in close companionship with these other, fainter ones of a blue, green, or purple color, and the cause of this difference is revealed by the spectra. We find that in the case of white stars, the dark absorptive lines are pretty equally distributed over the whole spectrum, which gives the characteristic color of the star.

The spectroscope has also afforded important assistance in the examination of the *nebulæ*. These bodies appear in the heavens as a faintly luminous haze, some of which, when examined by a powerful telescope, appears to be resolvable into a number of bright points; and long ago Sir William Herschel suggested that these *nebulæ* were the primordial matter out of which the existing stars have been formed.

Spectrum analysis, notwithstanding the difficulty of applying it to bodies so very faint, has afforded much valuable information regarding the physical distinction which separates the *nebulæ* from the fixed stars. The spectrum of the *nebulæ* consists of bright lines, showing them to consist of incandescent gaseous matter, and the same results are obtained from those *nebulæ* which appear to be resolved by the telescope, the only difference apparently being that the bright points consist of more dense, but still gaseous, matter than that composing the unresolvable ones.

From such experiments and observations as have been described, we appear to be justified in concluding that the sun consists of a white hot nucleus surrounded by a cooler atmosphere, containing many elements which are met with on the earth; that the fixed stars have a constitution analogous to that of the sun; and that the color of the stars depends upon the nature of the elements which occur in their atmosphere; whilst, with regard to the *nebulæ*, the experiments have perhaps not been yet sufficiently numerous to allow any definite theory being formed.

Silver Mining in Nevada---A Visit to some of the Mines.

After waiting a few minutes for one of the cages, as they are called (being large sheet iron boxes drawn up and lowered down by an everlasting windlass, propelled by steam power), to arrive at the surface, we spend the time in looking down, down, until nothing is discernible but the faint glimmer of a light, no larger than a twinkling star. The cage has arrived, and all aboard, our tour of inspection has begun. We experience none of the heat that was anticipated, as the draft of air formed by our descent has dispelled it. The cages go down very rapidly, and we could hardly believe that we were in motion until we were landed at the 700 feet level with a jar. Quickly jumping off the cage and lighting the candles handed to us, we follow our guide, finding the climate at this landing quite cool, as there is a strong current of air being forced continually down from above by means of large blowers made for the purpose. The passage on this level is about five feet wide, with a car track laid on sleepers, upon which small, open cars, drawn by mules, are run, carrying ore, working material, etc. There are smaller passages or drifts, as they are called, cut through here and there, while prospecting for pay rock. Now we go down innumerable ladders and inclines, preferring this more exciting method than the cage, and have a better view of the surroundings; pass the stables used for the underground animals, where the mules stand perfectly quiet and looking as contented as if they were aware that they had plenty to eat and very little to do; we have finally reached the 1,100 feet level. Pause, reader, and only think; 1,100 feet down in the bowels of the earth, among untold wealth waiting but to be carried away. Here we find the atmosphere very warm and the perspiration starts in streams. Going in an easterly direction, as the lead runs from east to west, we arrive at one of the many drifts, and finally pause for a moment and are asked to try our hand at the pick to see what kind of a miner we would make; nothing loth, we seize hold of one and begin our new labor, but are very soon exhausted and find our progress has been slow indeed, as nothing but a blast of powder will affect the rock. Being rather warm after our exertions, we concluded to start for more genial quarters; but being asked if we would not like to go over to the Belcher mine, we conclude to do so, and we wait for a load of timber, which was coming down the tunnel on one of the cages, to follow after it, meantime looking at the pumps, machinery, and workings of the incline cars, which come and go continually, laden with ore to the station, to be hoisted up in the cages.

The lumber has at last arrived, and is quickly transferred aboard one of the cars; and we are all prepared to follow its course, but the carman, a shrewd Yankee, quickly sees that we are strangers, and immediately whips his mule up on a keen run, and we after him as fast as strength and "foot and walker's line" will admit of; our candles are blown out, leaving us in almost total darkness, and forgetting to keep our bodies in a stooping position, our heads come in close contact with the beams above. Arriving at the "Belcher" out of breath, we again halt before the face of a rock they are at work upon, which is sixty feet wide, and the ore very rich. As fast as the quartz is taken out, they fill behind them with waste and timbers as a precaution against its caving in on them. The beams are twelve by fourteen inches, and placed every few feet apart, and cross braced so as to be as firm as possible; yet we notice some of the timbers twisted and broken in every conceivable shape by the enormous weight they have to withstand. Leaving this, the fifth level, we go up to the fourth and third levels, and are shown some of the richest ore in the mine, and are given some fine specimens of crystallized quartz to carry home with us. From here we are taken to see the cave-in that was had at the "Crown Point" a short time since, when thousands of tuns of rock fell, leaving the roof looking like a huge dome. Luckily the fall happened during the hour of noon, otherwise thirty human souls would have passed into eternity. In this part of the mine it is excessively warm, so much so that the men work in six hour shifts, and where it is cooler eight and ten; but little clothing suffices, some having a cloth only tied around their loins; yet all appear to be healthy enough and very stout. Starting back on our return, we meet with no stoppages until arriving again at the 1,100 feet level in the "Yellow Jacket," where we are told by Mr. D. that we have traversed from three to four miles, and been under nearly all the city of Gold Hill, and then seen but about half of the underground works. All aboard the cage again, and in about thirty seconds, after passing station after station, with a jar we are landed from our first starting point, and with a shiver change our clothes, having come from the torrid to the freezing zone in so short a space of time. We step outside of the building and are much surprised to find the stars shining brightly, as it was in the afternoon when we started on the descent.—*Philadelphia Post.*

The "Argento" Picture, by Mr. F. A. Wenderoth of Philadelphia.

The manipulations are briefly as follows: A carbon print is made by exposing a piece of carbon tissue, sensitized by bichromate of potash, under an ordinary negative, in th usual way of printing carbon prints. A metal plate with a silvered surface is taken and ribbed by rubbing it with a sanded brush, to deaden the polish and to give effect to the picture. The plate is then cleansed with spittle, nothing else answers the purpose as well, and then laid upon a sheet of paper on a table flowed with diluted alcohol. The carbon print is now laid face down upon the print, paper laid upon it, and a squeegee (made of a piece of wood and several thicknesses of ordinary bed ticking wrapped over one end) used to force out the superfluous alcohol between the picture and the plate, and to make the one adhere to the other. The alcohol also serves to prevent the occurrence of air bubbles.

The whole is now immersed in a pan of water of about 100° temperature, and developed in the usual way, leaving on the plate a picture, the shades of which consist of the colored gelatin and the lights, or rather, the highest lights of the surface of the plate exposed under colorless gelatin. This part of the operation, as all carbon printers know, is most fascinating and beautiful—more like the developing of a collodion plate than anything else. As soon as the superfluous color is all washed away, the pictures (now on the metal plates) are removed from the water, and hung upon a line by clips to dry.

To render them more lasting still (though a carbon print on a metal plate seems to be as permanent as anything can be) they are, when dry, hermetically sealed to glass in the following manner: A little stand should be provided, made of a plate of cast iron, say one quarter of an inch thick and twelve by twenty inches in size, smooth on the upper surface, riveted to a leg at each corner. This plate is heated with gas, or a coal oil stove, the heat being applied at one end, so that the end of the plate furthest from the heat will be considerably cooler than the other. Now lay the picture upon the iron plate at the warmest end. When it becomes warm, drop upon it a small piece of white wax, which will soon melt and naturally spread over the whole surface of the picture. Now, having first heated the glass, place it upon the surface of the picture, place them under a weight on the cooler end of your iron plate, where they will gradually cool and become effectually sealed together. They are then cleaned and mounted in a case or frame, as desired.

The results are very beautiful, and are made more brilliant by the metal plate on which they are mounted. The prints are made with "cut outs," so that, when finished, the white metal plate forms the margin, which adds greatly to the effect.

Waterproof Glue.

WE have recently met with a very useful form of cement for wooden or other similar articles which are employed for holding water or non alcoholic liquids. Although the formula is not a very novel one, we know it to be useful and likely to suit the requirements of some of our readers. It stands as follows:—

Alcohol, (spirit of wine) 1 pint; sandarac, 1 ounce; mastic, 1 ounce; common white turpentine, 1 ounce; glue and isinglass, sufficient; water, sufficient. Dissolve the two resins—sandarac and mastic—in the spirit, and then add the turpentine to the solution. Make some very strong glue, and add to it a good pinch of isinglass. Now heat the alcoholic varnish until the liquid begins to boil, and then very slowly stir in the warm glue. The amount of the liquid glue to be added is determined by noting the point at which, after thorough mixture, a magma or thin paste is formed capable of being easily strained through cloth. When required for use, the strained mixture is to be warmed and applied like ordinary glue to the articles to be united. A strong junction is effected, which is not destroyed by cold water, and only after a comparatively considerable time by hot water or ordinary saline solutions.—*British Journal of Photography.*

EVERYTHING in nature indulges in amusement of some kind. The lightnings play, the winds whistle, the thunders roll, the snow flies, the rills and cascades sing and dance, the waves leap, the fields smile, the vines creep and run, the buds shoot, and the hills have tops to play with. But some of them have their seasons of melancholy. The tempests moan, the zephyrs sigh, the brooks murmur, and the mountains look blue.

WALSH'S WATER WHEEL GOVERNOR.

We have been very strongly impressed with the efficiency of this ingenious device, not so much from the numerous testimonials which substantiate its merits as from personal examination of a working model, which convinces us that all the elements of a really good water wheel governor are combined in it.

Our engravings (Figs. 1 and 2) represent two different forms of this governor, the principle of construction being the same in each. Figs. 2 and 3 exhibit this principle.

A, Fig. 3, is the vertical shaft, which revolves the balls, driven by a pulley shaft and bevel gearing, shown in Figs. 1 and 2. The balls, as their orbit widens or narrows, move the collar, B, vertically, in the ordinary way. This movement of the collar actuates the bell crank lever, C. To the bell crank lever is pivoted the connecting rod, D, which is also pivoted to the shield, E, Figs. 1 and 3. This shield consists of a disk, as in Figs. 1 and 3, or sector of a disk, as shown in Fig. 2, which has a rim upon its edge turned down at right angles. This rim covers the toothed wheel, F, Figs. 1 and 3, but has a notch cut in its lower part, as shown in Fig. 3. To understand the office of this shield, we must now refer to the eccentric, G, Fig. 3. With each revolution of the ball shaft, this eccentric, through the connecting rod, H, reciprocates a cross head carrying the gravity pawls, I. One or the other of these pawls engages the toothed wheel, F, according as the notch in the rim of the shield permits the engagement. As the collar, B, Fig. 3, moves up and down with variations of speed, the shield is moved by the connecting rod, D, above described, so that the notch in the shield permits the proper pawl to act.

