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SCIENTIFIC AMERICAN

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GREAT TELESCOPES.

Only eighty miles to the moon, or, rather, the human eye, to all intents and purposes, is brought within the above distance to our attendant satellite, through the annihilation of 160,000 miles of space by the immense refracting telescope represented in our illustration. Its magnifying power, in other words, is 3,000 times, and as the eye naturally receives a beam of light one fifth of an inch in diameter, this instrument, gathering from the surface of its twenty-five inch object glass, will have an illuminating power 15,625 times greater. That is, it will convey that number of times more light into the eye.

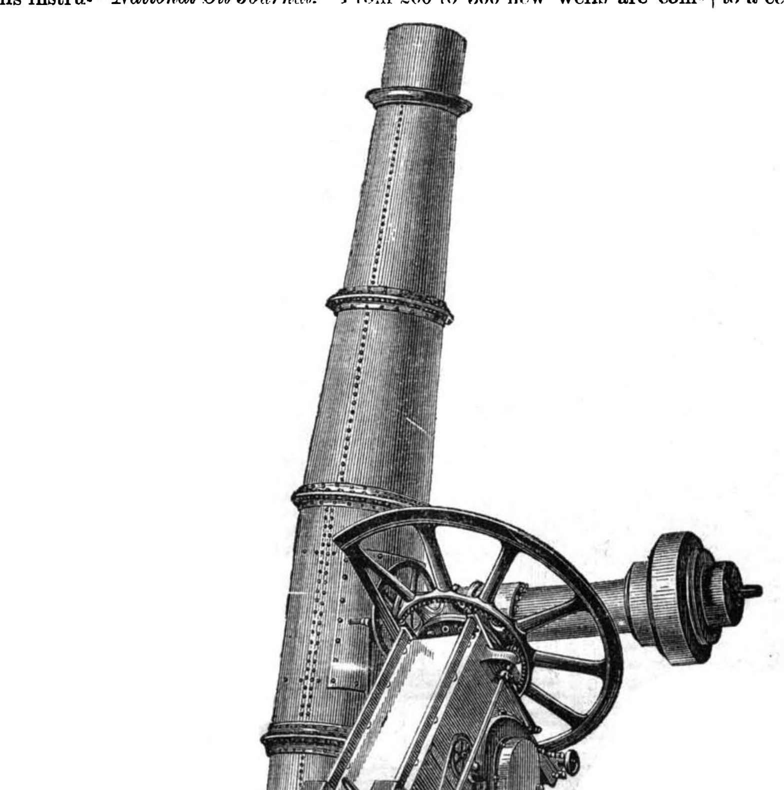
The object glass, now the largest in the world, was recently made in England. It is by far the most difficult part of the apparatus to construct, for it must be without blemish, *striæ* or wavy lines, of absolutely uniform density, and perfectly pellucid. To produce so large a lens, the labor is immense, for, with the increase of power, every defect is proportionately magnified. Even after the glass is cast, its grinding to exact curves and the application of the polish is a scarcely less formidable work.

The tube of this telescope is of steel, of strength sufficient to prevent the possibility of flexure under the great weight which it has to carry. A zinc tube within serves to cut off any currents of warm air which would disturb the cone of light. The instrument is mounted on a pillar, twenty-nine feet high, on which it is adjusted with the nicest precision. Suitable clockwork serves to carry it around in following any heavenly body which is under observation. The entire instrument weighs nine tuns.

The next largest telescope is located in the observatory in Chicago. It was made by Mr. Alvan Clark, and its object glass is eighteen and a half inches in diameter. The two next in size, having objectives three inches smaller, are of German manufacture and are located at Cambridge, Mass., and Pulkowa, Russia.

Though the instrument we illustrate is now the largest in existence, it will not long remain so. The Messrs. Clark, of Cambridgeport, Mass., have, for some time past, been engaged in grinding a twenty-seven inch lens for our Government, which, when complete, is to cost $50,000. The telescope in which it will be placed will, in all probability, be located on some elevated position, or in the astronomical station to be established by the United States Coast Survey Bureau, on the Sierra Nevada mountains. It will be situated at a hight of from seven to ten thousand feet above the sea level, in an atmosphere of great purity and comparatively free from clouds. This great instrument will doubtless allow of observations which will add greatly to our knowledge of physical astronomy.

Perhaps it may be the fortune of our readers at some future period to learn of the construction of the million dollar telescope, to be built under government auspices, the erection of which we recently advocated in these columns In such a case, instead of being eighty miles from the moon, as we now virtually are, we should reduce that distance to four or five miles. The magnitude of the results which could thus be obtained can hardly be conceived; but the question of the existence of human or other beings in the moon, which, from the times of that veracious scientist, Baron Munchausen, to the present day, has disturbed the mental equilibrium of sensational would-be astronomers, might at least be definitely settled through the convincing agency of direct optical proof.



THE LARGEST REFRACTING TELESCOPE.

Novel Fire Alarm.

Mr. N. M. Booth, Secretary and Superintendent of the Ohio River Telegraph Company, at Evansville, Ind., has lately put a novel fire telegraph and steam signal apparatus into operation in that city.

The telegraph is so arranged that, when the circuit is closed, it pulls the support from under a lever. The lever, being an extension of the handle to a cock, falls and swings back and forth, letting on the steam and cutting it off as it continues to swing. When oscillation ceases, the whistle gives a prolonged scream until the lever is replaced ready for another alarm. This line is only a part of Major Booth's invention, being intended as a signal to the engineers to put on extra water pressure in the water pipes when a fire occurs. On a recent trial a police officer turned the alarm key, when instantly the steam whistle tooted out five or six puffs and then settled down to a long shriek.

Names of Oil Wells.

We have frequently been amused as well as interested at the odd names given to oil wells in the oil regions, says the *National Oil Journal*. From 200 to 300 new wells are completed each month, and to each must be given a name by which it may known by the producers and pipe companies, and we do not wonder that owners should find a dearth of names or resort to those that seem odd. Should the same name be used more than once, much confusion and annoyance would be the result, and many times mistakes would be made that it would be next to impossible ever to correct. We find one man, who evidently thinks much of the game of cards, who has named his wells "High," "Low," "Jack," "Game," "Seven Up," etc. Another man thinks more of such things as "Race Course," while "Reliable" and "Prosperity" and "Calamity" figure very conspicuously with "Faith," "Hope," and "Charity." Not far away, and beneath the "Maple Shade," another, with "Wild Cat," "Black Sheep," and "Devil's Ridge," closely fills up the background, and we might go on indefinitely, but we forbear. "What's in a name," if the well pays?

Air and Steam Engines.

It is well known that the injection of a certain small quantity of air amongst the steam that is to supply a steam engine has been found to produce improved economy of heat to a certain extent. There are obvious causes for this fact connected with the more efficient communication of heat from the fuel to the water and steam. For example the air may be previously passed through tubes which expose a large surface to the fire in addition to that which the steam boiler alone presents, or the air may be itself part of the products of combustion, being freed from dust by suitable processes.

The following remarks are intended to show that according to the principles of thermodynamics the air has a tendency, independently of the communication of heat from the fuel, to increase the efficiency of the steam in transforming heat into motive energy, and to show that it is worth while to test how far this beneficial action can be carried in practice, by the aid of experiments in which a larger proportion of air shall be employed than has hitherto been tried. It is well known that the efficiency of any heat engine is limited by the temperatures between which it works; the greatest possible efficiency, that is, ratio of work done to heat expended between given limits of temperature, being expressed by dividing the range of temperature by the absolute temperature at the higher limit.

In order that this theoretical duty may be realized, it is essential that all heat whatsoever received by the working substance should be received at the highest limit of temperature, and all heat rejected by the same substance given out at the lowest limit; for example, if the air is heated at five atmospheres and cooled at one atmosphere, of absolute pressure, the upper and lower limits of absolute temperature bear to each other the proportion of 1·58 to 1, and the theoretical efficiency is about 0·37. In a steam engine working between the same limits of pressure, the theoretical limits of temperature on Fahrenheit's ordinary scale would be about 296° and 212°, corresponding on the absolute scale to 757° and 673° Fahrenheit, and the theoretical efficiency would be equal to $84 \div 757 = \cdot 124$. It is easy to see in a general way that in an engine in which the fluid employed consists of air and steam mixed, the efficiency will be something intermediate between the quantities above set down, being less than that in which air alone is employed. The most efficient engine of all, theoretically, would be one in which nothing but dry air was employed. Here we are met by the fact that great practical difficulty has been found to attend the employment of dry air, in particular that it has been found almost impossible to prevent the heating vessel from becoming overheated, and consequently burned. On the other hand, an engine worked with steam alone is liable to fall considerably below the calculated theoretical efficiency. There is a certain proportion of air to steam which enables all the heat required for raising the temperature to be produced by the compression of the air, being the surplus over and above that which is required in order to raise the temperature of the air itself, and thus the efficiency of the engine is prevented from falling materially below the calculated theoretical efficiency for steam. In the examples already given, the compression of dry air to five atmospheres would produce a rise of 390° Fahr., while the actual rise required is only 84° Fahr., and without going into a minute calculation of the surplus heat produced by the compression of the air, it may be mentioned as the result of such a calculation that the surplus heat so produced amounts to about three fourths of the whole heat due to the compression, and that by introducing a mass of air at each stroke, equal to about one and one third the mass of feed water employed, the whole heat, necessary for raising by 84° Fahr. the temperature of the air and water, may be obtained by compression of the air alone, to the great benefit of the efficiency of the steam.

The above example appears to be sufficient to show that it is worth while, in what have lately been called aëro-steam engines, to carry experiment further than has hitherto been done in the direction of the introduction of large quantities of compressed air.

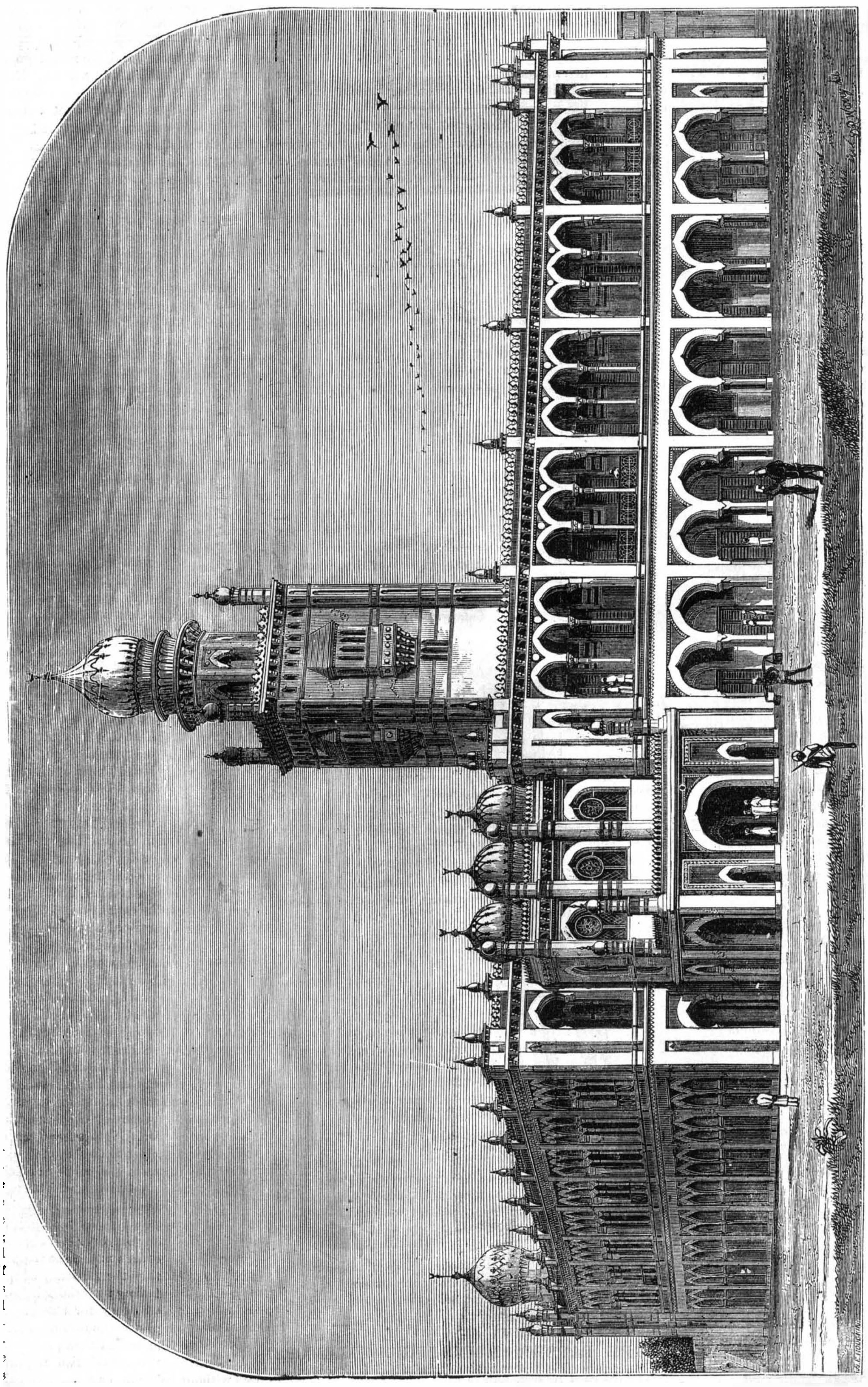
NEW BUILDINGS IN MADRAS FOR THE REVENUE BOARD OFFICES.

The Revenue Board Buildings in Madras, India, of which we append an illustration, stands adjacent to the old palace of the Nawabs of the Carnatic. The latter structure, which is now used as a college, is constructed in the mixed Hindoo-Mahomedan style so common in the south of India, and the general effect of the exterior (which is colored dark red and white) is more pleasing than that of many buildings subsequently erected by Anglo-Indians. The Government found it necessary to make extensive alterations and additions, and, by the desire of the Governor General, Lord Napier, these works have been carried out so as to assimilate the Revenue Board buildings with the older adjacent structure. Mr. Chisholm, the Government architect, while keeping to the general lines of the old structure, has taken his details and many forms from purer types of the style, and superior materials have enabled him to adopt a much lighter form of construction. When the offices have been completed, the outlay will scarcely be felt, as the amount of rent now paid by Government for private offices represents capital equal to the expenditure involved.