Fig. 1

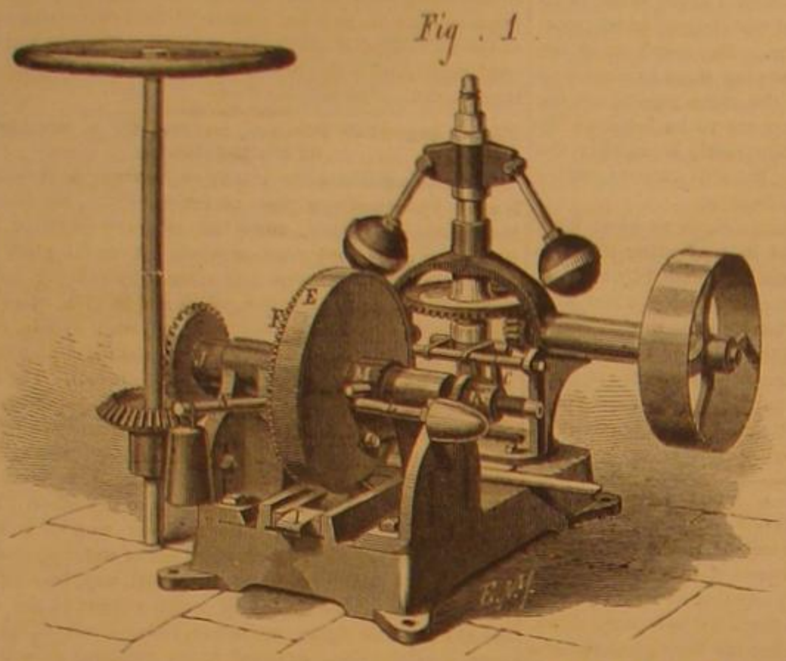
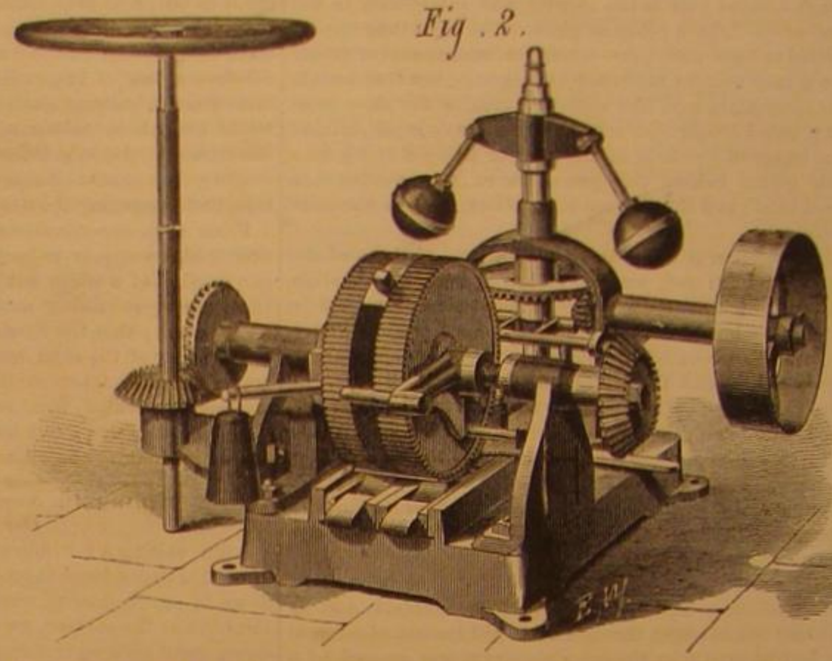
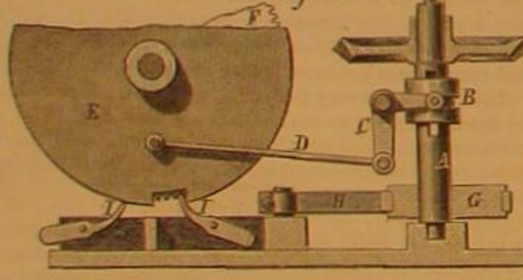


Fig. 2



WALSH'S WATER WHEEL GOVERNOR

Fig. 3



The toothed wheel, F, *Fig.* 1, is fixed to the shaft, J, which is connected to the gate shaft by bevel gearing.

It is obvious that when the notch in the shield stands midway between the pawls, I, that neither of the pawls can act. Advantage is taken of this to limit the hight to which the gate can be raised by the governor. A nut and arm, K, run in a thread cut on the shaft, J, Fig. 1. The arm carries a pin, L. By the continued action of the pawl that raises the wheel, the nut, K, is run along the thread on J, till it finally abuts against a shoulder turned on the shaft, and then turns with the shaft. At the same time the pin, L, is brought under a lug, M, formed on the hub of the shield. The shield is thus turned so as to bring the notch to the center, where, as neither of the pawls can act, the gate cannot be further raised. As soon as the speed of the general *shafting*, to which the governor is belted, increases, the action of the collar, B, and bell crank, C, Fig. 3, moves the notch off the center so that the proper pawl to lower the gate acts as before.

Fig. 2 represents a governor made to act by two eccentrics, two systems of pawls, and two toothed wheels, so as to raise or lower the gate faster than the single system will, this style of governor being designed for certain turbines, the gates of which are operated with screws which require many turns to open or close the gate.

A friction brake, N, Fig. 1, is employed to hold the shaft, J, from turning back, as it will in some cases during the intervals between the impulses imparted by the pawls.

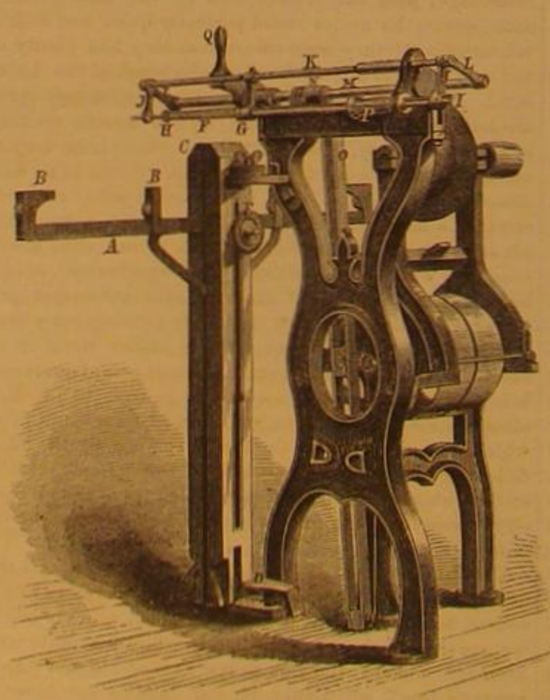
Patented, *through* the Scientific American Patent Agency, Oct. 6, 1868, and April 19, 1870. For further information, address A. Walsh, Cambridge, N. Y.

Professor Treadwell.

Professor Daniel Treadwell died recently at Cambridge, Mass., aged 87 years. He was born at Ipswich, Mass., in 1791, was a man of great inventive genius, and to his labors and research the world is indebted for many valuable and useful discoveries in practical science. At an early age, he invented a machine for making screws. In 1818 he produced a printing press of a new construction, and in 1819 visited England, where he conceived the construction of a power press which, upon his return to this country, he completed, and which was the first upon this continent upon which a sheet was printed by other than human power. In 1822, in connection with Dr. John Ware, he established and conducted "The Boston Journal of Philosophy and Arts." In 1825, he was *employed* by the city of Boston to make a survey for the introduction of water and in 1829 completed a machine for spinning hemp for cordage, which was the first ever successfully used for the purpose and is still in use at all the navy yards in the United States. In 1832, he became Rumford Professor of Technology at Harvard College, which position he held until 1845. Shortly after becoming a professor he invented a cannon, which eighteen years ago was adopted and patented in England by Sir William Armstrong, and is now known to the world as the "Armstrong gun."

CHAPMAN'S IMPROVED SAW FILING MACHINE.

The original filing machine, manufactured by the inventor of the improved machine herewith illustrated, has been before the public for twenty years, and is familiar to the majority of American lumber manufacturers. The improved machine, which forms the subject of the accompanying engraving, is the result of practical knowledge gained during the period named, the improvements being numerous and important. The machine, as it is represented in our engraving, still retains the best points of the old machine, although the changes are so great that the machine may be said to be entirely remodeled.



The present machine is made wholly of iron, and is much more compact than the old one. The clamps are peculiarly formed, being adjustable and adapted to filing all styles and sizes of saws in common use. By means of the swinging frame described below, all kinds of files may be used, and can be easily and quickly exchanged. Both ends of the file are held, and thus the file is guided evenly and straight across the saw tooth, so that any person, however unacquainted with saw filing, may manage this machine. A peculiar arrangement of the connecting rod causes the file to traverse much more rapidly on its return stroke than in making its forward stroke, the motion thus produced simulating, in this respect, that of the file in filing saws by hand.

A simple and cheap appurtenance, consisting of an emery wheel and proper supporting devices, may be attached at the option of the purchaser, and answers the purpose secured by the more costly ones now in use.

It is claimed that, with this machine, one man can do three times the work that can be done by hand, doing it better, and with a less number of files, than would be consumed in doing the same work by manual labor.

Referring now to the engraving, A is a bar which supports the back of the saw. This bar is provided with guides, B, at the bottom of each of which is a roller. The bar, A, is supported, as shown, between the two parts of the clamping vise, C. The inner part of this vise rests upon a pivot at th bottom. It is pivoted at the top, a small graduated arc and pointer enabl'ng the entire clamping device to be set at any required angle, to give the proper bevel to the saw teeth; when thus adjusted, it is held by a set screw. It is instantly clamped by the foot lever, D.

The hight of the guide bar, A, is regulated by the set screw, E, *which* is adjustable in the longitudinal slots of the two parts of the clamping vise. The file, F, has its shank inserted at G, and its point is held at H. It is held by adjustable devices, so that different sizes of files may be used; and being placed as shown, is reciprocated through the rod, I, the arms, J being connected with the rod, K, which is pivoted to the arms L, the latter being fastened to the rod, M. The rod, M, is reciprocated by the collar, N, the latter being actuated by the oscillating bar, O. The bar, O, is oscillated by a crank pin taking its motion from the pulley shaft, and impelling a sliding block in a longitudinal slot formed in the bar, O. It is by the latter means that the quick backward motion, as compared with the forward motion of the file, is secured. It will also be seen that the rods, I, K, M, reciprocate together. But the rod, I, has V shaped grooves, in which slide suitable ways formed in the handle, P. This handle does not reciprocate, being held by a device for that purpose. It may, however, be rotated, and when so rotated by the hand of the operator, it holds the file in the proper position to act properly upon the saw tooth.

The handle, Q, does not reciprocate, but through suitable devices it is used to rotate the rod, M, on its longitudinal axis; and in so doing, it will raise the file clear of the teeth during the advance of the saw, and, by reversing the motion, lower the file to its proper position for filing again. Both this movement and the one previously described may be made without stopping the reciprocation of the file, and thus the work can proceed rapidly and be performed with superior accuracy.

The machine is, as will be seen, very compact and substantial. The attachment of the emery wheel is shown in the engraving, and needs no particular comment, except that as we have remarked above, it saves the increased expense of a costlier device.

The improvements described were patented through the Scientific American Patent Agency, January 30, 1872, by T. M. Chapman, whom address for further information at Old Town, Maine.

We have received from Washington the advertising circular of Joel Floyd & Co., under the free frank of Hon. R. R. Butler, member of Congress. We have occasion to send off large numbers of business circulars, but have heretofore been compelled to pay full postage on them. We would like to inquire of the Hon. Mr. Butler if he is open to an engagement to frank letters to other parties, and what his charges are to Floyd & Co. for attending to their postal business.

Professor Shepard, of Amherst College, Mass., has one of the largest collections of meteorites in the world. It embraces 146 different meteoric stones and 93 meteoric irons. The heaviest specimen of the irons is one from Aeirotopas, weighing 438 pounds, and the largest of the stones is that from New Concord, weighing 52 pounds.

Scientific American.

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VOL. XXVI., No. 12. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, MARCH 16, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

AMERICAN ART INDUSTRY.

Prior to 1870, the manufacturers of woven and printed fabrics in this country were accustomed to depend wholly upon foreign artists for the origination of ornamental designs. No sooner was a novel pattern produced in England or France than our manufacturers copied it here without giving to the artist, by whose study and labor it was designed, either credit or recompense.

This illiberal and unjust policy was productive of a variety of evil results. First, it deprived the original artist of all chance of reward for his labors. Second, it encouraged our manufacturers in stealing the fruits of such labors. Third, it utterly prevented the development of home talent in the production of artistic works of this kind. Why should our rich and prosperous manufacturers hire home artists to prepare designs for patterns when they could steal them, ready made and free of cost, from foreign artists?

To remedy this evil, and gradually to compel our manufacturers to employ native artistic talent, Congress revised the patent law, in 1870, so as to permit foreigners to patent their designs here. This was an act of simple justice to foreign artists; at the same time, it gave protection and stimulation to home industry. The manufacturer could no longer copy his designs with impunity from foreign sources, and was compelled, as a matter of course, to call in home talent to his assistance.

This has been the practical effect of the new law thus far. Hundreds of artists have found remunerative pay for their labors, and hundreds of art students are diligently at work preparing themselves for this new field of industry. In a very few years, if this law is allowed to stand, the United States will occupy a leading position as the originator of beautiful art works, and a noble branch of home industry will be created.

These remarks are called forth by the attempt on the part of certain manufacturers to change the existing law so as to restore the old status. A bill for this purpose, preventing foreigners from registering their designs, has just passed the Senate. It bears the innocent title of "A bill to amend the statutes relating to patents and copyrights." But its title, if correctly given, would be "An act to discourage American art industry, and to assist wealthy manufacturers in stealing artistic designs." We trust that the House will reject the Senate bill.

ARE EXPERIMENTAL TESTS OF TURBINE WHEELS TRUSTWORTHY?

We answer to this query that they can be made so. The conditions necessary are simple and easily established, but so far as we are aware they have never been carried out in any series of tests yet made in this country.

It is conceded by competent hydraulic engineers that no turbine wheel will utilize the same percentage of water power under all heads. Some wheels do their best at high heads, others show greater proportional efficiency with low heads. To make a turbine that shall perform the best with a given fall of water, it should be constructed with special reference to the conditions under which it is to be used; but to do this in every instance would make the cost of this class of wheels too great; therefore manufacturers attempt to construct them so as to give the best average results under varying heads.

It is obvious, then, that to know what a turbine will do, with a given number of inches of water and a given fall, it must be tested under those particular conditions. It is not perhaps practicable to test wheels for all heads and with widely varying quantities of water; but for all heads, excluding fractions of feet, and with quantities of water varying from large to small within the limits found in ordinary practice, this might be done; and until it is done, being closely observed, the public will know little in regard to the merits of different wheels in the market.

There is no question that a friction brake properly constructed can be made to indicate accurately the power of a given wheel under any particular set of circumstances; but, if the conditions are changed, the results obtained in the first instance cannot be a sure guide to what may be expected in the second. When the wheel overcomes the friction of the brake, it is performing work just as much as though it were sawing lumber or grinding wheat. There is, therefore, in our opinion, no force in the statement made by some that the only true test of a wheel is what it does in the performance of useful work. Work is work, whether it is useful or not, and the scientific measure of work is the foot pound, not a bushel of wheat or a thousand feet of lumber. So far from discouraging such tests, we are disposed to encourage them; but we insist upon it that turbines should be tested under different heads, and that the wheels should be finished in the style of those actually put in the market.

TUNNELLING UNDER CITY STREETS--THE ATMOSPHERIC RAILWAY.

During the past year, an eight foot tunnel has been constructed under the streets of Cincinnati, O., for drainage purposes, by means of the novel boring machine, illustrated on page 154, Vol. XXII of our paper. A vertical opening or shaft was first made on Sycamore street, near Hunt street, and carried down to the intended bottom grade of the tunnel. Two of the boring machines were then lowered into the shaft and set at work boring in opposite directions, the tunnel being laid up in brick as fast as the machines advanced, the earth being removed at the shaft. The tunnel extends from Abigail street along Sycamore street to Court street, where it makes a sharp turn into Court street, along which it passes to Broadway. The crown of the tunnel is some twenty feet below the street surface, and on its route passes under two canals, the Miami Canal and a branch or raceway. This method of boring has peculiar advantages for city uses, as it permits the construction of tunnels beneath the streets of cities without disturbing the surface or the usual travel of vehicles, while the only earth to be handled is a body equal to the exact size of the tunnel.

The Cincinnati boring machines were constructed and operated substantially on the same plan as the larger machine used in building the Broadway Underground Railway tunnel now existing in this city.

This tunnel, it will be remembered, extends from the Broadway Bank, at Murray street, passing under Broadway northerly to Warren street, where, on a curve of 50 feet radius, it turns into the Company's passenger station. This railway is worked on the atmospheric plan and has been in practical operation for some two years. Thousands of passengers have enjoyed the atmospheric ride under Broadway, finding it an agreeable and novel method of travelling. In fact, the Broadway Underground Railway is one of the attractive curiosities of the city. By means of a large blowing engine, a current of air is made to traverse back and forth through the tunnel, and this current, impinging against the ends of the cars, carries them along like a boat before the wind. The car in use is of about the same size as the ordinary street car, having seats for twenty-two passengers.

The Company are applicants before the Legislature for the privilege of enlarging and extending their works, so as to carry passengers from the Battery, under Broadway, to Harlem river, a distance of nine miles. The present working section of railway was built for the purpose of demonstrating the practicability of placing a railway under Broadway without injury to adjoining property; and in this respect the work is a complete success. It was alleged and generally believed that the foundations of buildings, as well as the water pipes, gas pipes, sewers, etc., would all be damaged by such a railway. In answer to this, the Company set to work with one of the boring machines above alluded to—the design of Mr. A. E. Beach, of the SCIENTIFIC AMERICAN—and built a railway tunnel under Broadway, passing below water pipes, gas pipes, sewers and the foundations of some of the heaviest buildings. The thing was done in a few days, with the entire travel of omnibus and other vehicles passing over the heads of the workmen, and on its successful completion all reasonable objections to the construction of a railway under this thoroughfare were removed. In fact, so strongly in favor of its building have the leading property owners become that they now present themselves as rivals before the Legislature, and ask that the right of construction may be given to them and not to the Transit Company, which has begun the work and at a heavy outlay of money demonstrated its desire and ability to execute it with success. The Legislature is not likely to do such an act of injustice, and there is reason to believe that the necessary authority to proceed with the work will be shortly granted to the Beach Transit Company.

A MUNCHAUSEN COMET.

A European journal recently published a discovery (?) by a Professor Plantamour, whom it mentions as a well known Genevan astronomer, that a comet is now approaching the earth, that a collision between the bodies may be expected on the twelfth of next August, and that, if the prediction be verified, the destruction of the world is certain to occur on that day. Of Professor Plantamour we do not find any necessity to speak, never having before heard of that scientist; and our readers' patience need not be tried by a lengthy and serious consideration of his theory. But we must express some astonishment at the number of journals who have given space to discussion of the subject; and we respectfully suggest that some public provision be at once made for the education, in the physical sciences, of newspaper editors and writers.

The eccentricity of the orbits and the varying periods of the recurrence of comets have long given to these bodies a prominent place in the sidereal phenomena; but the idea of danger from their approach or of destruction by contact with them is not compatible with the enlightenment of the nineteenth century. In the year 1699, the Elector of Darmstadt informed the world that a dangerous eclipse was about to take place, but the calamity did no mischief. We are no longer to be scared by an eclipse; but the ignorance and folly of the celebrated autocrat have still their representatives in the Genevan Professor; and the public who thankfully received the Elector's warnings were little less instructed than those who read the predictions of the comet destruction, and who find nothing in them contrary to their knowledge or repulsive to their intelligence. There may be some readers of the SCIENTIFIC AMERICAN to whom a recapitulation of a few facts concerning comets will be useful, and to such we present the following:

Comets are bodies of such extreme tenuity that the planets, the Earth among others, have frequently passed through them without producing any other effect than an auroral glare, changing the color of the sun's light on the planet, while the period of transit lasted. Many secondary bodies, such as Jupiter's satellites, have been engaged in Lexell's comet without having their positions or periods affected in the least. We have already pointed out, in an article on this subject on page 279 of Vol. XXV., that the Earth passed through the comet of 1861; and this well known fact might, if duly considered, have hindered this Plantamour from gaining notoriety by talking nonsense, and quieted the fears of the writers engaged on many daily journals. While however, no comet of whatsoever magnitude has been observed to consist of a sufficient mass of matter to influence the smallest planetary or stellar body in the slightest, nearly every one which visits our field of observation is changed in its course by the attraction of stars infinitely less in proportion than itself. This is further evidence, perhaps not needed by our readers, that a comet is composed of matter so impalpable that some of the largest, such for instance as the one of 1843 which was 200,000,000 miles in length, have not sufficient aggregate gravity to render their influence of any importance in an astronomical calculation. We therefore think that the comet "scare" is not worthy of a moment's serious attention; and we regret that so many of our cotemporaries can fill their columns with matter so insulting to the understandings of their readers.

THE COMMON LAW OF TRADEMARKS.

An interesting decision has recently been delivered by the Supreme Court of Louisiana, touching the right of a manufacturing firm to the exclusive use of a peculiar name by which its goods are known to the public.

A firm in Holland sells a peculiar preparation of gin, known by the original makers' name, with a sonorous and fanciful title. The defendants had manufactured an imitation of this gin during the last ten years and sold it in bottles resembling those in which the original is sold, and labelled so like them as to be "colorable imitations." The Court expressed itself convinced that the original article was pure and exactly what it professed to be, while the imitation was adulterated. It was shown that the foreign manufacturer had devised the bottles and labels in 1851, and that he had used them ever since. A lower court had thrown out a claim for damages and merely issued an injunction restraining the defendant from the use of the personal name, but allowing the use of the peculiar name given to the gin. The Supreme Court reversed this judgment, ordered an injunction against any imitation of labels or bottles, and allowed fifteen hundred dollars as damages, with costs in both courts against the defendants.

Among the peculiar features of this case was a claim by the defendants that they had used the imitation label for ten years without interruption, and that they had gained a customary and prescriptive right to it. The Court said that the damages could not be assessed for more than one year back, but the claim that use for ten years gave the defendants a right to the trade mark could not be allowed. Another claim of the defendants, that the words on the label were not new, was also rejected, the Court saying: "His combination of those words is proved to have been new, and it is proved to indicate the origin and ownership of the liquor, and the defendants have no right to filch this combination, or any important part of it, in such a way as to mislead the purchaser as to the real origin and ownership."