The material is the fine chunam of that coast, a well known and beautiful building stone.

The building finds favor in the locality; both Europeans and natives seem to take a general interest in its progress, and Lord Napier, in a lecture delivered there some time back, makes the following allusion to it:

"The Government has endeavored, with the advice of an accomplished architect, to exhibit in the improvements at the Revenue Board an example of the adoption of the Mussulman style to contemporaneous use. Mr. Chisholm would be the first to disclaim and condemn the material which has been forced upon him by necessities to which we are still subjected, but his design will be a practical demonstration of the views which I have here advocated. He has paid the first tribute to the genius of the past; he has set the first example of a revival in native art which I hope will not remain unappreciated and unfruitful."



THE REVENUE BOARD BUILDINGS IN MADRAS, INDIA.

The Practical Man.

The practical man derides those who bring forward new inventions, and calls them schemers. No doubt, whatever they do scheme—and well it is for the country that there are men who do so—it also may be true that the majority of the schemes prove abortive; but it must be recollected that the whole progress of art and manufacture has depended and will depend upon successful discoveries which, in their inception, were and will be schemes just as much as were those discoveries that have been and will be unfruitful; but the successful discoveries, because they are successful, are taken out of the category of schemes when years of untiring application on the part of the inventors have, so to speak, thrust them down the throat of the unwilling practical man. Take the instance of Mr. Bessemer, who was beset for years by difficulties of detail in his great scheme of improvement in the manufacture of steel. As long as he was beset the practical men chorused: "He is a schemer; he is one of the schemers; it is a scheme." Supposing that these practical difficulties had beaten Mr. Bessemer, and they had not been overcome to this day? The practical man would have derided him still as a schemer, although the theory and groundwork of his invention would have been as true under these circumstances as it now is. Fortunately for the world, and happily for him, he was able to overcome these most vexatious hindrances and make his invention that which it is. No one now dares to apply the term "schemer" to Mr. Bessemer, or "scheme" to his invention, but it is as true now that he is a schemer and his invention a scheme, as it would have been had he failed up to the present to conquer the minor difficulties. It is a species of profanation to suggest, but it as true, that Watt, Stephenson, Faraday, and almost every other name among the honored dead to whose inventive genius we owe the development that has taken place within the last century in all the luxuries, the comforts, even the bare necessities of our daily existence, would, in their day and while struggling for success, have been spoken of as schemers, even in respect of those very inventions of which we are enjoying the fruits.—*Popular Science Monthly.*

THE American cotton crop of 1872 will considerably exceed that of last year. The acreage this year is 8,656,504, an increase of 945,305 acres over last year. The average yield per acre last year was 0·885 of a bale, making the total yield 2,974,351 bales. At this rate the crop will be 3,290,000 bales.

The Teeth—Treatment of Exposed Pulp.

While we are not always and under all circumstances in favor of capping exposed pulps, says Dr. G. W. Klump, in *Dental Cosmos*, we believe that, when it is desirable, a large majority of teeth so conditioned may be treated and restored to health.

Our first effort is to remove all decay and foreign matter from over and around the pulp without injuring the pulp itself; next prepare a piece of punk of suitable size, moistened with carbolic acid, tincture of aconite, or any good anodyne, and after drying out the cavity carefully, place the punk over the exposed pulp and seal it up with cotton and sandarac, being cautious not to use too much cotton so as to cause a pressure on the pulp when the cotton swells. We let this remain in the tooth one, two, or three days, as the case may be, with special directions to the patient to come in, without regard to the appointment, at the first approach of pain. We regard this last injunction as highly necessary in the proper treatment of an inflamed pulp. If we can, by this means, keep an exposed pulp ten days or even a week without giving any pain, we consider the case one favorable for capping with oxychloride.

We now remove any decay that may yet remain along the edges of the cavity, and insert, for a few moments only, a pledget of cotton with carbolic acid. We then prepare another pledget of cotton moistened with glycerole of thymol, and after removing the former pledget, place this in the cavity and again seal up, say from five to ten minutes. In the meantime we take as much of the oxychloride and liquid as we expect to use, placing them on a glass slide near each other. We select an excavator of proper shape and size, and roll some cotton around it tightly, forming a kind of cotton probe. Having a bottle of collodion on hand, we now, by any means preferable, protect the cavity from the fluids of the mouth, remove the cotton with the thymol, dry out the cavity, and, with cotton saturated with collodion, give the entire cavity a coating. We now mix oxychloride to proper consistency, and introduce to the orifice of the cavity with spatula or flat burnishers, and with the cotton probe press to its proper place; keep it dry ten or fifteen minutes, then give it a coating with sandarac or wax, or, what is better, seal up with cotton and sandarac, and let it so remain ten days or two weeks. If the tooth during this time remains perfectly comfortable, it may now be filled over the capping with the permanent filling.

The above has, for some time, been our usual mode of practice. The almost unbearable pain which so frequently followed the capping, and which was such a serious cause of anxiety to both patient and operator, is by this means either entirely removed or so slight that it forms no important objection to capping, and, as we would naturally infer, is much less liable to produce destruction of the pulp than when such severe pain follows the operation. We have capped very many in this way, and they have, with few exceptions, proved successful in every respect.

PROFESSOR TYNDALL ON LIGHT.

The eminent English scientist and investigator, Professor John Tyndall, has for the first time appeared before a New York audience, and in two masterly discourses has opened a series of lectures on the subject of "Light." Familiar as we are with the admirable works of this learned author, we naturally expected an able and entertaining disquisition on the prolific subject he had selected; but we confess we were unprepared for so excellent, clear and scholarly an elucidation of the most elementary principles of physics. He fairly placed light in a new light, and by his simple explanation of theory and splendid execution of experiments illuminated with the brilliancy of his genius even the dazzling rays from which he drew such treasures of learning and thought.

It is a matter of regret to us that the pressure upon our columns and the rapid sequence of Professor Tyndall's lectures prevent our giving them *verbatim;* but the most interesting and striking portions will be carefully selected and presented as fully as our space will admit. An allusion to the favor with which his books were received in this country, and the circumstances which brought about his visit to the United States, constituted the introductory remarks of the opening discourse. After briefly glancing at the birth of science and in a few words tracing its progress to the time of Newton, the lecturer entered upon his subject proper at its very beginning: The ancients, he said, satisfied themselves that light moved in straight lines; they also knew that these lines, or rays of light, were reflected from polished surfaces and that the angle of incidence was equal to the angle of reflection. This knowledge constitutes our starting point. To the source of light to be employed during the experiments attention was asked, and after alluding to the generation of heat and light by combustion, Professor Tyndall brought together coke points, which being attached to the poles of a small voltaic battery, glowed with a white heat. Whence comes this heat? Suppose, in the first instance, when the thick wire was employed, that we had permitted the action to continue till one hundred grains of zinc were consumed, the amount of heat generated in the battery would be capable of accurate numerical expression. Let the action now continue with this thin wire glowing until one hundred grains of zinc are consumed. Would the amount of heat generated in the battery be the same as before? No, it would be less by the precise amount generated in the thin wire outside the battery. In fact, by adding the internal heat to the external, we obtain for the combustion of one hundred grains of zinc a total which never varies. Here, continued the speaker, we have an illustration of the constant law that in physical nature we have incessant substitution, but never creation.

Professor Tyndall then added some further remarks regarding the electric light, saying that it would constitute the mode of illumination for experimental purposes, and noting the fact that, during the intense glow of the carbon, the eye failed to see the coke points whence the light issued. This, he stated, is due to the spherical aberration of the organ, or in other words, that the circumferential and central rays have not the same focus. To illustrate by means of a lens, the carbon points in the lantern were projected on the screen. The image was faint and nearly obliterated by a halo of light by which it was surrounded. A similar effect is produced in the eye, the blur of light upon the retina being sufficient to destroy the definition of the retinal image of the carbons.

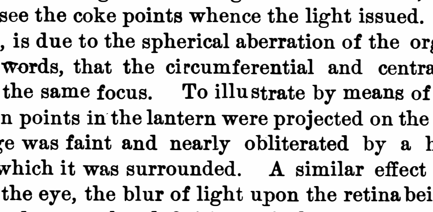
The theoretical defects of the eye were alluded to—its opacity, want of symmetry, lack of achromatism and absolute blindness in part—which, said the speaker, caused an eminent German philosopher to say that, if any optician sent him an instrument so full of faults, he would return it with the severest censure. Referring to the

PROPAGATION OF LIGHT,

its rectilineal nature may be shown by the simple experiment of allowing the rays to pass through a minute orifice into a darkened chamber, where external objects will be projected reversed upon a screen. Every straight ray proceeding from the object stamps its color upon the screen, and the sum of all the rays form an image of the object, which is seen inverted because the rays cross each other in the aperture. To explain this fact, the lecturer made a small perforation in a sheet of tinfoil stretched before the light in his lantern. A single reversed, though blurred, image of the carbon points appeared on the screen. A second aperture produced another image, several orifices a number of images, until if the foil be removed altogether all these bright figures run together and combine to form the circle of clear light.

ILLUSTRATION OF A LAW OF LIGHT.

The law that the angle of incidence is equal to the angle of reflection was experimentally illustrated by the simple apparatus shown in Fig. 1.

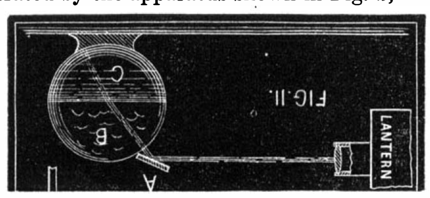


A straight lath is placed as an index perpendicular to a small mirror, A, capable of rotation. The beam of light from the lantern is received upon the glass and reflected back along its line of incidence. The index being turned the mirror turns with it, and at each side of the former the incident and the reflected beams are seen tracking themselves through the dust of the room. This device enables us also to illustrate the law that, when a mirror rotates, the angular velocity of the beam reflecting from it is twice that of a reflecting mirror. That is, referring to our engraving, that while the mirror B passes from the perpendicular to its represented position of an angle of 45°, the beams diverge to a right angle or 90°. This is shown by mere inspection from the position of the index.

Passing to the subject of

REFRACTION,

Professor Tyndall gave a short historical sketch, of the course of inquiry into the phenomenon from the year 1,100, by Alhazen, an Arabian philosopher, to the first discovery of the principle by Willebord Snell in 1621. The bending of the ray in passing from a thin to a dense medium was admirably illustrated by the apparatus shown in Fig. 2,



the lecturer observing that he preferred to produce direct optical proof rather than ask the audience to believe facts from chalk lines on the black-board. A circular vessel with its two sides of clear glass is partially filled with colored or turbid water; A is a movable inclined mirror which may be placed at any point on the periphery of the circle, so as to reflect a beam of light from the lantern either perpendicularly to the surface of the water or obliquely, as represented. Striking the liquid perpendicularly to its surface, the course of the ray is shown in a bright vertical line in the water, so that it is unrefracted. Meanwhile the beam passes unseen through the air above the water. Laughingly observing that he was not addicted to the small vice of smoking, Professor Tyndall lit a cigar and puffed the smoke into the space B, when the track of the ray became clearly apparent. Moving the mirror A to the position shown in the cut, the beam was caused to strike the liquid obliquely, when refraction was clearly produced as represented. Snell's discovery that the quotient (the index of refraction), obtained by dividing the sine of the angle of incidence by the sine of the angle of refraction, was always a constant quantity for the same medium, whatever the obliquity of the rays may be, was then graphically described and referred to as one of the cornerstones of optical science. This was applied by Descartes to the

EXPLANATION OF THE RAINBOW.

The bow is seen when the back is turned toward the sun. Draw a straight line through the spectator's eye and the sun; the bow is always seen at the same angular distance from this line. This was the great difficulty. Why should the bow be always, and at all parts, forty-one degrees distant from this line? Taking a pen and calculating the track of every ray through a rain drop, Descartes found that at one particular angle the rays emerged from the drop almost parallel to each other, being thus enabled to preserve their intensity through long atmospheric distance; at all other angles the rays quitted the drop divergent, and through this divergence became practically lost to the eye. The particular angle here referred to was the foregoing angle of forty-one degrees, which observation had proved to be invariably that of the rainbow.

Newton's experiment with the prism was then described, and served to introduce the subject of the

PHENOMENA OF COLOR.

Various well known experiments were made in the analysis and synthesis of light, proving that the colors of a spectrum may be squeezed or blended together by the aid of a lens; that an image of the carbon points, whence the light issues, may be built up from the colors of the spectrum, and that, in virtue of the persistence of luminous impressions upon the retina, the prismatic colors may be mixed together in the eye itself, the impression of whiteness being the result.

DISPERSION

is the drawing out of a white line into a spectrum. Newton supposed that refraction and dispersion were inseparable, but Dollond showed that, by combining two different kinds of glass colors could be extinguished still leaving a residue of refraction, and he employed this residue in the construction of achromatic lenses. This point was illustrated by throwing a beam through a prism of water and marking with a pointer the position of the spectrum on the screen; then, by adding a prism of glass, a white image was produced, which, compared with the point noted, was still considerably refracted. The refraction and dispersion of bisulphide of carbon, as compared with water, was alluded to in order to show the great extent and richness of color of the spectra of the former substance.

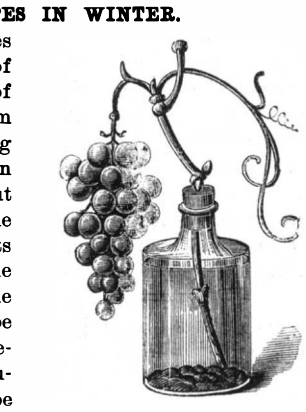
WHAT IS COLOR?