Floating Fire Engines.

Among the many means now available for promptly extinguishing fires, there are none more useful in our business towns than the floating engines now in use in New York Baltimore and elsewhere. In the firstnamed city especially, the proximity of nearly all parts of the city to one or the other of the rivers, and the enormous accumulation of valuable merchandise all along the water's edge, point out the floating engine as the most ready and accessible implement for the purpose. The facility with which it can be brought to the scene, the instant supply of water, and the great power obtainable from the engines, which need not be limited in size or capacity, are additional recommendations.

LABOR AND PERSONAL CLEANLINESS.

Our attention has been called again to this subject by a statement from a committee of the Board of Health, on the condition of the street cars and the liability of their communicating disease to passengers. Referring to the line skirting the East river, which runs past many large manufacturing establishments, slaughter houses, gas works, etc., the statement referred to asserts that the cars are constantly kept in a filthy condition by workmen who enter them covered with grease and grime, and reeking with perspiration from their work. We have ourselves before noticed this fact, and have endeavored to stimulate a greater regard for personal cleanliness among workmen, but we fear with little avail.

While dirt, and dust, and soiled raiment, are inseparable from some kinds of useful toil, they are admitted even by those who endure them, to be very disagreeable concomitants of labor. Their needless infliction upon others is, to say the least, a very unhandsome thing on the part of those who could, by a little effort, cleanse themselves before crowding into a vehicle for public use, and it is a matter of just complaint. We see, however, a spirit manifested by workmen which indicates that one who tries to avoid contact with them in their besmirched state is regarded by them with disfavor. Not long since, entering a Third avenue car, we saw three men, covered from head to foot with black oil, who threw themselves into seats as though it was a good joke to soil any one's clothes that were decent. A gentleman, who quietly rose and passed to the seat opposite to avoid their contact, was abused by them, and tauntingly asked why, if he thought so much of his dress, he did not take a carriage and ride home like a gentleman.

Now it was evident this gentleman did not avoid these men simply because they were workmen. To have done this, would have forfeited his claim to be called a gentleman. It was the dirt, of which they were the nasty vehicles, he wished to escape. If workmen wish to be regarded with respect, they should avoid making themselves nuisances. One of their own craft, in cleanly garb, would have shunned these dirty and unmanly fellows.

There is no excuse for a workman, in any business, who enters a public conveyance, or even as a regular thing walks through crowded thoroughfares, in a condition that is disgusting to people of cleanly habits. Blackened hands and faces are amenable to soap and water; and greasy overalls may be left hanging in shops, or, if it be needful to carry them, they may be rolled and wrapped up so as not to be offensive to sight or touch.

There is a great lack of true manly pride among certain classes of workmen. Of unmanly pride, they have overabundance. They profess to be proud of their calling, proud to belong to the great army of producers—in this they are right; they are proud of the power of their associations, and scornful of luxury and wealth, which they claim oppress them with burdens too grievous to be borne. Were they equally proud of their personal appearance and scornful of that which is degrading in their habits, they would command more respect for their rights as members of society, and be able to enlist the sympathy of many who now stand aloof from them. Drink and dirt are the two most degrading habits of working men. No man can possess self-respect who is disrespectful to others, and no man is respectful to others who can willingly annoy them by exposing them to personal uncleanliness.

We are far from applying these remarks to all workmen, or even to the majority of them. We know many whose avocation is of a sooty order, but by whose side we would as soon sit in a car as ride next the sprucest dandy that promenades Broadway. We only ask those to appropriate what we have said, who, upon reflection, find it fits their case.

MEASURING THE HEAT OF COMBUSTION.

It has been shown, in several former articles, how the acceptance of a unit of heat, as a radical measure for the determination of relative amounts of caloric, has had most important results in placing the subjects of latent heat and specific heat in a clear light, subjects which otherwise would always have remained enveloped in much obscurity. Still more important, however, is the application of this unit to determine the results of combustion of different substances, as it settles, in the most rigorous manner, the comparative value of different kinds of fuel. At a time when steam is applied in so many and so diverse directions, or in other words, in an age when heat is continually and universally being converted into motion, the subject of investigating the nature and results of diverse kinds of combustion is of course of the utmost importance. It is an investigation of the amount of caloric or potential force hidden in the fuel, which hidden force is only changed into visible force by the intervention of evaporating water, expanding air, etc., and so the unit of heat may be directly connected with the unit of power.

In most cases, combustion is a chemical combination of the fuel with atmospheric oxygen, and in all cases it is a chemical process, by which the latent heat of dissociation is set free (see page 21, current volume). The conversions taking place always form new compounds; for instance, we convert hydrogen into HO (water), carbon into CO (carbonic oxide), or CO_2 (carbonic acid), sulphur into SO_2 (sulphurous acid), phosphorus into PO_5 (phosphoric acid) sodium into NaO (soda), magnesium into MgO (magnesia), iron into FeO (ferric oxide), etc. The amount of heat produced varies with the nature of the substance, but depends more on the amount of oxygen consumed than on anything else; so we find that the combustion of one pound of coal gives as much heat as that of three pounds of sulphur, while chemistry proves that one pound of coal is able to combine with nearly as much oxygen as three pounds of sulphur can do. The combustion of one pound of coal produces, however, only one quarter of the amount of heat produced by the combustion of an equal weight of hydrogen; but here again analytical chemistry teaches that, in the combustion of three pounds of carbon, no more oxygen has been converted into CO_2 than in the combustion of one single pound of hydrogen into HO, because the weight of O is six times that of H; six pounds of hydrogen, therefore, combine with 6×8 of oxygen, while six pounds of carbon combine only with 2×8 of oxygen.

Practical experiments with different kinds of fuel have shown, however, that this estimate of the heat produced by the amount of oxygen consumed is not strictly correct; and that other circumstances must be taken in account in order to explain the discrepancies. The principal influence on the result is the nature of the product of combustion, its gaseous or vaporous or solid condition, latent or specific heat, etc. We communicate here a table, giving the units of heat produced by the combustion of one pound of different substances, obtained by practical trial, and the amount of water which each of these substances may convert into steam, making the supposition that the latent heat of steam is 962 units of heat, and that some 150 units are required to heat the water from the ordinary temperature to the boiling point.

TABLE OF THE UNITS OF HEAT AND AMOUNT OF STEAM PRODUCED BY THE COMBUSTION OF FUEL.

Name of substance.	Formula.	Units of heat produced.	Pounds of water changed into steam
Hydrogen	H	56,000	50·4
Marsh gas	C_2H_4	23,500	20·9
Petroleum	$C_n H_{n x 2}$	22,000	19·6
Paraffin	$C_{40}H_{42}$	21,600	18.9
Olefiant gas	C_4H_4	21,350	17·6
Oil of turpentine	$C_{20}H_6$	20,000	16 0
Spermaceti		18,000	15·6
Stearic acid	$C_{36}H_{36}O_4$	17,500	14·2
Ether	C_4H_5O	16,000	12·5
Wood charcoal		14,500	12·4
Gas coke		14,450	12·2
Anthracite coal		14,220	11·6
Bituminous coal		13,500	13·0
Alcohol	$C_4H_6O_2$	13,000	11·1
Sulphur	S	3,500	3·0

SCIENTIFIC AND PRACTICAL INFORMATION.

METALLIC DUST IN FACTORIES.

The injuries to health, arising from infinitesimal metallic particles inhaled by the breath into the lungs in cutlery and other works, are especially serious in the operation of dry grinding, used in the manufacture of steel forks. Mr. Charles Stodder, of Boston, has recently made an investigation into the quality of a similar dust produced in the process of polishing fire arms in the United States arsenal, at Springfield, Mass.; and he found that it consisted of a few organic fibers, some minute crystalline fragments, and about 66 per cent of iron and steel dust. He makes a useful and practical suggestion that magnets be placed near the grinding surfaces to withdraw the iron dust from the air breathed by the workmen; and the simplicity and feasibility of the device will ensure it a trial.

CABINETS FOR THE STUDY OF MINERALOGY.

The Department of Public Instruction of New York city has recently approved a specimen cabinet of mineralogical specimens, compiled for the use of teachers. Such a collection, if properly and judiciously selected, may be made available for laying the foundation of a highly practical technical education; and we should be glad to see similar object-teaching introduced into other branches of knowledge. The specimens were chosen and arranged by Professor E. C. H. Day, whose name is familiar to all readers of the SCIENTIFIC AMERICAN.

WINE GROWING IN AMERICA.

There is little reason to doubt that a large proportion of the territory of the United States is suited for the cultivation of grapes from which wines, not only in practically unlimited quantities but of the highest excellence, may be produced. California takes the lead of all other States in this culture and manufacture, and exhibits great variety of qualities and flavors in her productions. A writer in the *Overland Monthly* catalogues these as follows, according to the localities in which they are respectively cultivated: Sonoma county is best adapted to produce white wines, resembling those of Germany; the upper part of Napa valley and certain portions of Santa Clara county will make excellent clarets; the Sacramento valley, near the foot of the inclosing hills, is destined to produce our future sweet muscats; El Dorado county is best adapted to the production of wine resembling the far famed Burgundy; Solano county produces a wine which is a natural port; San Joaquin and Stanislaus counties give wines which closely resemble, both in flavor and taste, the best Madeira, but they have to attain an age of from five to six years before this taste is sufficiently developed; Anaheim and certain portions of Los Angelos county produce light white wines, which very closely resemble those of Chablis, in France, and they, too, must be some four years old before this peculiarity shows itself distinctly; and the last two years should be in bottle.

THE BEHAVIOR OF CADMIUM, IRON, AND TIN UNDER THE ACTION OF NITRIC ACID.

It has been observed that iron acquires, by being placed in nitric acid, a peculiar condition of surface enabling it to resist the action of the strongest acid; and a still more remarkable and important phenomenon has been observed, which is that iron so treated will form a galvanic circuit with ordinary iron, the treated metal being decidedly negative to the latter. Dr. Schönn produces further evidence of the changed character of the iron by showing that it refuses to reduce copper from the solution of its salts. He shows, also, that cadmium, in strong nitric acid, remains unacted on if platinum wire be coiled around it; but on the removal of the wire, the cadmium is at once attacked by the acid. Tin exhibits similar characteristics. The result of the experiment with iron points out electrical action as the cause of these effects, which, on further investigation, may give us some new light on the subject of electrolysis.

OBTAINING ABSOLUTE ALCOHOL.

A German savan has recently improved on the well known method, employed by Mendelejeff, for obtaining absolute alcohol. Alcohol of ·792 is boiled with quicklime, the pieces of the latter projecting above the surface of the liquid, for half an hour more, with a condenser inverted so that the liquid may return by its own gravity to the flask. The condenser is then reversed, and the alcohol redistilled. If the alcohol contains more than 5 per cent of water, the process must be repeated two or three times. The vessel should only be half filled with the pieces of lime, as the rapid formation of hydrate of lime may break it to pieces.

ELISEE RECLUS.

It was with much pain that we read the news of the condemnation of this eminent French geographer to a term of deportation; and we shall not be accused of political bias when we express our regret for his defection from the ranks of science to follow a chimera. Among the idiosyncracies of the talented and misguided man may be mentioned the union in one mind of the blind cruelty of the commune, and a humanity which forbade to eat meat for the reason that it is not lawful for man to slay his fellow creatures. Reclus is a native of the south of France, and was educated at Neuwied and subsequently in Berlin. His contributions to the *Revue des Deux Mondes* are well known for their learning and lucidity of style. Petitions on his behalf have been addressed to the Committee of Pardons, Versailles, having been signed by Sir Charles Lyell, Sir John Lubbock, Sir Henry Rawlinson, Professors Owen, Duncan, Tennant, Forbes, Carpenter, Richardson, Darwin, and many others. The pleadings of these men will hardly be ignored by the government of such a nation as France, and it would be a graceful act for the scientists of America to forward a similar petition, which possibly might set Professor Reclus once more free to pursue his studies and teachings for the benefit of mankind.

LEAD POISONING.

The painful effects of poisoning by lead are not by any means confined to painters, white lead manufacturers, and others whose trades bring them into constant contact with this deleterious metal. There are some persons whose obstinacy allows them to use it, in cosmetics and hair washes, in spite of the warnings of the medical profession; and the evil is augmented by the fact that such preparations may be used for years with impunity, and the palsy, paralysis, and other effects do not appear till the whole system is thoroughly impregnated. One medical man writes to a contemporary to say that he has one patient who has been paralyzed for nearly three years, her vision is imperfect, and her memory is gone; and another victim to this criminal practice has constant torture in her eyes, and is obliged to stay in a dark room. Many similar cases have been reported; but the practice still continues, and now Dr. J. M. Crocker publishes an account of a man, aged 55, who was afflicted with what appeared to be muscular rheumatism, affecting mainly the deltoid and other muscles of shoulders. When first visited, he was suffering from pains which he had felt more or less severely for a month or two. Both arms were in this manner crippled. Dr. Crocker ordered cotton batting to affected parts, lemon juice and opiates internally; and the patient made quite a rapid recovery, but when seen in the month following, he was suffering from an almost complete paralysis of extensor muscles of fingers and hands, with dropping of wrists. He could readily and forcibly grasp, but found difficulty in letting go. Subsequently, upon inquiry, it was discovered that for fifteen years he had used a hair renewer, made by himself, of three teaspoonfuls lac sulphur and two teaspoonfuls sugar of lead to a pint of water. With this he had drenched his head and scalp as often as once a week. Under use of iodide of potassium and galvanism, he has made a good recovery, the hair dressing having of course been discontinued.

THE MINERAL RESOURCES OF SOUTH CAROLINA.

Mr. A. C. Laughlin, of Columbus, S. C., informs us that corundum is found in South Carolina in inexhaustible quantities; this mineral is specially adapted for spindles and pivots of watches, and other fine machinery where the wear is constant. Sapphires and garnets are frequently found, some of the latter being perfect specimens of crystallization. Magnesian iron ore is very abundant, but is as yet almost undeveloped. Mica is another substance yielded by the soil of that state, and is daily coming into increased use. Mr. Laughlin speaks most favorably of the South Carolinian gold fields, and states that the precious metal can be obtained therefrom with great facility.

ONE cubic inch of water weighs ·03617 lbs. One cubic foot of water weighs 62½ lbs. One cubic foot of ice weighs 58¾ lbs. One cylindrical inch of water weighs ·02842 lbs. One cylindrical foot of water weighs 49·1 lbs.

MR. H. E. COLTON, an occasional contributor to this paper is now engaged on the *World* as agricultural editor.

What they think at the White House of the United States Watch Company's MARION WATCHES.

The following is from General PORTER, President GRANT's Private Secretary:

EXECUTIVE MANSION,
WASHINGTON, D. C., October 18th, 1871.

DEAR SIR—My watch has kept excellent time since I have carried it. Yesterday, in some unaccountable way, the crystal was broken. Will you please replace it, and oil the works? they have never been oiled or examined since the watch left the factory. I expect to be in New York a day, about Thursday or Friday of next week, and I shall call at your place, 13 Maiden Lane, for the watch. Yours very truly,
(Signed) HORACE PORTER.

F. A. GILES, Esq.

The Watch referred to above, is No. 27,835, Stem Winder, Trade Mark "John W. Lewis—manufactured by the United States Watch Co., (Giles, Wales & Co.) Marion, N.J."—and has been carried by Gen. Porter for over a year. We are glad to see that our officials in high places appreciate fine American mechanism, and set the example of patronizing home productions instead of sending our gold abroad for inferior articles.

Examples for the Ladies.

Mrs. T. M. Scullin, Troy, N. Y., has used her "dear friend," a Wheeler & Wilson Machine, since 1856, in dress and cloak-making. The last six months she earned $332, and the year before, $417.

Mrs. C——, of New York, has used a Wheeler & Wilson Machine since 1857, never averaging less than $700 a year, and for the last five years $1,000. She used the same needle during 1870, and earned with it over $1,000.

For Irritation of the Scalp, apply *Burnett's Cocoaine* night and morning.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Manufacturers and Mill Supplies of all kinds. Greene, Tweed & Co., 18 Park Place, New York.

The "Safety" Hold Back for Carriages prevents runaway accidents. See Sci. Am. Feb. 24, 1872. Undivided Interest, or State and County Rights, for sale. Address N. W. Simons, Williamsfield, Ohio.

Lord's improved Screen or Separator—also Watchman's Time Detector. For particulars, address Geo. W. Lord, 232 Arch St., Phila., Pa.

Scale in Steam Boilers. We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

The Exeter Machine Works, Exeter, N. H., manufacturers of Sectional Boilers and Steam Engines, will soon open, in Boston, Mass., a centrally located sales room, in connection with their works; and are willing to take the agency of a few first class Machines and Tools not already introduced in that city.

For Diamond Turning Tools for Trueing Emery Wheels and Grindstones, address Sullivan Machine Co., Claremont, N. Hamp.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ½ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 176 Broadway, New York.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D.Andrews & Bro,414 Water st.,N.Y

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N.Y.

For Circular of the largest variety of Wood Planing and Mitre Dovetailing Machinery, send to A. Davis, Lowell, Mass.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber M'f'g Co., 9 & 11 Park Place, New York.

Best and Cheapest—The Jones Scale Works, Binghamton, N Y.

Grist Mills, New Patents. Edward Harrison, New Haven, Conn

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Vertical Engines—Simple, Durable, Compact. Excel in economy of fuel and repair. All sizes made by the Greenleaf Machine Works Indianapolis, Ind. Send for cuts and price list.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N.J.

For 2 & 4 Horse Engines, address Twiss Bros., New Haven, Ct

Opium Eaters—If you wish to be cured of the habit, address T. E. Clarke, M. D., Mount Vernon, Ohio.

Blake's Belt Studs. The best fastening for Leather or Rubber Belts. 40,000 Manufacturers use them. Greene, Tweed & Co., 18 Park Place, New York.

Wanted—An agent to sell territory for a new and valuable patent. Address, for circular and terms, P. O. Box 773, New York.

Hoisting Engines. Simplest, cheapest, and best. Send to John A. Lighthall, Beekman & Co., Office 5 Bowling Green, New York.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

New & Improved Bolt Forging Machines, J.R.Abbe, Prov., R.I.

File Grinders' Grindstones, coarse grit—Mitchell, Phila., Pa

Independence Grindstones—J. E. Mitchell, Phila., Pa.

Well auger which will bore at the rate of 150 ft. per day. Send 10c. for circular to W. W. Jilz, St. Joseph, Mo.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Parties wishing to go S. W. with cotton or woollen machinery, address Isaac Sharp, Evening Shade, Sharp County, Ark.

Wanted Situation, by a Draughtsman—competent to design any kind of Engines or Machinery; or would be found expert in carrying out designs for Engineers, and good Practical Mechanic. Good reference. Address E. M., Box 157, Mansfield, Ohio.

A young man desires a situation in a Civil Engineer Corps—understands leveling. Good references. Address Engineer, Camptown, Bradford County, Pa.

For Sale—A 2½ H.P. Stationary Engine. Address J. Abbot, Fitchburg, Mass.

Wanted, to correspond with owners of Patents—Picture Frames, Hangers, or other light metal work—view to manufacturing. Address H. J. Dorchester, 618 North Main Street, St. Louis, Mo.

For the best Match Splint Machinery made, address H. M. Underwood, Kenosha, Wis.

Manufacturers of Spoke and Last Machines, send description and price list to William Graham, Smiths Falls, Ont.

Parties desiring articles prepared for the press, describing really meritorious and useful inventions or processes, may find it to their advantage to communicate with Richard H. Buel, Consulting Mechanical Engineer, 7 Warren Street, New York.

Get your steam boilers and pipes covered with the best non-conductor in the world. Call for Circular. Asbestos Felting Company, 45 Jay Street, New York City.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Notes & 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.—CUTTING GLAZIERS' DIAMONDS.—Can any of your correspondents tell me how to cut worn glaziers' diamonds to a new point?—W. K.

2.—FLUID AND LIQUID.—Will some one tell me the proper and fine distinction between a fluid and a liquid? Can a substance be both at once? I assume that the difference is great, and would like to have other opinions.—H. W. H.

3.—COLORING SHELLS.—Is there any way of coloring these a bright red?—C. H.

4.—HYDROGEN GAS.—Is there any process yet discovered by which illuminating gas can be made over into pure hydrogen? Has the metallic base of hydrogen ever been discovered?—E. X.

5.—NITRIC ACID IN BATTERY.—Is the nitric acid, in the porous cup of a Grove or Bunsen battery, raised any degrees of temperature; and if so, about how many, if the acid is put in at about 60 degrees Fahr.?—E. X.

6.—FROZEN WATER MAIN.—Will some of your readers please inform me which is the quickest and cheapest way to thaw out 150 feet of frozen water main, 4 feet under ground?—C. H. J.

7.—COMPRESSION OF WOOD PULP.—Is there any way by which wood pulp can be compressed so as to be impervious to liquids, without destroying the elasticity of the wood?—H. B.

8.—FAST COLORS.—Will some of your readers inform me how I can make a dye of logwood and copperas "fast" so that it will not rub off?—F. W.

9.—BRASS COLORED PAINT.—Can any one tell me if there is any paint of the same color as brass, and of what is it made?—O. W. V.

10.—ELASTIC CEMENT.—I have broken an india rubber gas bag; will some one please give me a recipe for a good, durable elastic cement, suitable for mending it?—W. M. S.

11.—W. B. D., of N. J.—Please give us the title of the book you refer to containing notice of asbestos packing. Also extract, if convenient.

12.—BATTERY FOR PLATING.—I would like to know how to make a good galvanic battery for plating with gold and silver. I want some one to tell me how to get up the cheapest and best for that kind of work.—W. B. J.

13.—CRACKED FLUTE.—Will some one please inform me how to keep a flute from cracking, and how to stop cracks that have already appeared?—A. E. T.

14.—TANNING BUFFALO HIDES.—Can any one inform me how the Camanche Indians tan the hides of buffaloes, so that the leather does not get hard and horny, nor does the hair come out?—B. F. B.

15.—PAINTING IRON BATH TUB.—Will some one inform me what kind of paint I can use for painting my iron bath tub, that will adhere and not scale off in a short time? I have had it painted several times with pure white lead mixed with raw and boiled oil; but it scales off.—C. A. H.