Natural bodies have showered upon them, in the white light of the sun, the sum total of all possible colors, and their action is limited to the sifting and appropriating from this total the colors which really belong to them and rejecting those which do not. The portion rejected gives them their hue. But what is black? Throwing a brilliant spectrum upon the screen, the lecturer placed a piece of black ribbon in succession in the different colors. It quenched all, and consequently blackness is the result of the absorption of the constituents of solar light. Taking a second piece of ribbon he held it in the red portion of the spectrum; it appeared as black as the first piece. He then moved it along until it reached the green, when it appeared of a vivid shade of that color. Therefore the ribbon absorbs all the red and yellow light and offers mere darkness to the eye; while it rejects the green and blue shades, appearing of its proper hue. The same was similarly shown with a red ribbon, which absorbed the green color and rejected the red. Why is it that on looking at objects through a red glass, all are tinged with that hue? This was answered by passing the dispersed rays through such a colored glass, when the spectrum showed nothing but the red, all other tints being quenched. A blue glass allowed blue, indigo, violet and green rays to pass, and a yellow glass permitted only the transmission of green, yellow, orange and red. A very beautiful experiment was made with a solution of permanganate of potash, which is a very exquisite purple and unlike the pure tone of that tint in the spectrum. Passing the light through the prism of that liquid, it was found that not only the purple but the red rays were allowed to pass, so that by the mixture of these colors the unusually beautiful shade was obtained.

BLUE AND YELLOW DO NOT MAKE GREEN

but white, as they are complementary colors. Why is it then that by mixing chrome yellow and Prussian blue we obtain a green pigment? It was shown in the course of the above experiments that a blue glass permits not only the blue of the spectrum to pass through it but a portion of the adjacent green. A yellow glass, though cutting off the blue, also allows the passage of the green. This may be expressed as follows, representing the colors by their initials, those absorbed being in italics, thus: Blue glass, *R, O, Y,* G, B, I, V; yellow glass, R, O, Y, G, *B, I, V.* Now combine both glasses; together they destroy every color but the green which, as experiment proved, appeared singly on the screen. Consequently the blue and yellow powders when mixed together absorb all other colors and appear to the eye as of the only color to which both are transparent. The blending of blue and yellow light to make white will be explained in a subsequent lecture. In conclusion, said Professor Tyndall, we may profitably glance back on the web of relations which these experiments reveal to us. We have, in the first place, in solar light an agent of exceeding complexity, composed of innumerable constituents, refrangible in different degrees. We find, secondly, the atoms and molecules of bodies gifted with the power of sifting solar light in the most various ways, and producing by this sifting the colors observed in nature and art. To do this they must possess a molecular structure commensurate in complexity with that of light itself. Thirdly, we have the human eye and brain so organized as to be able to take in and distinguish the multitude of impressions thus generated.

FRESH GRAPES IN WINTER.



Parties still having grapes on their vines at the end of October or the beginning of November can keep them fresh and juicy by observing the following method: When the first frost comes on, cut the grapes with a considerable stem, having one or two knots below and one above the grape (see engraving). The upper end of the stem is to be covered with beeswax to prevent the escape of the circulating juices. After the grape is thus prepared, remove all bad berries from the bunch, and place the stem in a bottle of water, having a layer of charcoal at the bottom, which tends to keep the water clean; then close the bottle with a cork letting the stem pass through the center, and cover the top with beeswax. Grapes prepared in this manner will be sure to keep fresh and juicy all winter. DAHEIM.

A Composite Counterfeit $500 Note.

The ingenuity of counterfeiters is well illustrated by the following recent development at Washington:

There was received, a few days ago, at the Treasury of the United States, a note purporting to be a United States legal tender note of the denomination of $500. It is composed of parts of different genuine notes of various denominations. The center is a part of a one hundred, with the "one" taken out in the center and upper border, and a "five" neatly inserted. The left hand lower end contains a portrait of Andrew Jackson taken from a five dollar note, and the right hand lower end, a vignette from a ten. The scroll work, containing the figures 500, has been taken from a national bank note. The back of the note is from a ten dollar United States note, the "ten" having been cut out and replaced by the "ovals" from the back of a five. Although this note is not calculated to deceive bankers and brokers, it would be readily taken by those who are not accustomed to handling much money, as the engraving is all genuine. Fortunately its general appearance has no resemblance to the note of the denomination of which it purports to be a genuine issue.

THE Boston *Globe* says: "Our friend Potts read somewhere that electric sparks could be evolved from a cat by taking it into a dark room and rubbing its back. He made the experiment, and was surprised to hear a loud yell, and to feel something clawing across his face. Then he missed the cat. Mr. Potts is now uncertain whether he was struck by lightning evolved from the cat's back, or whether she became unduly excited as he stroked her, and stroked back again; but he is certain that, when he undertakes to procure electricity again from a cat, he will first soothe her with a shot gun."

Correspondence.

[For the SCIENTIFIC AMERICAN.]

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the items of meteorological observations, for nearly all relating to meteors, and for some of the computations, in the following notes, I am indebted to students.

The places of the planets are given approximately only, the aim being to furnish to everyday readers such information as will enable them to recognize the principal planets.

M. M.

Meteors.

The evening of November 27 was marked by an unusual number of meteors. The period which includes the last week of November and the first of December is known to be one in which meteors are frequently seen, but there was no reason to locate the maximum of this period on any particular evening. At 5h. 15 m., before the daylight was over and when the sky was so much overcast by thin clouds that very few stars could be seen, a brilliant meteor, starting from the zenith, passed toward the west leaving a bright yellow train.

At 5h. 40 m. another, so brilliant that it attracted the attention of a student who was not near a window, passed from a point near the pole star to the horizon. Before 6 P. M. so many had been seen that, as soon as it could be arranged, a systematic look-out was instituted. Two students began at 6h. 20 m. to keep a record. They were aided, after half an hour, by three others, and the count was kept up until 8h. 45 m., when it became cloudy.

From 6h. 20m. to 7 P. M., more than 200 were seen. The frequency diminished after 7 P. M., but, in the 2h. 20m. during which the watch was kept up, 795 were recorded. It is not an easy task to trace the course of meteors in the few seconds of their apparition, but an effort was made to determine the radiant point. The constellations *Cassiopeia* and *Perseus* were named by the observers, but the greater number must have radiated from the latter.

More than ordinary interest is felt in the meteors of this period because they are supposed to be connected with Biela's comet.

The evenings of December 7, 10, and 11 have also been reported to me (by students) as the dates of remarkably bright meteors.

Positions of Planets for January, 1873.

Mercury.

Mercury rises on the 1st at 5h. 45m., comes to meridian, or souths, at 10h. 27m. in the forenoon, and sets at near 3 P. M. It is at its greatest elongation on the 5th. January 31, Mercury rises at 6h. 40m., comes to meridian about half past eleven and sets at near 4 P. M.

Venus.

January 1, Venus rises a few minutes before 10 A. M., comes to meridian, or souths, at 2h. 55m., and sets near 8 P. M.

January 31, Venus is nearly in the celestial equator; it rises at nine in the morning, comes to meridian a little after 3 P. M., and sets at 9 in the evening.

Mars.

Mars is still very small, but its ruddy light makes it easily known. When it souths on the 1st, it is 4° above *Spica*, the star being east of the planet. Mars rises on the 1st about 1 A. M. On the 31st it rises soon after midnight, comes to meridian at 5h. 26m., and sets at about 11 A. M.

Jupiter.

Jupiter rises before 9 P. M. on the 1st, souths at 3h. 30m. A. M., and sets about 10 A. M.

On the 30th Jupiter rises at 6h. 24m., comes to meridian at 1h. 22m. on the morning of the 31st, and sets about 8 A. M.

All through the month Jupiter increases in apparent size, and its position becomes more and more favorable for observers. On the 31st, at 1h. 22m., it has, in the latitude of Vassar College, an altitude of more than 61°.

The Nautical Almanac gives the time of the eclipses of the satellites, and according to that, the 3rd satellite, which is the largest, passes into the shadow of Jupiter, or is eclipsed, on the 1st at 6h. 42m. 7·5s. (Washington time) and reappears at 10h. 15m. 38·5s. A glass of very small magnifying power will show this phenomenon at places above whose horizon Jupiter has risen.

On the 1st, Jupiter is east of the bright star *Regulus*, in *Leo*, and they will have nearly the same altitude when on the meridian. On the 31st they will be nearer together in right ascension, and further apart in declination.

Saturn.

Saturn has been apparently very near to Venus, during the first half of December, especially on the 4th. It sets on the first at half past five, having passed meridian 10 minutes before one.

On the 31st, Saturn rises before the sun and sets before 4 P. M., coming to meridian before the sun.

Uranus.

January 1. Uranus comes to meridian at 1h. 45m. A. M., sets about 9 A. M., and rises at about 6¾ P. M. It is among the small stars of *Cancer*.

January 31. It comes to meridian at 11h. 38m., having risen 20 minutes after 4 P. M.

Neptune.

This planet, unlike the others, requires a large telescope. It souths on the 1st at 6h. 42m. at an altitude of (in this latitude) of 55° 50′.

On the 31st, it rises in the morning, comes to meridian before 5 P. M., and sets at about 11 P. M.

Meteorology.

OBSERVATORY, VASSAR COLLEGE.

THERMOMETER AND BAROMETER FROM NOVEMBER 15 TO NOVEMBER 30.

Highest thermometer at the time of recording was at 2 P. M., November 25........51°
Lowest thermometer 7 A. M., November 30........12°
Highest barometer 9 P. M., " 17........30·58°
Lowest " 7 A. M., " 30........29·55°

The highest wind was from the southwest, on November 30 at 2 P. M. There was no rain.

DECEMBER 1 TO DECEMBER 15.

Highest thermometer at the time of recording was at 2 P. M., December 27.
Lowest thermometer 9 P. M., December 12........7°
Highest barometer 9 P. M., " 11........30·37
Lowest " 2 P. M., " 9........29·63

The highest wind was from the northwest December 10, at 2 P. M. Fall of rain very slight.

The Unknown Planet Actually Seen.

To the Editor of the Scientific American:

In your issue of December 14, I see a statement, which I saw before in *Nature*, that Mr. J. R. Hind, the astronomer, was demonstrating that there was a probability that a planet is situated between Mercury and the sun. As I do not know Professor Hind's address, nor the facts upon which he bases his opinion, I address you in hopes that the statement I make will, by this means, fall under his eye. I do not know whether it will add to his store of knowledge, but it is a fact vital to his theory. In the latter half of September, 1859—I cannot now fix the exact date, though it may have been about the 20th—I saw the planet pass over the disk of the sun. I first saw it about 9 o'clock, my attention being called to it by some boys who were looking at the sun through smoked glass. It was then on the eastern limb, and its apparent diameter was about 2¼ inches. It took it about two hours to pass over the sun. As it is impossible for any of the known interior planets to pass over the sun in the month of September, it must have been an unknown planet. I communicated this fact to the naval professors in 1869, requesting that search be made for this interior planet at the eclipse of that year, but nothing was ascertained.

Hoping that this fact may be of service to Professor Hind, I make this statement through your valuable paper.

St. Louis, Mo. JOHN H. TICE.

Sulphite of Lime in Cider.

To the Editor of the Scientific American:

I wish to give my experience in the use of sulphite of lime in cider:

One writer thinks it may be injurious to the health; if he will study the chemical effects of its use, he will see that it has no disposition to appropriate the oxygen already combined, but prevents further combination, its own appetite for oxygen being stronger than that of the cider. There is, possibly, an electrical action besides, as the sulphite does not chemically combine with the cider; being insoluble, or very slightly soluble, it sinks to the bottom as so much sand.

What the effect would be on the blood I do not know; but I should think, as the blood was vitalized in the lungs, if it should come in contact with sulphite in the stomach, no harm would be done, especially as a very doubtful quantity is ever taken into the stomach.

The greatest danger would arise from an impure article; if the lime used was impure, especially if magnesia was present, it would have the effect of Epsom salts, as I have known in several instances. If the sulphite is not neutral, it will spoil the cider. It had better be acid than the opposite, as free lime kills the life of the cider. This can be ascertained from the taste; if it has a caustic taste, discard it. It should have very little flavor, and nothing that is in the least unpleasant; it ought to taste very much like wheat flour.

During the years 1861, '62, and '63, I made large quantities of it; I had a boy to help me, and in the season for it, about two months each year, there were few days in which he did not eat enough for a common forty gallon cask, and many days much more. I never knew of its doing him any harm, unless, perhaps, it stopped his working as much as he could without it. WM. A. BARNES.

Bridgeport, Conn.

REMARKS BY THE EDITOR:—The use of sulphites to prevent the fermentation of liquors was early suggested by Liebig, and has long been practiced in Europe and this country. At first the sulphite of soda was employed, but so much alkali in the wines was found to be deleterious, and recourse was had to sulphite of lime. This latter salt, when pure and neutral, contains, in 100 parts, 41 parts of sulphurous acid. The sulphurous acid absorbs the oxygen and thus stops fermentation. Sulphate of lime, or gypsum, is formed, which settles in an insoluble paste to the bottom and thus imparts no taste to the liquid. There is very little cider in the market which has not been kept sweet by the use of sulphite of lime; and as this salt has long been recommended, there appears to be no objection to its use.

DOCTOR PITHA, of Vienna, it is stated, has just received a fee of 100,000 florins ($50,000) on the recovery of the young Baron Todesco, the only son of a millionaire. The case entailed an attendance of about two months, and the patient remained entirely unconscious during 23 days. Professor Pitha's assistant also received a large sum of money.

Rocky Mountain Geological Explorations.

In October last a party, under the lead of Professor O. C. Marsh, of Yale College, started from New Haven for the purpose of procuring fossils in the almost unknown region near the Rocky Mountains. Several expeditions have been made in former years by Professor Marsh and scientific students, and they have resulted in some important discoveries of fossil remains, which have shed a good deal of light upon the ancient animal inhabitation of the continent, as well as given some important hints as to its geological formation.

The October party went out with the intention of continuing these researches. They have lately arrived home in good health, satisfied with the successful results of the expedition.