16.—DISCOLORED GLASS.—Last summer I had some large glass panes put in my front windows; they have a smoky appearance. It seems to be on the surface and not all through the glass. Is there nothing that will remove it? It is not smoke; if it were, I could remove it with turpentine.—W. G. E.

17.—STAINS ON MARBLE.—What is the best method by which weather, tobacco, grease, iron rust, and other stains can be removed from marble; and by which the original polish can be restored?—A. P.

18.—PAINTING SHEET IRON.—Will some of your correspondents give me a recipe for some kind of paint or substance for coating a sheet iron smoke stack, to prevent its rusting and to stand the heat?—J. C.

19.—HEATING BY STEAM.—How large a boiler will it need to heat a building 60x30 feet, and four stories high? How can I calculate the size of a boiler required to heat any particular building?—J. C.

20.—MICROSCOPY.—I have a microscope (non-achromatic lenses) which, though it shows a transparent object clearly enough, gives little more than the outlines of an opaque one. How can this difficulty be overcome? Will a condenser make the whole top of an object plain?—A. M.

21.—MATCHES FOR MOLDING.—Can any of your readers inform me how to make sand and oil matches to mold from, and how to prevent plaster matches from softening with work?—O. K.

22.—LETTERS FOR PATTERN MAKERS' USE.—What kind of metal is used, what are the proportions of mixture, and what is the best way to make, letters, figures, etc., for model and pattern makers to use on their work?—J. M. S.

23.—PIN SPOTS IN STEEL.—How can I treat steel so as to soften the hard spots or pins in it? I have bars of the finest steel I could purchase in New York, but it all has had spots in it. I have tried many different ways to soften them and failed. How can I make steel as soft as possible without hurting its quality?—H. M. H.

24.—IRON CASTINGS.—Is there any process by which soft iron castings can be made from old castings, without the addition of new iron?—H. M. H.

25.—SUCTION FAN.—What is the best shape for the wings of a suction fan, intended to draw the shavings from four or five planing machines? What should be the shape of the spouts, and the proportionate sizes of inlet and outlet?—J. E. G.

26.—CARBON BATTERY.—In your paper of Jan. 6th, 1872, there are directions for making a carbon battery, and also for making the carbon plates. I have been experimenting in electricity, and I was anxious to try the different kinds of batteries, so I tried to make a carbon battery. I made the plates all right, but when I came to set the battery to work, it would not go; and I have failed to make it go. Can any one give me definite instruction as to what are the component parts and quantities necessary to make a carbon battery?—L. E. H.

27.—TEMPERING STEEL.—Is there any way in which I can bring a large number of small steel articles to a uniform degree of hardness, other than the slow process of "drawing?" Will dropping them into some liquid, heated to a high temperature, prevent them from becoming too hard?—E. B. T.

28.—BURNING CHARCOAL.—I am engaged in the manufacture of charcoal. I burn about sixteen cords in a pit. The wood is cut four feet in length, set up endwise, two tiers high, to form a conical shaped pit, and covered with earth in the usual manner. I have experienced difficulty in charring the ends of the lower tier, which rest on the ground, having a loss of 8 to 15 per cent in "uncharred butts" left in the pit. Will some one give me the best mode of burning? Also, tell me if any have tried or seen ovens used similar to cooking ovens for burning charcoal?—B. C. C.

29.—MEASURING FLOW OF WATER.—How can I ascertain how much water would flow over a given point, in a given time (say one minute) in a creek? The minimum of water flowing in the creek is 45 square inches. Its descent is as much as 20 feet in 30 rods. The plan given in your valuable paper a year or two ago for this purpose is useless to me, because there are so many short turns and obstructions (fallen trees) in the creek.—C. B.

30.—PLASTIC SLATE ROOF.—Is there any way of repairing a plastic slate roof which has, in three and a half years, become so cracked and torn as to be exceedingly dangerous? The roof originally consisted of a heavy coat of felt, covered with some composition which is now, with the felt, highly inflammable.—J. M.

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.

F. B., of Conn.—Your question about fire from steam pipes has been repeatedly answered in these columns, both in editorial articles and answers to queries. We do not wish to reopen the subject at present.

D. B. H., of S. C.—We have met with no explanation of the statement that the eyes are affected in ice boating when running with the wind at high speed. We have, in our own experience, suffered no such inconvenience.

W. K. R.—Sound is the vibration of the air; the rubbing of a goblet with wet fingers produces vibration in the glass which communicates it to the air and to the ear. Let him rub a goblet in a vacuum, and listen if he hears anything.—J. A. L., of O.

VOLTAIC PILE.—Let T. F. G. take disks of copper, zinc, and woolen cloth of any size, soak the cloth in a solution of sal ammoniac, then pile them up in the following order: copper, zinc, cloth, and so on; then connect the outer disks with a copper wire. The larger the disks and the greater their number, the greater is the intensity of the current.—J. A. L., of O.

VOLTAIC LIGHT.—It will take a battery of forty cells of Grove's elements to make an electric light of any considerable size. If, however, you have a battery of another kind, you can take as follows: Forty-five Bunsen's, fifty-five Daniells', or seventy-five Smee's. Grove's battery is the cheapest and best for the more striking effects of electricity. The carbon pencils should be made of the same kind of coke as the carbon in Bunsen's battery. Browning's lamp is the cheapest lamp for exhibiting the light.—E. X., of Mass.

RAISING NUMBERS TO FRACTIONAL POWER.—T. M. N., query No. 6, Feb. 24. The best way to raise a number to the power of a fraction is to take the logarithm of the number from a table of logarithms, multiply that logarithm by the fraction, and find in the table the number corresponding to that product. The number, expressed in whole numbers and decimals, will be practically accurate.—.——.

BREAKING OF CAST IRON PULLEYS.—The explanation of C. M. R.'s broken pulley is this: Cast iron is always crystalline, and wrought iron often becomes so by constant jarring. That pulley was crystalline in the interior while the surface was not. This caused the interior to expand or rather to attempt to. So long as the surface was whole, the interior was bound, so that it could not expand freely. But when the surface was broken the tension was removed, the piece expanded fully, and became too large to be replaced.—.——

CARBONIC ACID GAS IN WELLS.—With regard to carbonic acid gas in wells, the most simple plan to get rid of it is to get a blacksmith's bellows—an old one could be borrowed in almost any town—and a tin or lead gas or steam pipe. Attach it to the nozzle of the bellows and run it to the bottom of the well; so long as the bellows is worked the well will be free from gas. A well digger in this place burned shavings in a well he was digging every hour; still his workmen were so affected they were about abandoning the work, when the contractor came to me to see if I could tell him how to get rid of the gas; I told him of the bellows; he borrowed one and set a boy to working it, and his men worked for and finished the well without further trouble.—M. W., of N. J.

Speed of Circular Saw.—D. S. B. inquires as to this, and N. B., of Pa., answers that it will be safe to run 1,900 revolutions per minute. About 15 years ago, I gave 9,000 feet per minute for the rim of a saw to run as a proper speed, with some slight variations under certain con litions. This rule has been generally adopted. But N. B. would run it about 19,500. I assert that this is a random guess, without any practical demonstration; and, if put into practice, some one will get their brains split open. Nine thousand feet per minute for the rim will run a 52 inch saw about 698; 700 is plenty, and 400 revolutions will saw 10,000 feet per day easily.—J. E. E., of Pa.

Tempering Steel Bits.—If H. G. will put in six quarts of soft water one ounce of pulverized corrosive sublimate, two ounces of pulverized sal ammoniac, and two handsfull of common salt, he will have no trouble in making his steel bits hard enough and tough enough. Let him heat the bits to a cherry red only, and plunge them in and not draw any temper.—W. M., of Ill.

The Appian Way.—Can you tell me the age of the Appian Way, and whether it was made of stone or asphalte?—L.—Answer: The Appian Way (*Via Appia*) extended from Rome to Capua, and was built by Appius Caecus the censor, in the year B.C. 312. It was made by first driving piles into the swampy ground to lay a solid foundation; then a layer of stones about the size of hen's eggs, then a course of rubble work in lime cement, then one of broken bricks and pottery, set also in cement, then a pavement of the hardest stone, fitted together with the greatest nicety. At the end of the road towards the city of Rome, the stone used is a basaltic lava. Two thousand and more years traffic has done little to wear this roadway, and the solidity of its construction is a standing reproach to the mud road makers of the present day.

Brittleness of Horse Hoofs.—If E. E. S., query 18, February 24, 1872, will tie a woolen cloth saturated with vinegar and water (equal parts) loosely around the hoof two or three nights out of every week, he will find that the hoof will become soft and pliable. Do not let the cloth touch the hair. If the frog is hard, put a sponge soaked with weak soft soap in the bottom of the foot. At certain seasons of the year, I put this on all my horses' feet to prevent brittleness. This treatment is simple and clean, and instead of conveying disease (as many other preparations do) will prevent and cure fever in the feet, and often carry off disease.—J. A. F., of Mass.

Balancing Slide Valves.—In No. 8, current volume, you express doubts whether Western engineers balance only the ports in their slide valves. Having had some little experience this way myself, I should not hesitate to assert that any slide valve, having a greater amount of balance than this, however perfectly fitted, would not keep its seat during one revolution of the engine. At least, this has always been my experience.—F. F. H., of N. Y.

Brewing Light Ales.—In answer to J. A. R.'s query, No. 9, page 138, Vol. XXVI., I would say: Let him take an ordinary firkin, put in a false bottom, full of holes, about one inch above the real bottom. Then lay a layer of clean straw over the holes. Then put in eight quarts of good malt and pour on it four gallons of hot water; after that has leached through pour on two gallons more hot water, and after that one gallon cold water; then boil the liquid of the three leachings thirty minutes, adding one quart good molasses and four ounces good hops. Stir it well; then strain it in a clean tub and, when about milk warm, add one and a half pints good yeast. Stir it well and let it stand until it rises and begins to fall, then skim off the yeast on top and save it for a future brewing. Bottle in strong bottles and set in a dark place; and you will have an excellent table beer. Lessen the quantity of malt if you want a weaker beer. This beer has been highly recommended by physicians for invalids.—C. S. P., of Mass.

Foul Air in Wells.—I occasionally find damp or foul air in wells. My plan for removing it is (if there is a pump in the well) to pump water down the well on one side. The water going down one side forces the air up the other, creating a circulation. I have tried other plans, such as throwing burning straw down the well and throwing hot stones down; but had very poor success compared to that with the pumping, as described above. Where there is no pump, I tie a common basket to a line, and operate it up and down the well; this soon gets a circulation, and so answers the purpose.—J. W. H.

Declined.

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

Geometrical Problem.—L. G.
Proportioning Toothed Wheels.—T. H.
Small Pox.—W. H.
Sugar Manufacture.—C.
Testing Water Wheels.—N. F. B.—G. C.—W. W. H.
Zodiacal Light.—S. B. C.
Answers.—C. P.—S.—H. B.—F. C.—H. B. B.—C. C. W.—G. M. T.—W. H. R.—G. P.—W. H. B.—M.—C. F.—P.—H. D. I.
Notes and Queries.—C. V. R.—W. H. K.—C.—W. T. J.—D. S. H.—I.—G. K.—G. M. T.—F.