At Fort Wallace they were joined by a military escort consisting of Lieutenant Pope and eight soldiers, army wagons, and mules for riding. The whole party had a competent guide, Edward S. Lane. They started from Fort Wallace and proceeded down the Smoky Hill Fork, and in this neighborhood camped out for twenty-five days. In this region there were immense quantities of buffaloes, and the party shot while camping, about fifty of them. One herd was seen which it was estimated numbered about fifteen thousand. There were also great quantities of deer and antelope. The time of the party was spent mainly in discovering fossils, and quite a lot of valuable saurians, pterodactyls and birds were found. Of the first two classes, there was an especially good collection obtained, and there were also some valuable bird fossils found. The largest bird fossil, Professor Marsh said, stood fully six feet high. A large number of fossil fish were found, not valuable enough to pick up.

The daily life of the party was something as follows: They usually arose at from seven to eight o'clock, and, after looking after their mules, prepared breakfast, which consisted generally of buffalo meat, sometimes deer and prairie hens. They were obliged to depend upon the government for such supplies as tea, coffee, flour, etc., obtaining them at wholesale government price. After breakfast the party generally started for the cañons and spent the rest of the day in diligent search for fossils, not returning to the camp till supper time. On the prairie they were thoroughly armed, each one carrying a rifle, revolver, knife and cartridge belt. The evening was generally spent in arranging the collection of fossils found during the day, under Professor Marsh's direction. The party slept at night in the regular Sibley tent, heated with the Sibley stove. At Cheyenne they found the thermometer standing at fifteen degrees below zero, and very naturally did not care to do much outdoor work in such an atmosphere. Water was all frozen up, and the most bitter winter weather was experienced. From Cheyenne they took a southeasterly direction to Crow Creek in Colorado. Here they camped seven days and explored the country toward the Rocky Mountains. At this point Pike's Peak was in sight. The explorations were not very successful, except near the camp where they found one or two cañons full of bones. There were found some rhinoceros' teeth, as well as bones of various rodents, and fossil turtles in plenty.

Snow Plowing.

A correspondent, W. W. of Evanstown, Wyoming Territory, states that a plow 32 feet long, 11 feet wide, and 12 feet high, *plus* 58 feet for trucks and platform, is well proportioned; and a weight of 50 tuns is enough. But, he says. "the first side drift it strikes, it will throw something (I think it will be the rail). The rail we use here is 4 inches high plus 3¾ inches wide, and some of the old pine ties are two feet apart and spiked with a smooth spike. I have shoveled snow in the same drift as John Chinaman. He told me: 'Irishman all same as Hong Kong man, no count to keep track clear of snow when it drifts 40 knots an hour, snow plow and locomotive on *larbert* side' (topsy turvy)." "I see," continues W. W., "no better method for clearing away snow than the one the aboriginal American used before the pale face borrowed his corn."

BE CHEERFUL.—"Be cheerful," says the man who is easy in his circumstances, missing no loved face at the table, nor by the hearth. But does he ever consider how hard it may be to be cheerful when the heart aches, and the cupboard is empty, and there are little fresh graves in the churchyard, and friends are few and indifferent, and even God, for the time being, seems to have forgotten us, so desolate is our lot? How difficult for one man to understand another in such different circumstances! How easy to say "Be cheerful!" How hard he would find it to practice, were he stripped of all life's brightness!

A NEW GALVANIC BATTERY.—Gaiffe's new galvanic battery consists of a vessel in which are contained a plate of lead and a plate of zinc. The lead reaches to the bottom, while the zinc is but half as long. The bottom of the vessel is covered with a layer of red oxide of lead, and the exciting fluid is water containing 10 per cent of sal ammoniac. The electro-motive power of this battery is estimated at one third of that of a Bunsen cell. Its internal resistance is very slight and it is said to be very constant. It has the merit of cheapness.

A PECULIAR LOCOMOTIVE.—A new locomotive, named the Anthracite, which has been placed on the Albany and Susquehanna Railroad, has six driving wheels and carries its water above the boiler. A tender is thus dispensed with. The firing apparatus is stated to be so arranged that the fires last all day without replenishing, and the furnaces only require damping once a week.

EARLY TRACES OF MEN.

When quarrymen uncovered slabs of Connecticut sand stone, bearing impressions exactly like bird tracks, geologists reasonably inferred that, at the time the rock was forming and was as yet but wet sand, there existed gigantic birds or bird-like animals, which strode along these ancient sea shores much as beach birds do along the shores of to-day. The fact that traces of birds had never been found before in strata so ancient, much less the popular theory that birds were of later creation, did not invalidate the inference; one positive fact, as is well known, outvalues any amount of negative assertion, and the old theory had to give way.

When workmen, digging a canal near Stockholm, came upon a buried hearth with charcoal on it, exactly like those which uncivilized people now make and use, the natural inference was that some one of more than brute intelligence had lived there before the overlying earth was deposited. Had the hearth been slightly buried, say six feet below the surface, there would have been no question of its artificial origin; it would have been accounted the work of man as surely as if a human skeleton had been found lying beside it. Should the inference be considered less legitimate because there happened to be sixty feet of earth above the hearth? True, that accumulation of erratic blocks and sand and sea shells gave unmistakable evidence of great geological changes since the hearth was last used—glacial action, submergence of the land and its subsequent elevation,—all involving long periods of time; but that told not so much against the testimony of the hearth as against the belief that man was of more recent creation.

Now that such witnesses have been multiplied to an almost infinite number, forming a continuous chain from the earliest historic times far back into the tertiary period, the evidence is overwhelming; the "alleged" antiquity of man, as it is styled by those who have never investigated the matter, passes from the domain of hypothesis into the region of demonstrated fact. The vista of human antiquity opened up by these surprising discoveries is indeed vast, so vast that even those who have most patiently followed them and assisted in their development are overwhelmed with the thought of it. No wonder, then, that those to whom it comes as a sudden revelation should flatly refuse to admit its reality. As Mr. Evans remarks in the closing paragraph of his magnificent work on the ancient stone implements, weapons and ornaments of Great Britain, "it is impossible not to sympathize with those who, from sheer inability to carry their vision so far back into the dim past, and from unconsciousness of the cogency of other (than the fossils described in the work above mentioned) and distinct evidence as to the remoteness of the origin of the human race, are unwilling to believe in so vast an antiquity for man as must of necessity be conceded by those who . . . have fully and fairly weighed the facts which modern discoveries have unrolled before their eyes." Yet while we sympathize with the natural incredulity of those who lack the basis of intelligent judgment, we need not imitate their unreasoning assurance in contradicting the deductions of science while refusing to examine either the ground of their own convictions or the evidence of the different convictions of others.

The geological proofs of the antiquity of man, to which Mr. Evans alludes, are of threefold character:

1. The association of human bones with the bones of extinct animals, under conditions which prove them to be of equal age.

2. The signs of human action on the bones of extinct animals: the breaking of them to extract the marrow, after the manner of existing savages; the shaping and polishing of them for use and ornament; and more instructive still, the tracing on them of the outlines of mammoths and other animals now extinct or driven by change of climate to distant parts of the earth.

3. The discovery of wrought stone implements, weapons and ornaments under undisturbed strata demonstrably belonging to periods reaching as far back as the pliocene period, if not farther.

Detailed descriptions of these evidences, which are as marvelous in number as in variety and interest, may be found in the elaborate works of Lyell, Lubbock, Wilson, Evans and other English scholars, as well as in numerous French and German writings; or the evidences themselves may be studied *in situ*, and in numerous rich collections of archæogeological specimens, by any one disposed to do so. The purposes of this article admit but the briefest mention of a few of the most ancient of these traces of early man.

First, for our own country. Perhaps the oldest skull yet discovered is the one found in the pliocene strata of Cable Mountain, California. Having no companion in its almost incredible antiquity, it was natural at the time of its discovery for men to ridicule the age accorded it, and to take refuge in the assertion that it never came from the place alleged, or, if it did, it must have come there by irregular means. But when many corroborating evidences of human existence during the pliocene period are found, as they have been, in the same strata under conditions which satisfy careful geologists that the strata had not previously been disturbed, the astonishing character of the testimony is not sufficient ground for flatly rejecting it. More recently, similar fossil evidences of perhaps a still earlier presence of man on our Pacific coast have been discovered. At a meeting of the San Francisco Academy of Science, in May last, Dr. Blake presented the Society with a number of perforated implements of serpentine, which had been taken from stratified rock near the summit of the coast range, 1700 feet above the sea. They were found, embedded in argillaceous shales, in digging away the side of a hill for the foundation of a house, and, says Dr. Blake, were "evidently fashioned by the hand of man or some animal capable of using its anterior extremities so as to fashion objects to meet its wants, and apparently possessed of sufficient intelligence to use lines or nets for catching fish; as it would seem that these instruments must have been used as sinkers." Dr. Blake pronounces the rock in which these interesting specimens of primitive manufacture were discovered, to be of an age not later than the pliocene period; while Professor Whitney, the State Geologist, is of opinion that it is still more ancient. Anyhow, man appears to have antedated the upheaval of the coast range and the attendant geological changes; a remoteness in time which makes the fossil skeleton found at Natchez and New Orleans, and the human fragments under the Florida canals, seem comparatively modern. Yet at that distant period man had existed long enough to overspread a considerable portion of the earth, if not the whole of it, since traces of such primeval men have been found wherever they have been diligently sought for.

Scarcely a decade has passed since geologists began to admit the possibility of finding traces of men in glacial or preglacial strata; yet already human bones or unquestionable evidences of human handiwork have been found in the deposits of those early times, in connection with the remains of supposed prehuman animals, in England, Scandinavia, Belgium, France, Spain, Italy, Germany, India, Australia, and South America, as well as in our own country; and the more carefully the search has been conducted, the farther back the history of man has been pushed into the distant past. Every inch of the ground has been fought over, the firm conviction of the early investigators that man could not be so old a creature causing them to receive every discovery with downright disfavor. Such an upturning of all the recognized foundations of history seemed of necessity to involve some hidden error. But it did not. The facts are so numerous and intelligible that the most skeptical enquirers have been convinced, and now not a few of them hold high rank among the authorities of the young science of archæogeology. Among these is the venerable Sir Charles Lyell, whose caution is not less remarkable than his courage. After studying some of the earlier discoveries of human fossils, he admitted their preglacial origin and thought we might expect to find the remains of man in the pliocene strata. Writing after the discovery of such pliocene remains, Sir John Lubbock set the time of the first beginning of the human race as far back as the miocene, or middle tertiary period; while Alfred Wallace carries the date still farther back, into the eocene period; this, however, on theoretical grounds, since the traces of men earlier than the pliocene period are few and somewhat questionable. In what is said to be miocene strata near Pontlevoy, France, a M. Bourgeois has found numerous wrought flints in a stratum containing the remains of a long extinct animal allied to the rhinoceros, and beneath a bed which contains the mastodon, the dinotherium and the rhinoceros. Similar evidences of man's presence and skill have been found in the miocene beds of Aurillac, with the remains of animals long since extinct; and at Pouancé, another observer, M. Delaunay, has discovered a bone of a herbivorous cetacean of the miocene period, which bears the marks of cutting instruments, such as must have been made when the bone was in a green condition. Doubtless these faint foreshadowings of man's presence in the middle tertiary will be strengthened by future discoveries, as the first evidence of his existence in the later tertiary and quarternary periods have been.

The time required for all the geological changes which have taken place since man demonstrably entered upon the struggle for existence is simply inconceivable. The glacial limit lately set to his history has been overpassed, and his dominion extended perhaps farther beyond it than it is back of the present. "We of the present generation," says Sir Charles Lyell, "when called upon to make grants of thousands of centuries in order to explain the events of what is called the *modern* period, shrink naturally at first from making what seems so lavish an expenditure of past time." Yet, however much the imagination may take alarm at the immensity of such periods, the sternest reason declares them to be necessary unless we stand ready to deny the orderly sequence of events. The same sort of evidence which proves the existence of man on earth six thousand years ago proves his presence here as many thousand centuries.

BESSEMER'S ANTI-SEA-SICK SHIP.

The channel which separates England from France has, from time immemorial, been a bugbear to the traveling public of both countries. Innumerable are the books that have been written depicting the miseries of the passage from Dover to Calais, and equally multifarious are the proposals and plans published, having for their object to connect the two shores, and so not only abolish the wretched steamers now in use, but save the traveler from the discomforts of sea sickness and exposure to the weather. As near as we are able to discover, no less than thirty schemes have been advanced, including submarine tunnels, tubes laid on the bed of the channel, submerged roadways, embankments from coast to coast, steam packets of especial construction with improved harborage, and, lastly, a vast bridge which should span the twenty-two miles of dreaded water. All these ideas, involving as they do, not only a consummate engineering skill, but the expenditure of at the least of a hundred million dollars, are but dim visions of the future. At present Mr. Henry Bessemer, well known for his invaluable improvements in the manufacture of steel, steps forward with a saloon vessel, constructed on a principle which has already been applied to furniture, berths, and even state rooms. In short, Mr. Bessemer proposes to suspend an entire saloon, after the fashion of a lamp or compass, in gimballs. As there is in every vessel, when pitching or rolling, a neutral axis, on a point coincident with this axis Mr. Bessemer intends to hang his apartment.

The first point to overcome was the mobility of the load. A passenger could not be expected to sit perfectly still in a fixed position during the voyage, while, on the other hand, were he to move or promenade, the equilibrium of the apparatus would be lost. The inventor, finding, therefore, that he could not prevent motion by his means of suspension, concluded he could arrest it the moment it began. To this end he designed a saloon—the description of which we find in the London *Times*—70 feet in length, 30 feet in width, and 20 feet in hight, carrying on the top a promenade deck at a hight of seven feet above the ordinary deck of the vessel. The points of suspension of this saloon will be in a line with the keel of the vessel and coincident with the neutral axis of the ship when rolling. The saloon will be well lighted and ventilated, and will be fitted at each end with rooms for passengers. The governing power consists of a set of powerful hydraulic apparatus connected on the under side of the flooring, and so arranged that, as the vessel rolls to either side, the pressure or resistance afforded by the water is instantly brought into play and utilized in checking the motion. The device is controlled by a pair of very sensitive equilibrium valves actuated by a hand lever. At this lever stands a steersman who, with a curved spirit level before him, watches the slightest indication of the rolling of the vessel, and in an instant suppresses the tendency of the saloon to follow the motion of the ship.

The difficulty of pitching is overcome by increasing the length of the vessel so as to insure longitudinal stability. The principle of the saloon is, in fact, carried out in a vessel designed by Mr. E. J. Reed, for the channel passage. She will be 350 feet long, with 65 feet beam over her paddle boxes, and 7 feet 6 inches draft of water. The saloon will be placed amidships, in the position generally occupied by the engines. The latter will be of 750 horse power, nominal, and are expected to drive the vessel twenty knots per hour. The ship will be double-ended so as to enable them to enter and quit existing harbors, and at each extremity will be provided a very low free board, so that she may cut the waves instead of rising to them.

In order to demonstrate the feasibility of his scheme, Mr. Bessemer has constructed a large working model on the grounds of his residence. The arrangement consists of a wenty foot length of the hull of a vessel of twenty foot beam sunk in a brick pit and carried on a longitudinal axis. In the ship is a saloon suspended as above described, and connected with it is a curved spiritlevel, with a graduated scale and pointer, the latter of which the steersman always keeps at the zero point. An oscillatory motion is given to the hull by a small engine connected to it with suitable gearing. This motion amounts to 14° each way, representing a total roll of 28° with ten oscillations per minute, but notwithstanding this the cabin does not indicate a deviation of more than from 1° to 1½° from the horizontal. Mr. Bessemer considers his idea but the germ of what may be thought out, and frankly admits that some other brain than his own may push on the work he has initiated.

We hardly think the plan will prove successful, and are convinced that Mr. Bessemer will find the short chopping sea of the channel, seemingly striking a vessel on all sides at once, far different from the regular oscillations produced in his model. Moreover, unless there is some mistake in the figures as we extract them from the *Times*, it seems impossible that a vessel 350 feet long should not pitch in a very decided manner. We have crossed the channel repeatedly in a ship 320 feet long, and in rough weather have experienced pitching by no means light. Again, if simple pitching and rolling were a vessel's only motion, the apparatus might answer, but such is not the case, unless, perhaps, in the long heavy and regular swells of the Atlantic. A chopping sea, which is, *par excellence*, that found in the channel in rough weather, produces a spiral, so to speak, movement of the ship, calculated to vanquish the strongest stomach, while the sometimes unaccountable angles taken by the decks cannot, we believe, be avoided by any device based on Mr Bessemer's principle.

THE London journals state that that interesting young stranger, the hippopotamus recently born in the Zoölogical Gardens, is being brought up entirely by hand. Like children generally, he is giving considerable trouble to his keepers. As an instance of his juvenile precocity, it is mentioned that he can already remain under water twice as long as his mother.

IT has been decided to pierce the tunnel of St. Gothard, in Switzerland, by means of lithofracteur; 25 tuns of this explosive body have just been purchased by the engineers in charge of the work. Some idea of the extent of the undertaking and the exceptional hardness of the rock to be traversed may be formed from the fact that at least 1,500 tun of lithofracteur will be the total amount required.

A YOUNG Briton lately won a bet on spiders, in the following ingenious manner: He wagered that a spider which he would produce would cross a plate quicker than a spider to be produced by a friend. Each spider was to have its own plate. His opponent's spider, however, on being started, would not stir, whilst its rival ran with immense speed. The bet was consequently lost; and the loser soon found out the reason why: his friend had a hot plate.

PRIME'S WASH BOILER.

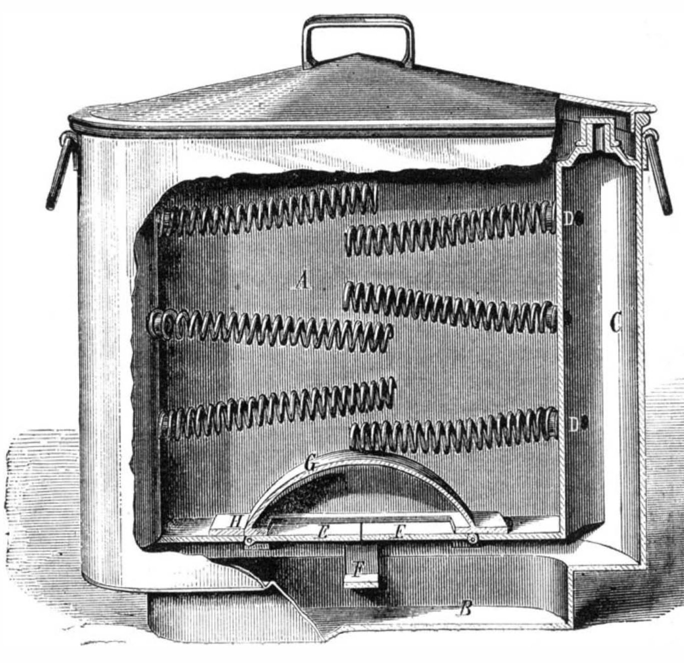
The inventor of this device proposes to furnish an improved and more effective circulation of the steam and water among the clothes by means of appliances which prevent the contents of the boiler from packing around, and so closing the orifices in its sides. The illustration shows parts of the apparatus broken away, with sectional views of other portions, and affords a clear idea of the interior arrangements.

A is the wash boiler, which may be of any suitable design. B is the receptacle beneath for the soap and water. C C are chambers or channels closed at the top and connecting with the interior of the apparatus by means of the orifices, D. The spiral springs shown are so arranged as to fit over the ends of short tubes around the perforations, within the boiler, and to extend through and among the clothes. E E are wing valves opening downwards as far as the guard, F, and protected from being choked, by the clothes above, by the guard, G. These valves are hinged to a plate, H, which may be readily removed for cleaning the heating chamber.

By means of the spiral springs, channels are afforded which admit of a free escape and circulation of the steam and water passing from the heating chamber, B, through the conductors, C, The springs may be either used separately, being placed in and removed from the boiler with the garments or they may be attached to nozzles, as shown, or directly to the walls.

The various portions of this device are easily accessible for cleansing or repairs, and the apparatus is claimed by its inventor to thoroughly meet all practical requirements.

Patented through the Scientific American Patent Agency, Nov. 12, 1872. For further information regarding agencies, sale of machines and territory, address Geo. M. Prime, Eldorado, Ark.



PRIME'S WASH BOILER.

Litmus Paper.

When the physician and pharmacist buy litmus paper, says Dr. Squibb, they generally make the same mistake that the photographer does, and demand that it shall be deep in color, that the blue shall be very blue, and the red very red. This is wrong in principle and in practice, particularly for physicians' uses, where slight traces of alkalinity or acidity are often important, and the palest instead of the deepest paper should always be selected. To prepare good litmus paper, the following formula may be useful: Take of good litmus, in fine powder, 1 part; water, 4 parts; alcohol, 1 part, all by weight.

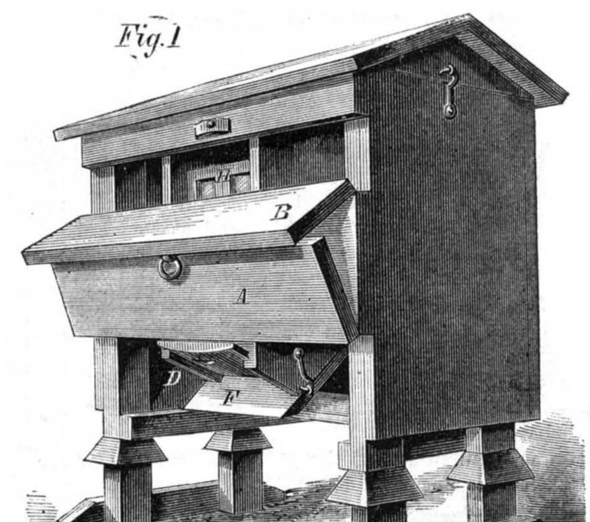
Put these ingredients into a bottle, and shake the mixture occasionally during 24 hours; allow the sediment to settle out completely, and decant as much as possible of the clear liquid into another vessel; then put the same quantity of water and alcohol upon the sediment, shake again and, when again well settled, pour off the clear liquid for use in diluting the first portion of liquid, or for dissolving a fresh portion of litmus. Separate about one fourth part of the first clear liquid, and add to the remainder dilute sulphuric acid until it becomes of a purple tint, or gives a purplish blue color to a slip of white paper; then add about one half of the separated fourth part of the solution, and if this should entirely restore the original pure blue color, again add diluted acid until a purplish tint is again obtained; then add the remaining eighth part of the original solution to restore the pure blue color, or, which is more delicate as a test for acidity, a very faintly purple blue color; then dilute this solution either with water, or with the second liquid from the litmus sediment, until a slip of neutral white paper dipped into it has a pale blue or pale purplish blue color. Here it is necessary to remember that this paper when dry is many shades paler than when wet, and the dilution should be made accordingly. The solution making red litmus paper will not bear the same amount of dilution as that for the blue, and must be made of the proper purplish red color by the addition of dilute acid before dilution. The solutions so made will keep almost indefinitely, and may be passed on from one process to the next. The paper should be made from pure rag stock—not from bleached wood nor straw—should be quite white, and above all, must be quite neutral, and show no red spots or blotches when moistened with the blue solution. French or German filtering paper commonly answers well if of good quality. This is cut into convenient size, the larger the better, because there is less waste, and held by two corners, which corners are to be kept dry; it is to be skillfully laid on the surface of the solution, first one side and then the other, then drained, and hung over clean glass tubes to dry. The vessel to hold the solution for dipping should be larger than the sheet of paper, and shallow.

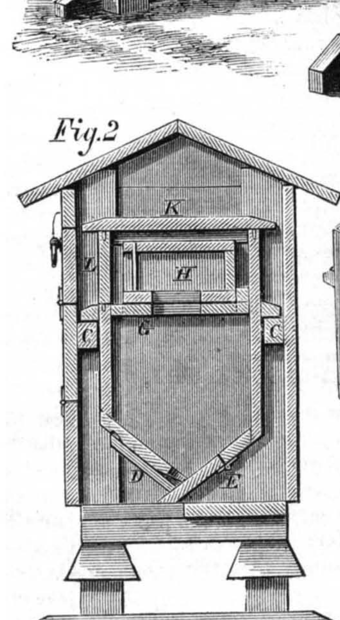
The sheets when dry are laid together, and the edges trimmed off all round. They are then cut into sheets 3 to 4 inches wide and 12 to 18 inches long, according to the size of the paper used What is sold as "a sheet of litmus paper" should never be less than 4 inches by 12, or 3 by 18. Such a sheet cut lengthwise through the middle gives a strip which, when cut crosswise into strips a quarter or three eighths of an inch wide, is of a convenient size and form for use. The sheets, one paler and one deeper of the same color, if desired, should be rolled up together in a tight roll, slipped into a test tube and corked. In corked test tubes they keep unchanged for an indefinite time, while the test tubes when empty and corks are always worth their cost to those who use litmus paper.

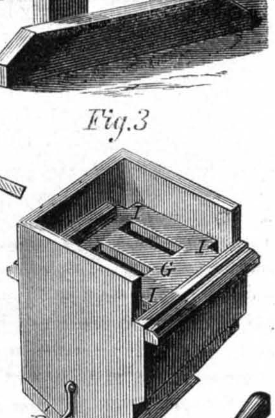
In this form of sheets, however, the paper is not so convenient for the physician as when cut into strips 1 to 2 inches long and a quarter of an inch wide; and the writer finds that about 100 of such strips, put up in a wide mouth tube vial, corked and properly labeled, is a most convenient and popular form for physicians' use. One such vial of each color put up together forms a pair which no physician should be without. And most physicians will buy them if they can get them. These convenient little strips may be shaken out of the vial as wanted for use, but as the fingers, should, by rights, never touch any other strip than the one taken, it is best to take them from the vial by a pair of forceps from the physician's pocket case.

BROWN'S IMPROVED BEEHIVE.

As the embodiment of a long experience in apiculture, the accompanying invention will doubtless prove a valuable acquisition to all engaged in that industry. The inventor has aimed to so construct a hive as to prevent the diseases to which bees are subject in changeable climates, and in winter to keep their dwellings sufficiently warm, so that the young insects may not be destroyed by the cold. Free ventilation in the breeding chamber is provided, and the hive generally is constructed in close imitation of the abode of the bees in their natural state.







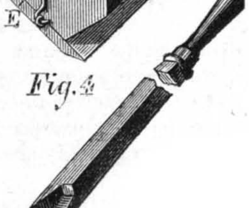


Fig. 1 represents a perspective view of the house and hive; Fig. 2 a sectional plan, and Fig. 3 shows the interior of the chamber for holding the honey boxes. The house, Fig. 1, is constructed with a movable roof or lid, and with two shutters, A, which can be raised and folded back, designed to be closed in winter and opened in summer, and B, by which access may be had to the honey receptacles. Between the floor and the shutter there is about one quarter of an inch of space left in order to insure a supply of fresh air. The floor is movable. Fastened longitudinally in the interior are cleats, C C, Fig. 2, which support the hive in place. The legs are provided with inverted cups or flares to prevent the ascent of mice, etc.

The hive proper is arranged with perpendicular sides. The bottom consists of two inclined portions, D and E; D, the front, has a sliding cover whereby the size of the bee aperture may be regulated, and is provided with a small notch at F for ventilation when closed. The rear portion, E, is hinged to the hive, its forward inclined part constituting a lighting board for the bees. G, Figs. 2 and 3, is the diaphragm dividing the breeding from the honey chamber. It is pierced, as shown more clearly in Fig. 3, with two rectangular orifices in the center, which communicate with similar holes in the bottom of the honey boxes, H. The inventor has found, through long experience in the management of bees, that the eggs of the bee moth are always deposited around the corners of the hive. In order to remove these nuisances, and so to protect the bees from their ravages, he provides the four corner orifices, I I, in the diaphragm, G, which, whenever necessary, he scrapes with the instrument shown in Fig. 4, thus detaching the cocoons; after which, by means of a small swab, he covers such portions with a strong solution of brine, also applying the same liquid to the bottom of the hive. This operation requires but a few minutes, and may be accomplished without moving the hive or disturbing the bees. The corner orifices, when not thus used, are covered with wire gauze. The upper part of the hive is closed with a movable lid, K, and front, L, which should not be left in position except when feeding a late swarm that have not secured sufficient honey for their maintenance.