Recent American and Foreign Patents.

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

Steam Boiler.—Michael Smart, of New York city.—This invention relates to an improvement in steam boilers whereby the steam is quickly separated from the water, and the danger of explosion is reduced, while at the same time the heat of combustion is more fully utilized than in other boilers. The invention consists principally in the application of a steam arch or vessel above the cylindrical body of the boiler, and in its connection with the latter in such manner that a smoke passage is formed between the two.

Electric Carriage.—Lawrence W. Coe, of Auburn, N. Y.—It is intended to provide carriages adapted for being propelled by magnetic engines directly applied to the hind axle to which the wheels are to be keyed, so that the turning axle will turn the wheels; and for so applying the engine it is necessary that the frame, to which the shell or frame of the engine must be connected, be arranged directly on the axle without springs, for any vibration of the engine, except with the axle, would interfere with the proper working of it. And as it is highly important that the body of the carriage be capable of springing, it is mounted at the rear on springs which are mounted on the axle independent of the engine frame, which is also mounted on the axle but without springs; and at the front of the box or body it is hinged to the frame. In making very short turns in narrow streets where a carriage has to be backed up to the curbstone, it is necessary with carriages having the steering apparatus arranged in the common way, to turn the wheels nearly around a half circle to bring them from where they stop in backing up to the right position for going forward. The inventor therefore proposes to have the bounds circular and provide the lower one, which is supported on springs, with cogs all the way round, and mount a hand shaft and pinion on the upper one, which is suspended rigidly from the carriage frame, so that the wheels may be turned wholly around, by which, in such cases, they may be brought into the required position much quicker and by a shorter movement than when turned back in the ordinary way. The wheels are made of thin disks of sheet metal, preferably steel, punching out the axial holes for the hub, and other places, to remove all surplus metal and to fit them on the ends of a long hub, against collars, springing the disks very nearly or, in some cases, entirely together near the peripheries which are beveled and curved outward for the reception of india rubber tires. The parts riveted together are attached to a concave or square grooved metal tire, in which the india rubber tire is placed. The disks are clamped against the collars by nuts screwing on the hub. This hub is preferably made of wrought iron or steel and fitted up by turning in a lathe, but it may be made of malleable cast metal. Instead of applying the brakes to the rims of the wheels, as is common in land carriages, but which cannot well be done when india rubber tire is used, a friction wheel on the axle and a friction band is used with actuating levers for working it; one end of said band being connected to the carriage frame and the other to the lever in the usual way of arranging brakes of this character.

Traveling Bag.—Jacob Lagowitz, of Newark, N. J.—This invention has for its object to furnish an improved mode of making traveling bags, etc., by means of which the cover of the frame, the cover of the bag, and the lining may all be sewed at the same time, and with a sewing machine; and it consists in the mode of making the bag, as hereinafter more fully described. In making traveling bags in the old way, the edges of the cover, or the frame and the edge of the cover of the bag, were brought together upon the inside, and sewed by hand. The edge of the lining was then brought over the seam thus formed and sewed by hand, thus requiring two rows of hand sewing all around each half of the bag. In making a bag in accordance with this invention, the edges of the cover of the frame are brought together at the edge of the frame and turned outward. The edge of the cover of the bag and the edge of the lining are then brought together and placed upon the inner side of the edges of the frame cover, a narrow strip of the lining being interposed between the edges, which are then sewed together by a machine, the free edge of the strip being afterward pasted down over the edges of the cover and lining.

Brush for Applying Blacking to Boots and Shoes.—Nathan Eisenmann, of New York city.—This invention has for its object to furnish a simple and convenient brush for applying liquid blacking to boots and shoes, and for various other uses; and it consists in constructing the brush proper, or the parts rigidly connected therewith, so that it shall be adapted to be attached to the nozzle of a can. With this brush the blacking can be applied to the surface of boots and shoes readily, conveniently, and quickly, and at the same time without danger of soiling the hands.

Car Window.—William McCaull, of Philadelphia, Pa.—This invention has for its object to improve the construction of the windows of railroad cars street cars, etc., so that they may be more convenient and reliable in use and more satisfactory in operation than when arranged in the ordinary manner. It consists in an elastic cord and adjustable plate in combination with the box, stile pulley, and the sash or blind of the window, so that, when the sash or blind is lowered, the cords are put under tension, and when released the elasticity of the cords shall close the sash to its proper place.

Gopher Trap.—John Bowman, of Santa Cruz, Cal.—This invention consists principally in providing the outer end of the trap with an appliance whereby the interior can be made light or dark at will. The gopher's habit is to repair whatever damage is done to its burrow, to close holes that may be made by outsiders, and open such that have been closed. The trap can be adjusted to suit either plan, and is made dark when put within an open hole, to cause the attempt at reopening, and light when put into a closed passage to attract the animal's attention and attempt at reclosing. The invention further consists in a peculiar arrangement of spring, trigger, and swinging gate, all being so made that the trap cannot easily get out of order, and will be convenient for use and inspection.

Well Auger.—Francis Spees, of Tabor, Iowa.—This invention furnishes an improved auger for boring wells and for other earth boring purposes. The upper part of the worm is preferred to be made of a larger diameter than the lower part, so as to ream out or enlarge the hole, part of the dirt being thus received upon the upper part of the worm, thus diminishing the friction of the dirt upon the worm, and, consequently, the power required to operate the auger. In this case, a lip should be attached to the edge of the lower end of the enlarged part of the worm, to shave off the sides of the hole and leave them smooth. The hole may also be reamed out by a projecting vertical knife, the ends of which are bent inward and are attached to the flange or thread of the worm. By this construction, when a hard stratum of earth is found, the knife may be detached and a smaller hole bored through said stratum, the knife being afterward attached and the hole reamed out or enlarged to the desired size. A combination, with the stem, of the rigid section of the worm, an angular bit, and a sliding worm are the features upon which a patent has been obtained.

Ruling Pen.—Elliot Ingram, of Springfield, Mass.—This invention has for its object to improve the construction of ruling pens, in such a way that when different colored inks are used the inks may not become mixed while the ruling machine is being used; and it consists in the combination of a guard or shield with the pen, as hereinafter more fully described. The pens are constructed with grooves to conduct the ink to the paper in the ordinary manner. With the ordinary pens, the ink is liable to run back along the shank to the clamps, and along the clamps to the next pen so that the different colored inks become mixed. To guard against this, a guard or shield is attached to the shank of the pens so as to prevent the possibility of the different colored inks becoming intermingled or mixed. The guard or shield projects upward and rearward, so as not to interfere with properly securing and operating the pens.

Drop Leaf Attachment for Sewing Machine Tables.—Evelyn F. French, of New York city.—This invention has for its object to provide a drop leaf, applicable to sewing machine and other tables of suitable kind, and nicely fitted to whichever table or kind of table it may be applied. The invention consists in the application, to the devices which fasten the leaf to the table, of a pair of hinged springs that insure the flush position of the leaf when swung up into a horizontal position.

Milk Cooler.—Charles A. Douglass, of Franklin, N. Y.—This invention consists of milk troughs within water troughs in gangs or series, preferably one above another, with water and milk discharge pipes and adjustable apparatus for regulating the hight of the water surrounding the milk troughs. A high, narrow, and long frame is adapted to support a series of water troughs, one above another. A milk trough in each water trough is supported above the latter to allow the water to surround the lower part. A discharging nozzle for each water pipe, with a short vertically adjustable tube, tightly fitting the nozzle and extending above the bottom so that the water that escapes must pass through it from the upper end, is adjusted higher or lower and will vary the hight of the water accordingly. Branch water escape pipes lead into a main pipe which conveys the water away. The discharge nozzles of the milk troughs extend down into bushings screwed up through the bottoms of the water troughs water tight and fitting the nozzles so as to prevent leakage around them. Both the water and milk branch pipes are provided with funnels at the upper ends, to insure the receiving of the water while allowing the nozzles to be removed and reapplied frequently as the troughs must be frequently taken down to be cleaned. This is claimed to be a simple and efficient cooling apparatus for holding milk to obtain the cream.

Potato Digger.—William W. Speer, of Pittsburgh, Pa.—This is an improved machine for digging potatoes and separating them from the soil with which they are raised, which consists in the construction and combination of arms pivoted or hinged to a shaft and bifurcated or slotted to receive the cranks of another shaft, and also in adjustable bent bars in combination with the frame, crank shaft, slotted arms, shaft, shovel, and axle.

Folding Table.—Alfred C. Ballard, of Winooski, Vt.—This invention has for its object to so arrange an ordinary or any drop leaf table that it can be folded into a small space for convenient transportation; and consists, principally, in the application of drop leaves, which can be folded under the box or frame of the table top, and in their combination with folding legs. In this manner, the upper part of the table can be conveniently folded into quite a small space. The legs of the table are pivoted within the box in such manner that they can be folded into the same. When they are folded together, and the leaves also folded against and under the box, the entire table will be no larger than the box with the thickness of the leaves added to its width and depth. When the legs are swung down for supporting the table, they are held in place by means of suitable hooks or catches. The drop leaves, when extended, are supported on suitable pivoted or hinged brackets or bars

Car Brake.—George H. Reynolds, of Parsons, Kansas.—This car brake is so constructed that the weight of the caboose or rear car of the train may be employed to apply the brakes to all the other cars of the train. It consists in a shaft with the bumper head chain wound around it, with other mechanism and chains, rods, etc., combined with the brake mechanism of a train of cars in such a way that the brakes will be applied to all the cars of the train with the full force required to draw the rear car. The force required to draw the rear car may be increased by applying the brakes to the said rear car in the ordinary manner. This device is designed especially for freight trains, but may be applied to other trains, if desired.

Device for Locking Nuts.—Samuel B. Lowe, of Chattanooga, Tenn.—Plates having end slots and lips to lock the two end nuts, and also two central apertures to receive the two middle nuts which hold a fish plate to its rail, are not new; but this construction compels these lock plates to be rigid and unadjustable, while by employing a separate and independent plate for every two nuts each becomes adjustable, and it is no longer required that the middle nuts should be always placed in one arbitrary position. A plate having only a long slot and two long arms at each end, to adapt it to be applied adjustably to a pair of nuts, constitutes the improvement.

Trolling Hook.—George Sinclair, of Chicago, Ill., assignor to himself and Charles E. Sinclair, of same place.—This invention relates to a new method of attaching fish hooks to spoons, propeller wheels, and other styles of trolling hooks; and consists in forming, on the spoons or wheels, wedge shaped sockets in which the eyes at the end of the hooks are securely held. The advantages of this mode of fastening are, first, that the hook can be removed when worn or useless and replaced without difficulty; and that, moreover, a stronger connection is obtained than by the ordinary method of soldering.

Stop Motion for Drawing Frames.—Daniel W. Hayden, of Wauregan, Conn.—This invention consists of a combination, with the drop catch lever and trumpet and the stop wheel heretofore used for throwing off the belt for stopping the machine when the "end" or "sliver" breaks, of a weighted catch lever arranged in such manner that it holds the trumpet guide for the sliver in the working position, and is thrown into contact with the stop wheel to stop the machine in case the trumpet is pulled down by knots or bunches on the sliver clogging it.