Fig. 1 represents the device arranged for summer use, that is, with doors open and lid of hive removed. In winter time these portions are all closed, and the two inch space between the hive and walls of the house is packed with straw so as to secure warmth.

The inventor claims that the apparatus, with proper management, will prevent the vitality of the eggs being destroyed by cold, obviate the foul brood caused by chill and dampness (leaving a black and decomposed mass liable to kill the entire colony), and lead to early swarms and an abundance of honey. The device is simple and durable, and is well worthy the attention of bee keepers throughout the country.

Patented September 10, 1872. For further particulars regarding sale of entire right, etc., address the inventor, Mr. Peter Brown, Taylorville, Ill.

Telegraphic Experiment.

Mr. Highton describes in the *Chemical News* the following experiment: On November 4, the cable from Dover to Boulogne was broken by a ship's anchor, about 5 miles from Dover. By the kind permission and co-operation of Mr. Bourdeaux, the engineer of the Submarine Telegraph company I placed my instrument (shown lately to the Society of Arts) between the end of the broken cable at Dover and the water pipes of the town. To our surprise we could distinctly read every message to and from Ostend, Calais, and Dover, on the Dover and Ostend and Dover and Calais cables. The explanation was as follows: Part of the electrical current which went to earth at the Dover water pipes went on to a second earth formed by the end of the broken cable, and in its passage made signals on the instrument. Thus the enormous fault formed by the Dover water pipes was not sufficient to prevent a perceptible current of electricity passing on to the broken end of the Dover and Boulogne cable.

We also asked the French operator at Boulogne to send a current through the broken cable, and got a feeble result; but as we were not able, without special authorization from the French Government, to get him to put on such batteries and instruments at Boulogne as were necessary, and the remaining cables were fully occupied with messages, we did not follow out this portion of the experiment.

ATMOSPHERIC SUBMARINE POSTAL COMMUNICATION BETWEEN FRANCE AND ENGLAND.—E. Martin describes a modified plan, which consists in the use of a narrow tube through which simply microscopic photograms containing the dispatches, produced upon collodion, are to be transmitted. It appears that this method of operating was first used during the late siege of Paris, and has now been improved upon. The execution of these microscopic photograms can be conducted by day or at night by the aid of the electric light. The tube through which these light pellicules are to be transmitted need only be some few centimeters in diameter. The motion is imparted by compressed air.

AMERICAN IRON.—The Philadelphia *North American* says: "Certainly, if a country so limited in extent as Great Britain should dominate the iron trade of the world, as she has long done, we can, with our immense wealth of iron and coal, and our fast accumulating capital, do that much. Twenty years hence, if we are true to ourselves in the meantime, the American iron product will reach eight or ten millions per year, and we may even be able by that time to export a tun of iron for every bale of cotton. The era of cotton and wheat in American commerce has been a great one. But the era of iron now dawning upon us is destined to be far greater."

Scientific American.

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Contents.

(Illustrated articles are marked with an asterisk.)

BINDING.—Subscribers wishing their volumes of the SCIENTIFIC AMERICAN bound can have them neatly done at this office.—Price $1.50.

OUR NAVY.

The Secretary of the Navy has, each year since the commencement of the first term of President Grant, earnestly endeavored to impress upon Congress and upon the country the vital necessity of preserving the efficiency of our diminutive navy. Congress has, at last, taken up the matter and is considering the advisability of authorizing the construction of a number of new vessels of war.

There can be no doubt, in the mind of any thoughtful citizen, that the United States requires a navy, and that it will require one so long as we have commercial relations with foreign countries, so long as we are liable to become involved in war with other maritime nations, and so long as a large share of the great work of exploring distant parts of the globe can be best and most economically performed under the auspices of our navy department.

How large and of what character, this navy of ours should be, is not so easily decided. We must, certainly, have a number of cruising vessels to do the work which falls to our navy in time of peace, and this work may be done by ships of comparatively light armament, of full sail power, and of good speed under steam: by such vessels, it can be done efficiently.

We believe that there is not a vessel in our navy which possesses all of the requisites of such a class of ships. The "Wampanoag" class had the speed, the sail power, and the necessary armament, but were originally defective in their machinery, and are now generally worthless in consequence of the decay and weakness of their hulls. It is to make good our deficiency here, we presume, that the Secretary of the Navy proposes building ten new vessels. They are evidently urgently needed, and it is to be hoped that they will be built and built quickly. In justice to the Department, to Congress, and to the people who pay for them, it is to be hoped that they will, when completed, embody the very latest and best modern practice. They should have iron hulls; economical, simple, light and durable machinery, and an armament that shall not be rendered inefficient by deference to the hobbies of any enthusiastic inventor or of any single man. The plans should be invariably endorsed by properly constituted boards, who should be authorized and required, also, to consult experts, of generally recognized standing, in relation to all plans. Such a course would protect the navy department from malicious or ignorant misrepresentation and abuse.

We learn from the annual reports of the secretaries of our navy, commencing as far back as the administration of Gideon Welles, that our iron-clad navy, originally created under the pressing exigencies of civil war, and, as a matter of course, to some extent defective in design and hurriedly constructed, has become as worthless as the first class of ships. The Dictator is the most formidable of our iron-clads; but even the Dictator is of slow speed as compared with more recently built foreign vessels, has far less invulnerable armor, and is equally inefficient in her armament. Once the most powerful and formidable of iron-clads, she is, to-day, comparatively weak. This vessel, and others of our iron-clads, should not be allowed to become utterly worthless for want of proper care; but we question seriously the policy of building a new iron-clad fleet to compete with that of England, of Prussia, or even of Spain. We are by no means certain that the day of iron-clads has not already passed, and that the perfection of our various systems of using torpedoes for both attack and defence may not have already rendered us independent of such terribly expensive engines of war.

A new fleet of effective iron-clads, if built, should consist of not less than twenty vessels, each capable of meeting successfully the strongest foreign-built iron-clads, and would cost thirty millions of dollars.

Such a fleet might defend our shores and might successfully contend with all existing iron-clads, but it could not prevent the destruction of our limited commerce by fleets of fast, lightly-armed cruisers, and it could not enter or seriously threaten an enemy's port well defended by a system of torpedoes.

Abroad, the unarmored, lightly armed and fast vessels, which it is now proposed to build, could best destroy an enemy's commerce, and would easily avoid heavily armed cruising iron-clads, since the latter must always, of necessity, be defective, either in speed or endurance, or both.

At home, we are already safe against attack, thanks to the intelligence and energy of the torpedo corps of both army and navy.

The exigencies of our late civil war gave rise to these now well organized and effective organizations.

It would be impolitic to make public the results of their unremitting and very fruitful labors. The only suggestion that need be made is that, to still further increase their efficiency, the best talent of the naval engineer corps should be better utilized in this now vitally important work than it has yet been.

In brief, we may state that, in the event of our becoming involved in war with the most formidable of foreign powers, our harbors would be at once rendered inaccessible to the most formidable fighting machines yet put afloat, and this, too, at comparatively slight expense. Were all the fleets of the world to attack New York harbor, not one vessel would be likely to pass the Narrows. A fleet lying off the coast would be unsafe during the day and could be scattered or destroyed during a single night.

A worthy successor of Farragut would find means of destroying easily the most powerful of an enemy's fleet with the resources which are now made available by our torpedo corps.

We have fixed torpedoes that may be made to explode when struck by an enemy's ship, others that may be exploded from secure stations far away at any instant desired, others that may be rendered harmless when our vessels are passing among them and which may be then made to destroy any pursuing vessel that may attempt to pass them: and we have torpedo vessels that can be sent out without a single human being on board to attack a fleet anchored off the shore, and, directed from the shore, they will approach and explode a charge of powder under any vessel that it may be desired that they should destroy.

We may rely upon our torpedo corps, with confidence, to defend our shores and harbors against the world.

Let us have our cruisers, therefore; but let us hesitate before commencing to build iron-clads. We may find that the expenditure of many millions, in attempting to rival other nations, may be saved us by the comparatively inexpensive operations of well organized torpedo corps, and by the application of the wonderful ingenuity of our inventors to the perfection of floating and sub-aqueous torpedoes and torpedo ships.

The inventive minds of some of our readers will find here an interesting field in which to labor, and they may accomplish results of value to the nation while attacking a problem which, nearly a century ago, gave Hopkinson the text for his humorous poem, "The Battle of the Kegs," and with which Bushnell and Fulton made creditable progress at a very early period in the history of our country.

THE MOSCOW EXPOSITION.

The great Russian Exposition at Moscow was recently closed, and, according to a correspondent of the *Engineer*, the United States were extensively represented in the mechanical department; not, however, by goods sent directly from this country, but by machinery made in Austria, Prussia, Belgium, Russia and other countries, copied from American patterns, the products of American genius, protection for which by patents in the countries specified is practically denied to our citizens. At this exposition, the show of American sewing machines supplied from Germany was quite large. The correspondent says:—"If that benefactor of mankind, the ingenious Howe himself, could have appeared in the flesh and visited the Exposition, I think he would have been highly gratified, for the pet offspring of his genius, in some form or other, is continually to be met with, it being more difficult to say where it is not than where it is."

The entire motive power of the exhibition seems to have been furnished by the American Corliss steam engines, examples of which were supplied by several German manufacturers. Indeed, so many of these engines were to be seen in the exhibition that the correspondent is led to ask: "I wonder if the inventor reaps any advantage from this patent in Germany?"

This is only one of hundreds of examples of the way in which the Germans, especially the Prussians and Austrians, appropriate the best improvements of English and American inventors.

Our Commissioner, General Van Buren, in his endeavor to procure a large appropriation from Congress to be wasted in Vienna, is endeavoring to satisfy the members that unless the money is granted the United States will not be duly represented at the coming Vienna show. But Congress need not give itself any apprehension on that score. The ingenuity of America will be well represented in all the mechanical departments, by the pirating manufacturers of Austria and Germany. No nation in the world will have its mechanical ideas so largely represented at Vienna as the United States; but our countrymen will not specially profit thereby.

But to return to the Moscow affair:

Among harvesters, the Johnson American Self-raking Reaper is specially mentioned. As to steam fire engines, the first prize has been, as stated to have been, awarded to an American machine.

The display of war material was quite large, some very ancient and curious pieces, of Russian origin, being exhibited. Among these were queer shaped revolving mitrailleurs, having from twenty-four to forty-four barrels, five feet long and three quarter inch bore. These were made in the time of Peter the Great, but were discarded by him as impracticable. A brass rifled cannon was shown, which was cast in 1615—a hundred and fifty years nearly before the idea of rifling guns was known in England. A rifled arquebuse made in 1661, several breech-loaders, and a revolving gun of the seventeenth century were also on exhibition.

A SLIPPED ECCENTRIC AND WHAT CAME OF IT.

A correspondent in Connecticut, who writes to announce the sending of an excellent list of subscribers to the SCIENTIFIC AMERICAN, shows how our paper has practically benefitted him and his employers as follows:

"I have taken the SCIENTIFIC AMERICAN for nine years. When I first commenced to run a steam saw mill, I worked by the day as sawyer. One day the eccentric slipped on the shaft, and the engine, of course, stopped. The proprietor being away, we were in a bad fix. The fireman did not know how to set it again, and, practically, I knew nothing about it myself; but I recollected reading in your paper the rule for such an engine (a common slide valve one). So I tried my hand and succeeded, the engine doing better work, with less fuel, making a gain of three cords of slabs in ten days."

To the practical workman the regular reading of the SCIENTIFIC AMERICAN is unquestionably of great value. It insensibly educates the mind of the reader and, if he is a workman, renders him more intelligent, more skillful and more useful to his employer. It is the custom in some establishments for employers to present their workmen on the return of each new year with a year's subscription to the SCIENTIFIC AMERICAN. Proprietors find themselves abundantly repaid in the greater industry and superior work which their men give back in return for such attentions. Those who have not already done so should remember that now is the time to register subscriptions to our paper. This is the first number for 1873.

Send in the names as fast as possible.

PROFESSOR TYNDALL AS A MONEY MAKER.

During the evening of Professor Tyndall's first lecture in this city, while he was busy in exhibiting the wonderful qualities of light at the Cooper Institute, a thief struck a light in the Professor's room at the Brevoort Hotel and carried off $200 in gold from the Tyndall trunk. But that, after all, is a small item when we consider that the Professor is bagging about ten thousand dollars a week from his lectures, one of which he gives every other night.

If other scientific lecturers would bestow as much personal attention upon the preparation of their public appearances as does Professor Tyndall, it is probable that the demand for their services might be increased. There is never any hitch or break in the experiments, illustrations or speaking of Dr. Tyndall. The day preceding each lecture is devoted to a careful rehearsal of the experiments that are to be produced, and his assistants are drilled in the manipulation of the apparatus by their leader with the same care that the leader of an orchestra bestows in the rehearsal of his music.

Work and watchfulness are the keys to Professor Tyndall's experimental success as a lecturer.

THE VIENNA SHOW IN CONGRESS.

After a somewhat lengthy debate, a bill appropriating the sum of $100,000 to defray the expenses of American representation in the Vienna Exhibition has passed the House of Representatives and has been forwarded to the Senate for its concurrence. In addition, two naval vessels have been designated for transport duty, to carry pianos, sewing machines, buggies and other goods of exhibitors to Trieste, Austria. Space forbids our entering into any *resumé* of the discussion in the House. The bill was introduced by Mr. Banks of Massachusetts, and the opposition was led by Mr. Shellabarger, of Ohio. The latter gentleman made an able argument against the grant of the appropriation until the Austrian patent laws should be so modified as to protect American inventors; but the bill passed without this proviso, so that it now remains for the Senate to determine whether we shall allow this golden opportunity of testifying to the world our condemnation of these unjust and oppressive regulations to escape.

The amendment offered by Mr. Shellabarger, although it is a step in the right direction, hardly, in our opinion, covers the entire requirements of the situation. What we need and insist upon is not a protection merely for the limited duration of the show, but a permanent guarantee, ratified in solemn treaty obligation that the rights of our citizens in Austria, in respect to their inventions, shall be upheld the same as are the rights of Austrians in this country.

We earnestly trust that an amendment framed in this view will be introduced and favorably considered in the Senate. It is but a simple act of justice, it works no hardship to any one, and secures to us advantages that are inestimable. We have repeatedly shown that, in other continental countries, patent laws exist as oppressive as those of Austria. The latter nation is deeply anxious to procure a full representation of American genius, and, were such an amendment enacted, there is little doubt but that the objectionable features in the Austrian statutes would be repealed. This done, we should have gained an entering wedge toward ameliorating the similar laws of other countries, and eventually we should succeed in obtaining for our countrymen as full privileges in Europe as in the United States.

Our representatives, in advocating the appropriation, seem to look no further than the so-called protective certificate to be granted to exhibitors. It should be distinctly understood that the certificate simply purports to afford protection for a year; that is, it saves the inventor from the loss of his right to a patent during the period of the Exhibition. There is nothing to prevent an Austrian from gaining all possible knowledge regarding an idea, completing every preparation, and at the end of the specified time putting all he has thus acquired into practical execution. We have shown that nothing can be accomplished by bringing infringement suits, and that to this piracy there is no check. The certificate therefore merely permits the inventor to delay his application for a patent one year, and leaves him precisely where he would be in the beginning, did it not exist. He must accordingly then manufacture within the succeeding twelve months precisely in correspondence to his drawings, etc., and comply with sundry other similar regulations, or his patent, if he gets one, is null. On the other hand, an Austrian coming to the United States with a new invention may, by our law, make, sell and exhibit it all over the country for two years, and at the end thereof obtain a patent for seventeen years giving him complete and exclusive property in his device. He is not compelled to work his invention within any specified period, but is at liberty to do precisely as he pleases with his patent, which remains good for the term granted.

It is but little appreciated in this country to what an immense extent American inventions are manufactured abroad, and what vast benefits the people of Europe reap from our ideas. The continent is full of devices of American origin, and every new improvement of value is immediately adopted there, pirated and manufactured to the exclusion of the American inventor. The scientific publications of the continent are full of extracts from American patents, which they issue, with engravings, of all our latest and best improvements, which are promptly put in use. Of the dozen or more steam engine exhibitors from Austria, Prussia, Russia, Belgium, and other countries in the late Moscow Exhibition, nearly every one displayed Corliss engines of their own manufacture, made after the patterns used in Providence, R. I.; the entire steam power of the exhibition was supplied by these engines. In Russia, Prussia, Belgium, and Austria, the McCormick reaper, Howe sewing machines, Burleigh rock drill, Blake stone breaker, Gatling guns, Hotchkiss' projectiles, Colt's revolvers, Hoe's and Bullock's steam presses, Danks' puddlers, Westinghouse's railway brakes and hundreds of other American designs are well known, and many of them used; and without doubt large numbers of our best inventions of the most recent dates will be found among the entries of foreign manufacturing houses in this Vienna show.

We should have been glad had the motion in the House to strike out the appropriation altogether prevailed. Not that we do not appreciate the value of the Exposition, or fail to believe that, in the words of a contemporary, we "ought to join in all peaceful measures which belong to international courtesy and promote mutual goodwill," but simply to publish to the world that the United States failed to take part in the Austrian Exposition, because Austria has refused to do justice to American inventors. This it is yet in our power to do, and the amendment that we advocate should be so worded as to deny the payment of the appropriation until the Secretary of State receive official notification of the alteration of Austrian laws.

Our leading position among industrial nations, our world-wide renown as a people of transcendent inventive genius and our unexampled progress in civilization during the past century are due in great part to the stimulation and encouragement which our laws give to the inventor, teaching him to study new arts and processes, to develope new ideas and in the end to turn the results of his thought and labor into substantial profit. Is it not evident that the stimulus, thus afforded, would be infinitely increased could we make a world, instead of a country, the market for our productions? Can it be controverted that the direct advantages to our people would be invaluable, did they possess an exclusive and guaranteed property in their own original ideas in foreign countries? Or is not the fact plainly manifest that, were such rights secured to the United States and other people forced to come hither for the most useful improvements in science and art, we should place all other nations under contribution. In view of such benefits, the acquirement of which is so easily begun, it seems impossible that our legislators will neglect so plain a duty as to secure for the country the advantage which is now within their grasp.

SUNDAY RAILWAY TRAINS.

A few weeks ago we published a paragraph, copied from a reliable source, to the effect that the Brotherhood of Locomotive Engineers, in their recent St. Louis convention, had passed a resolution having in view the entire stoppage of railway trains on Sunday. We commented on such action as unwise, showing that while we were as decidedly in favor of the general rest from labor, on the part of engineers, of one day in seven, as anybody could be, still we considered it to be a matter of public necessity that certain trains should be run on the Sabbath.

The New York *Daily Witness*, in commenting upon our remarks, says:

"Is it not strange that the Scientific American should be in antagonism to this Brotherhood of Locomotive Engineers, which recently passed resolutions in St. Louis in opposition to the running of Sunday railroad trains? The Scientific American believes in running them for mails, passengers, and freight as a necessity. The Brotherhood believes in no such necessity; but that the running on Sunday is a breach of the divine command and an infraction of public morals. We are glad that the Brotherhood are not afraid to speak their minds in favor of all classes connected with railroads having the rest of the Sabbath. Right is might and must prevail."

The *Witness*, if it wishes to give reliable testimony upon this subject, should inform itself better before attempting to speak. The Scientific American did not urge the running of freight trains on Sunday, but spoke of the necessity of running a limited number of trains for the transit of the mails and the carriage of such passengers as from necessity had occasion to travel on that day. The Scientific American further alleged that it was no more sinful to travel in case of necessity on a railroad, which was a public road, on Sunday and in a railway car, than to ride on an errand of necessity in an ordinary buggy on a common road on the Sabbath.

The *Witness* is also mistaken as to the objects of the Brotherhood. We have received a letter from Mr. Charles Wilson, G. C. E., of the Brotherhood, from which it appears that the engineers do not seek to stop all trains on Sunday, but only the unnecessary trains. He states that on some roads more traffic is run on Sunday than on any other day of the week, and it is to prevent this and cause the Sunday trains to be restricted to such as are actually necessary that the Brotherhood have resolved.

In this laudable endeavor the Brotherhood well know that they may count upon the aid of the Scientific American, and to this end we will thank them to give us the names of the roads and their controlling officers who impose in the manner stated by Mr. Wilson upon their engineers.

Inasmuch as the Brotherhood do believe with us, as represented by Mr. Wilson, that the running of certain trains on Sunday is necessary, the *Witness*' fervid puff of the piety of the Brotherhood, as relates to the breach of the Divine command and the infraction of public morals, is entirely wasted.

THE NEW YEAR.

The present number of the Scientific American is the first for the new year of 1873, and we would remind those of our readers who have not already done so that their subscriptions should be at once renewed. This will prevent interruption in the regular coming of their papers, and save them the risk of losing any numbers. One of our subscribers says that he regards the loss of a single number of the Scientific American like time lost in the prime of life. Send in your subscriptions as fast as possible. Terms, $3 a year. One copy of the Scientific American for one year and one copy of Science Record for 1873 will be sent for $4.50.

Some idea of the interesting and valuable character of the Science Record may be gleaned by reference to the general statement of contents published in our advertising columns. It will be noticed that every department of science is to be represented. Among the biographical illustrations several fine steel plate engravings are given, among which are portraits of Professor Henry, of the Smithsonian Institute; Professor Pierce, of the Coast Survey; Professor Dana, of Yale; portraits of Professor Morse, as he appeared in the prime of life, soon after the completion of the first telegraph line, of Professor Tyndall, who is now lecturing here, and other distinguished men of science.

RAPID TRANSIT IN NEW YORK.

The New York *Times* does not look with favor upon the proposition to use steam upon the street cars, in lieu of horses, for the reason that there would be increased liability to accident without any gain in speed. Our cotemporary thinks that the only way to realize fast traveling in the city is by means of tracks removed from the surface. The two ends of the metropolis are now twelve miles apart, and the people suffer great inconvenience for a lack of quick means of communication. The discussion of the various plans by which this may be best effected is a matter of interest, not only to New Yorkers, but to the people of all large cities. Nothing so stimulates business, gives value to property, and promotes the comfort of city life, as prompt and safe modes of local conveyance.

It is only by an elevated or an underground railway that rapid transit can be realized in New York. The relative cost of these roads is about the same, namely, from one million to one million five hundred thousand dollars per mile. The elevated road is inevitably an obstruction, in whatever street it is built, for it is simply an immense bridge, which no one wants before his doors. On the other hand the underground railway is entirely out of sight, does not interfere with the streets, and disturbs no one. In London a shopkeeper in one of the main streets was asked by an American where the underground railroad passed. He said he did not exactly know, but he believed it was on the next street back, a block distant from his premises. But the truth was, the railway in question passed directly in front of the man's door, forty feet below the surface of the ground; and the shopkeeper, who had moved in subsequent to the building of the road, was not aware of the fact, although three hundred trains a day were regularly passing. It has been affirmed by experienced engineers in this city that a single omnibus, clattering over the Broadway pavement, shakes the adjoining buildings and makes more noise on each trip than would all the trains of an underground railway during an entire day, if built on that street. Well made cars slide along very smoothly over a properly constructed track.

One and a half millions of dollars a mile is an immense cost for a city railway, and to insure its pecuniary success the first essential is to locate its route where its cars and accommodations will be constantly under the public eye, readily accessible to the largest portion of the population. Such was the testimony of the eminent engineer, Mr. John Fowler, before the Parliamentary Committee in respect to the London underground railways. It is evident that the route under Broadway in this city is the natural and proper line for such a road.

A variety of charters have been granted for steam roads in this city; but their routes are faulty, and none have been built, save the post railway on Greenwich street, which is far away from Broadway, and has proved a bad bargain to its original stockholders. They have not only lost their charter, but every cent of their original investments, amounting, it is said, to over one million of dollars in cash.

Another grand scheme was the Viaduct or elevated railway, the charter for which was granted to the notorious Sweeny & Co. The routes proposed were on side streets, east and west of Broadway. Although five millions of dollars were to be taken from the city treasury to help the scheme, still such was its enormously expensive character, so defective the route, and so greatly was it disapproved by the public, that it was impossible for the corporation to procure subscriptions enough to start the thing.

Three other charters were granted last year, one to Mr. Vanderbilt for an underground road on Fourth avenue, east of Broadway, another to Mr. Gilbert for an elevated railway to run on a side street either east or west of Broadway, according as certain commissioners may determine; and another to Mr. Swain for a double road, with both elevated and underground tracks, to run on the side streets west of Broadway. There seems to be no great obstacle to the procuring charters for New York railways. The grand difficulty is to secure the right route.

Of the various plans for fast railways in this city, that of the Beach Pneumatic Transit Company, for an atmospheric railway under Broadway, has been the most carefully examined and the most widely approved by the public. It has been shown that, for a cost of about one million dollars per mile, a double track railway can be built from the City Hall to Harlem which, with certain lateral branches, will give to our citizens the luxury of rapid transit all through the county. At the inception of this enterprise, the trustees of the corporation caused the most careful investigations to be made in respect to route and the method of building, and the unanimous conclusion was that the Broadway route was not only the most economical for construction, but afforded promise of accommodating a larger number of people than any other line that could be selected.

Great pains were taken to accumulate reliable evidence. Nearly all on the leading architects in New York were consulted in the matter, especially those who had had occasion to erect important buildings on the above thoroughfare. With an almost unanimous voice they joined in certifying that the railway could be built and operated on Broadway on the plan proposed by the company, without any molestation of or injurious effect upon adjoining buildings. The advice of the most eminent and experienced civil engineers was also taken, among whom were A. W. Craven, Esq., C. E., George S. Greene, Esq., C. E., Major General J. F. Barnard, U. S. Engineers, General Charles K. Graham, C. E., all of whom, after personal examination, certified in the most unqualified terms that the work proposed by the company could be executed and the railway worked without injury to adjacent property.

The advice of prominent English engineers was also taken upon the subject, among whom were Mr. F. E. Cooper, of the London Underground Railway, and Charles Douglas Fox, Esq., C. E., the well known railway constructor and engineer of London; all of whom fully coincided with our own engineers and architects. Mr. Fox did not merely write upon the subject, but had come to this country and made a personal examination of the route.

To illustrate the matter still further, and remove every lingering prejudice against the work that might exist in the minds of property owners, the company determined to construct a short working section of railway under Broadway. This they were enabled to do under the provisions of their original charter, which gives them the right to place pneumatic tubes under the streets for carrying freight and parcels. The company accordingly secured premises in the lower part of the large marble building at the corner of Broadway and Warren street, and, having constructed a novel boring machine, set it to work to excavate a railway tunnel down Broadway, below the foundations of the buildings, under the water pipes, sewers and gas pipes, without disturbing the surface of the street, and with all the omnibuses, trucks, and the enormous traffic of the street going on directly over the heads of their workmen. So carefully, expeditiously, and successfully was this work executed that the entire section of the tunnel, which is between nine and ten feet in diameter, from Warren street down Broadway to Murray street, was almost completed and the track laid before the newspaper reporters or the public were informed that anything of the kind was in progress. The work was then finished up, a large blowing engine put in, a handsome passenger car placed on the track, and the railroad set in operation. All this was done at an outlay of about a quarter of a million dollars. The admirable working of this short railway has been before described in our columns. It will be sufficient to say that, by means of the blowing machine, a current of air is impelled through the tunnel, and that it drives against one end of the car, carrying it along, just as the wind acting upon the sail of a vessel gives it motion. The car, on reaching the lower end of the tunnel, actuates a telegraph signal, the air current is reversed, and the car is driven back. Thus back and forth, indefinitely, the car is moved by atmospheric pressure, while the constant driving of the air current through the tunnel maintains a pure atmosphere and perfect ventilation. The car carries twenty-two passengers, moves with but little noise, and there's is no gas, smoke, dust, or cinders to interfere with one's comfort. Many thousands of our citizens have enjoyed the ride under Broadway in the pneumatic car, and this method of traveling is not only well known here, but is highly appreciated. The works of the Transit Company on Broadway form one of the most interesting attractions in New York. For city purposes, this system of car propulsion is admirable. The expense of its maintenance is estimated to be somewhat higher than the locomotive; but the pneumatic plan is so decidedly superior, in point of comfort and health to passengers, that the trustees had no hesitation in giving it preference. Its adoption was also recommended by the London engineers, where, as our readers will remember, there is a smaller pneumatic railway of between two and three miles in length, which has been worked successfully for several years past. Several miles of other small pneumatic tubes are also now in use in London for the transmission of telegraph messages between important points.