Self Sealing Pail.—Chas. A. Marshall, Cleveland, Ohio.—This invention consists in providing a pail (adapted to various uses but designed chiefly for transporting milk and other liquids) with a cover which may be tightly secured by means of a detachable screw hook connecting with a screw eye in the bottom of the pail. This means of securing the cover is easy to apply at well as cheap and safe, while it does not render the pail unadapted to use without it.

Railroad Track Cleaner.—Alexander Blakely, Fairfield, Iowa.—The invention consists in removing the sand which is spread in front of locomotive wheels to produce traction, by means of a brush arranged in rear of the hindmost drive wheel and rotated by said wheel. This brush is raised or lowered, and held to or away from the track by simple and convenient mechanism.

Tool for Cutting Sheets of Wet or Pasted Paper, Woven Fabrics Leather, Zinc or Lead.—John F. Bright, Washington, D. C.—The invention consists in a new tool for cutting leather, woven fabrics, zinc or lead with a rotary knife. It is provided with a gage and clamp by which it is enabled to cut with great accuracy and uniformity. It is adapted to be used as an independent tool or is readily attached to a bar, pitman or lever of any cutting machine. It was declared by the Patent Office to be entirely new in its principle of operation and is certainly a step forward in this class of invention.

Dropping Attachment for Harvesters.—Byron Seneff, Chillicothe Ohio.—The invention consists in a peculiar mode of dropping the bundles of grain from an inclined slide, without scattering, of uniform size and with the straws even. The effect of this is to save much grain that is usuallyl by scattering and by dropping from the bundle, as well as to enable it to thrashed with more facility and thoroughness.

Surface Blow-off for Marine Boilers.—Benton C. Davis and John T. Hardester, Baltimore, Md.—The invention consists in effectively and economically discharging the scum from a marine boiler, by blowing steam and water from the centre of the water surface, and drawing to a common center, automatically, all of said scum by producing a vortex at that point.

Harvester.—George S. Grier, Milford, Del.—The invention consists in constructing and arranging rake teeth upon endless carriers so that they will automatically fold when going under the platform and be erected as they ascend to the top. Its simplicity secures durability and cheapness of construction while its efficiency is unmistakable.

Metal for Brake Shoes for Railway Cars, etc.—Wm. McConway, Pittsburgh, Pa.—The patentee produces a very close grained, tough and durable brake shoe by suitable admixture of pig iron, malleable cast iron and steel. It has been practically tested and found to exceed the common shoe in durability as 20 to 1.

Sewing Machine.—Quinten M. Youngs, Utica, N. Y.—This invention consists in having the pulley, on the main shaft of a sewing machine, so arranged that it may be locked with the shaft to drive it in the ordinary operation of the machine, and unlocked to run loose and not work the machine when it is required to use the driving belt or the said pulley for working the bobbin winder, and thus avoid having to remove the work from the machine and readjust it again each time a bobbin is to be wound, besides saving the unnecessary running of the machine.

Fanning Mill.—John Drummond, Trenton, Mo.—This invention relates to improvements in fanning mills; and it consists in certain arrangements of the shoes holding the screws and apparatus for actuating them, calculated to work them more efficiently than they can be as at present arranged. An arrangement, with the shoe suspended in the peculiar manner, of a lever, bell crank, oscillating shaft, and the connecting rods therefor, for actuating the shoe in different directions, said lever and shaft being actuated by the fan shaft, are the features on which a patent has been issued.

Machine for Drying Paper, Wadding, etc.—Elihu C. Wilson, Medway, Mass., assignor to himself and Edward Eaton, same place.—This invention consists in a long closed case, through which the bat is carried by an endless belt near the bottom, and into which air, either hot or cold, is blown above the bat and caused to impinge upon the upper wet surface in an evenly distributed way, and then escape at the opposite end, carrying off the moisture in an efficient manner. The size or paste used for stiffening the bats to adapt them for waddings, and which it is the particular object of this machine to dry, will be applied to the bat just previous to entering the case, the application being made in any approved way. This plan of drying is claimed to be much better than by the calender rollers, for in that case the wet side of the sheet is run upon the roller and the damp air necessarily forced through the bat to the outside. This destroys the crispness of the interiors of the mass, and thereby very greatly injures the quality of the goods. The improved plan of drying is applicable alike to drying paper, woven cloths, and the like.

Steamboat Chimney.—William J. Hamilton, Cairo, Ill.—The object of this invention is to provide suitable and convenient means for lowering and raising the top or upper sections of jointed steamboat chimneys. The apparatus is operated from the deck entirely. The device is designed to be attached to the chimneys of steamboats, for enabling them to pass under the bridges which frequently span navigable streams. Its advantages over any device for the same purpose now in use will, it is claimed, be readily understood and appreciated on inspection by all western steamboat men.]

Electromagnetic Annunciator.—Charles E. Chinnock, of New York city, assignor to Edwin Holmes, manufacturer of burglar alarm telegraph appliances for houses, stores, etc., 7 Murray street, New York city.—This is an automatic indicator for electromagnetic alarm or call apparatus, and means for establishing currents through inaudible or other signals whenever the indicator is set in motion. It is intended for use in alarm apparatus to first indicate the locality at which the operating current was established and subsequently start the alarm, and is equally well applicable to hotel annunciators and similar apparatus for showing the number of rooms and calling the attendant. The numerous features of the invention are embraced in ten different claims upon which a patent has been issued.

CULINARY BOILERS.—Joseph Gibbs, Opelousas, La.—This invention consists in a boiler having a wide flange adapted for supporting it on the top of pots or saucepans of different sizes, so that the body of the boiler sets down on the pot or saucepan to be heated by the water boiled therein, with which boiler is combined a circular weight, adapted to rest on the top of the flange, and press it down upon the edge of the pot so hard as to prevent the escape of the steam from the pot as readily as it would without said weight.

FOLDING CHAIR.—Charles Marcher, New York city.—The object of this invention is to so construct a chair that it may be folded up to occupy but little space when it is not in use, or when packed for transportation or storing away. It is particularly useful for steamer and steamboat travelers. The back and the front leg pieces for each side of the chair are in one piece, and are pivoted to the rear legs. A track of metal, or other suitable material, is rigidly attached to each side of the seat. A metallic plate is rigidly attached to the upper ends of each of the rear legs, having a pin projecting inward, so as to bear and traverse on the track when the chair is folded up or extended for use. A shoulder forms a stop for the traverse pin when the chair is extended. The bottom is pivoted to the lower part of the back. The arms of the chair are pivoted to the seat. There are slots in the arms, and pins in the back on which slotted arms work as the chair is folded or extended.

COMBINED TABLE, SOFA, AND BED.—David Katzenstein, New York city.—This invention relates to a new article of furniture, which can be used as a table, sofa or chair, and bed, as occasion may require, and which, at the same time, is extremely simple in construction and convenient to handle. It consists in a new combination of three cushioned plates, of which one constitutes the table top, the sofa or chair back, and also part of the bed bottom, according to the position in which it is placed. The bed clothes can be kept in a drawer while the device is used as a table or sofa.

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DESIGNS PATENTED.

5,563.—CARPET.—Jonathan Crabtree, Philadelphia, Pa.
5,564 to 5,568.—CARPETS.—John Fisher, Enfield, Conn.
5,569 to 5,573.—OIL CLOTHS.—J. Hutchison, Newark, N. J.
5,574.—VEST CHAIN LOCK.—K. Kaufmann, New York city.
5,575 and 5,576.—OIL CLOTHS.—C. T. Meyer, Lyon's Farms, Elizabeth, N. J.
5,577 to 5,597.—CARPETS.—E. J. Ney, New York city.
5,598.—COOKING STOVE.—L. Rathbone, Albany, N. Y.
5,599.—JEWELRY BOX.—G. Schoenemann, New York city.
5,600 to 5,603.—CARPETS.—J. H. Smith, Enfield, Conn.
5,604 to 5,607.—CARPETS.—G. C. Wright, New York city.
5,608.—SUSPENSION EYELET.—G. W. Averell, New York city.
5,609.—KNIFE HANDLE.—M. Chapman, Greenfield, Mass.
5,610 to 5,618.—CARPETS.—Otto Heinigke, New York city.
5,619 to 5,623.—CARPETS.—H. Horan, Newark, N. J.
5,624 to 5,630.—CARPETS.—L. G. Malkin, New York city.
5,631.—CARPET.—W. Mallinson, Halifax, England.
5,632.—SODA FOUNTAIN.—G. F. Meacham, Newton, Mass.
5,633.—CARPET.—J. J. Patchett, Halifax, England.
5,634.—BIRD CAGE HOOK.—A. Wunder, New Haven, Conn.
5,635.—IRON BRACKET.—M. D. Jones, Boston, Mass.
5,636.—CARPET.—A. McCallum, Halifax, England.
5,637.—CEILING ORNAMENT.—G. Protin, New York city.
5,638.—CLOCK CASE.—P. B. Wight, New York city.

TRADE MARKS REGISTERED.

681 and 682.—BLEACHED LONG CLOTH.—Coffin & Altemus, Philadelphia, Pa.
683 to 687.—PHOTOGRAPH ALBUMS.—W. W. Harding, Philadelphia, Pa.
688.—CLOTH AND PAPER.—The Manhattan Cloth and Paper Company, New York city and Newark, N. J.
689 and 690.—SMOKING TOBACCO.—Winfree & Loyd, Lynchburg, Va.
691.—GIN.—Adams & Taylor, Boston, Mass.
692.—WHISKY.—Adams & Taylor, Boston, Mass.
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

20,356.—PROTRACTOR.—J. Lyman. May 8, 1872.
20,314.—VALVE COCK.—S. Adams. May 8, 1872.
20,341.—HORSESHOE MACHINE.—C. H. Perkins. May 15, 1872.
20,649.—VAPOR LAMP.—A. M. Mace. June 5, 1872.
20,692.—GRINDING MILL.—B. A. Beardsley. June 12, 1872.
20,837.—PRESSING STRAW BONNETS, ETC.—H. E. West. June 19, 1872.
20,411.—HARVESTER RAKE.—D. O. De Wolf. May 15, 1872.
20,447.—WHITEWASH BRUSH.—D. W. Shaw and W. McGraw. May 15, 1872.
20,542.—STONE CRUSHER.—E. W. Blake. May 29, 1872.

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[Compiled from the Commissioners of Patents' Journal.]
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HARVESTER.—L. Miller, Akron, Ohio.
METALLIC CANS, ETC.—H. W. Shepard and R. Seaman, New York city.
MOLDS, CORES, ETC.—W. Hainsworth, Pittsburgh, Pa.
MOWER AND REAPER.—W. Sprague, South Kingstown, R. I.
POSTAL CARDS, ETC.—A. L. McCrea, Washington, D. C.
PROPELLING VESSELS.—W. Condell, New York city.
REFRIGERATOR.—J. Gravenstine, Phila., Pa., D. W. C. Taylor, N. Y. city.
SEWING MACHINE.—Singer Sewing Machine Company, New York city.
STEAM GENERATOR, ETC.—A. G. Busby, Philadelphia, Pa.

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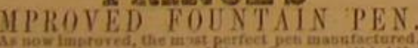

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