After the Transit Company had, at the great expense mentioned, completed their working section of road under Broadway, they applied to the State legislature for an amendment to their charter, authorizing them to carry passengers and proceed with the work. The members of the legislature visited the city, inspected the works, rode in the car and became thoroughly satisfied of the excellence of the plans. Both branches of the legislature, by very large majorities, passed the bill, and it was sent to the Governor, Hoffman, for approval. The notorious Sweeny & Co. were then in the zenith of their power, and the Governor was the pliant tool of their wishes. At their solicitation, he vetoed the bill and then promptly gave his approval to the abortion known as the Viaduct bill, of which the public disapproved, and in which Peter B. Sweeny and his immediate confederates figured as chief incorporators. Last year the legislature again passed the Beach Transit bill by increased majorities in both houses, but Governor Hoffman repeated his veto. A new governor, General John A. Dix, a man of much higher capacity, takes his seat in the gubernatorial chair on the 1st of January, and the many friends of this excellent enterprise believe that he will be glad to give it his approval.

In brief, then, the actual condition of the rapid transit business in New York is this: The only plan and route that fully meets the wants of the people that has been thoroughly examined, approved and endorsed by property owners along the route on which it passes and by the general voice of the public, is that of the Beach Pneumatic Transit Company.

At a heavy expense this Company has already begun the work, and stands ready to prosecute it with the greatest vigor as soon as the necessary authority of law is granted. No good reason exists why that authority should be withheld. It is a shame that the Company should be delayed and hindered in carrying forward this important enterprise in which so many of our leading citizens are interested, and by which the public convenience will be so greatly promoted. The Company will urge their petition before the new legislature, and, it is to be hoped, will this time succeed.

To Mail Subscribers.

The regular receipt of the SCIENTIFIC AMERICAN by mail is sufficient evidence to old subscribers that the time for which they prepaid has not expired.

To new subscribers, the regular receipt of the paper is an acknowledgment that their money has been received at the office of publication. It is a rule of the publishers to discontinue the paper when the time is up for which it is prepaid.

WORK has been commenced on a new railway tunnel through the rocks of Jersey Hights, at Weehauken, N. J., on the Hudson River, opposite New York. The tunnel is to be fifty feet wide, about a mile in length, and will have four railway tracks.

A CORRESPONDENT, writing for some missing back numbers, says that the loss of any copies of the SCIENTIFIC AMERICAN is like lost time in the prime of life.

SCIENCE differs from learning in being prophetic; whereas learning is a mere matter of the memory.

PATENT OFFICE DECISIONS.

Patent Wrench.

THE COLLINS COMPANY, ASSIGNEES.—APPEAL FOR THE REISSUE OF PATENT OF JORDAN & SMITH, FOR WRENCHES, OCTOBER 19, 1865.

LEGGETT, *Commissioner:*

It is admitted that the device differs from the references cited, and the applicant maintains that the words "substantially as described" sufficiently indicate the difference and define and limit the invention intended to be secured by this claim. The real issue in this case is whether the claim presented is met by the references cited. Otherwise an appeal to the Board would not have been in order. I think that as drawn it is met. It should be limited by including the nut, or otherwise, to clearly distinguish the invention from the references, and then the words "substantially as described" may or may not be used; but, as they serve to well round a claim, I would rather favor their employment than otherwise.

The decision of the Board is affirmed.

Improvement in Cutter Bars for Mowers and Reapers.

APPEAL OF H. MEWES.

LEGGETT, *Commissioner:*

This case had several examinations by the Principal Examiner, and was by him rejected. The applicant made numerous amendments. The final amendment embraced two claims, the latter of which is entirely inconsistent with the description of the invention in the body of the specifications. This fact was recognized by the Principal Examiner, and also by the Board of Appeals. The Examiner permitted the appeal to be taken, and the Board of Appeals heard the same and permitted the appeal to be taken to the Commissioner in person without first requiring that either the claim or the specifications be so amended as to make them consistent with each other.

The Commissioner will not examine the case in its present condition upon its merits, but returns the same to the Principal Examiner to have the preliminary questions settled.

Improved Spectacles.

APPEAL OF JULIUS KING.

LEGGETT, *Commissioner:*

Applicant proposes to improve ordinary steel spectacle frames by making the bridge or nose piece of solid silver instead of steel or steel silver-plated, as they have heretofore been made. The advantage alleged is that while oxidation is prevented, as in plated bridges, the solid silver bridge can be united to the steel rims by the autogenous process of soldering, which is said to be employed at a lower temperature than a steel bridge can, and thereby the danger of burning the steel and rendering it brittle at the point of union is obviated and a better frame is produced.

The decision of the Examiner, which is affirmed by the Board, proceeds upon a denial of the allegation that a more ready and safe application of the soldering process is practicable where a silver bridge is used than where the spectacle frame is made wholly of steel, and upon the assertion that no invention is exhibited.

I am satisfied, however, that it is true a silver bridge can be united to the rims at a lower degree of temperature than a steel one, and that thereby the danger of burning the rim and rendering it brittle is obviated. If the common method of soldering by the use of an alloy were employed, as seems to have been represented to the Examiner and Board, this would not be the case. But to secure a silver bridge no solder is required, as the silver itself (which is not perfectly pure) is a solder, and it can be united to the rims by such a degree of heat as will fuse it. That there is invention exhibited—not in any single step or feature taken alone, but in what is claimed (namely, the novel combination of the parts presented)—cannot be successfully denied, in view of the improved result obtained.

The decision of the Board is therefore overruled.

Trade Mark.

APPEAL OF BYRON GRAHAM FOR THE REGISTRATION OF A TRADE MARK FOR HARVESTERS.

"Manny," as applied to harvesters is a generic and descriptive name, and is common property as such. The word "New" as a qualifier of "Manny" is held to be equivalent to *improved*, and as such is descriptive.

Such a mark (The New Manny) cannot distinguish a machine from those of other manufacturers of "Manny" machines with improvements.

THACHER, *Acting Commissioner:*

As the only essential portion of the proposed trade mark is descriptive and not distinguishing, I am of the opinion that registration should be denied.

Saw Mill Carriage.

L. C. PATTEE.—INTERFERENCE APPEAL.

A rehearing in a case of interference will only be granted on such a showing of merits as would entitle a mover to a new trial in a suit at law.

THACHER, *Acting Commissioner:*

I have no doubt, after an examination of authorities, that in a parallel case a new trial would be unhesitatingly refused before the courts, and it must be here.

The motion is denied.

DECISIONS OF THE COURTS.

United States Circuit Court, District of Massachusetts.

PARTON *vs.* PRANG.

Copyright.

A suit in equity brought by Arthur Parton, artist, against Louis Prang, publisher, to restrain the defendant from the publication and sale of the chromo entitled "Close of Day," a reproduction by the process of chromo-lithography of a painting designed and executed by complainant in oils. Although the complainant had sold the original painting, which ultimately had been purchased by defendant, no special conditions being annexed to the sale, it was contended in behalf of the complainant that such sale of the picture did not convey the right of reproducing or publishing the same.

The opinion of the Court was delivered by Mr. Justice Clifford, in which a very able review of the general scope of the copyright law is given, and the distinctions pointed out between a copyright on a literary production and a copyright on a painting.

Assignments of a manuscript are required to be in writing by the copyright act, but enough has been remarked to show that a picture, under that act, might be transferred by an oral contract, and it is well settled law that even copyright is an incident to the ownership of a manuscript, and that it passes at common law with the transfer of a work of art. *Turner* vs. *Robinson*, 10 Irish Ch., N. S., 142. *Power* vs. *Walker*, 3 M. and S. 9. Hence the remark of the Court in *Turner* vs. *Robinson* that it was a strange proposition that the transfer of property should destroy and extinguish that which principally constitutes the value of the thing transferred, meaning not that the right to publish did not pass by the sale, but that the exclusive right of publication which attached to the manuscript was not lost by the transfer. Such a transfer of the manuscript or picture is not a publication of the same unless it was so intended by the parties: but if the sale was an absolute and unconditional one and the article was absolutely and unconditionally delivered to the purchaser, the whole property in the manuscript or picture passes to the purchaser, including the right of publication, unless the same is protected by copyright, in which case the rule is different. (*Baker* vs. *Taylor*, 2 Blatch., 82, *Ryan* vs. *Goodwin*, 3 Sum., 518; *Wood* vs. *Zimmer*, Holt, N. P., 60; *Pennock* vs. *Dialogue*, 2 Pet., 14.)

Unfairness is not pretended in this case, and inasmuch as the sale and delivery were in their terms absolute and unconditional, and without any reservation, restriction, or qualification of any kind, the court is of the opinion that complainant is not entitled to relief.

T. W. Clark, for complainant.

S. Z. Bowman and *H. W. Chaplin*, for defendant.

Supreme Court of the United States.

Steam Engine Patent.

JAMES REES, Plaintiff in Error, *vs.* WILLIAM L. GOULD.

In error to the Circuit Court of the United States for the Western District of Pennsylvania.—December term, 1871.

Mr. Justice Clifford delivered the opinion of the Court.

Letters patent were granted to William L. Gould, on the 24th of January, 1860, for a new and useful improvement in steam engines, described in specification as "a new and useful mode of operating and handling" such machines, which consists, as the patent states, in so arranging and constructing the cranks or arms of the lifters and cam rods of puppet valve engines that they may be operated and handled with ease and speed, by means of levers and connecting rods, the whole being arranged and constructed in the manner described in the specification.

Process was issued, and being served, the defendant appeared and plead as follows: 1. That he was not guilty. 2. That the plaintiff was not the original and first inventor of the improvement described in the letters patent, and tendered an issue to the country, which was joined by the plaintiff.

The defendent requested the presiding justice to instruct the jury that when a combination of mechanical devices is claimed, the patent is not infringed by the use of a combination differing substantially in any of its parts, and that the omission of one essential feature or element of the combination as claimed avoids the infringement, repeating that request in respect to each of the three claims of the patent, and the bill of exceptions shows that the presiding justice refused to give the instruction as to any one of the three claims, and that he instructed the jury in respect to the second claim that the use of the combination is an infringement, and that the omission of one of the elements and the substitution of another mechanical device to perform the same function will not avoid the infringement, adding, what undoubtedly is correct, that the elements of the machine may be old and the invention consist in a new combination of old elements whereby a new and useful result is obtained.

Just exception cannot be taken to the last paragraph of the instruction, but the preceding clause, which asserts that the omission, of one of the elements and the substitution of another mechanical device to perform the same function, will not avoid the infringement, cannot be sustained, as the principle as there stated, without any qualification, is not correct, and when given, as the instruction was, without any explanation, it was well calculated to mislead the jury.

Where the defendant in constructing his machine omits entirely one of the ingredients of the plaintiff's combination without substituting any other, he does not infringe, and if he substitutes another in the place of the one omitted, which is new or which performs a substantially different function, or if it is old but was not known at the date of the plaintiff's invention as a proper substitute for the omitted ingredient, then he does not infringe.

Tested by these principles, as the instruction in question must be, it is plainly erroneous, as it warranted the jury in finding for the plaintiff, whether the ingredient substituted for the one omitted was new or old, or whether the one substituted was or was not well known at the date of the plaintiff's patent as a proper substitute for the omitted ingredient.

Judgment reversed and a new venire ordered.

Business and Personal.

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

Notes & Queries

[We herewith present 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.—How can I do silver plating on carriage work with foil?—T. R.

2.—How is canvas prepared for painting pictures on?—J. C. J.

3.—Will some one tell me how horn is cleared or made transparent?—A. J.

4.—Will some one please inform me how shot guns are loaded so as to throw the shot closely?—A. J.

5.—Is there anything that will remove the taste of kerosene from a cask?—Z.

6.—Can you inform me how to take the oil out of cotton waste in the quickest and cheapest manner?—J. C. W.

7.—Can you give a recipe for making paste to stick to bright tin without first roughing the tin; a paste that will not peel off?—B W. & Co.

8.—What is the best size to use for gilding the engraved lines on ornamental walnut work, and also for gilding on pine board?—W. H. C.

9.—What is the best and cheapest process for gilding picture frames, and how can I obtain the high polish or gloss on certain parts of the gilt surface?—H. R.

10.—What is the best means of cutting brass stencil plates with acid, and what is the proper material with which to cover the portions of the plate that are to be protected?—J. J. C.

11.—Is it possible to take ink stains from dressed stone? One of the finest buildings in our city has been defaced by the use of writing fluid and some kind of syringe, in the hand of some spiteful unknown.—W. D. G.

12.—How is the pearl work put on the many sided part of ornamental handles of boxes, and on heads of canes, whips, etc.? From what is the material obtained, and in what part of the world is it produced, and what is the process?—C. D.

13.—Will some one tell me how thin, crooked ornamental patterns are made, such as stove patterns, column capitals, etc.? And how are small castings made to have the appearance of bronze or copper, by a cheap process?—G. W.

14.—I have a lead cistern which leaks; the plumber says it is caused by the action of the water on the lead. It is supplied from a well, and the water is not very hard. Do you know of any cement or paint which will stop the leaks and prevent any further corrosion?—B. F.

15.—Does wood, after it has been thoroughly kiln dried and treated with a non-absorbent of moisture, shrink and swell with variations in temperature, as iron, brass, zinc, and pipe metal do, and to what extent, taking iron as the unit? What is the best non-absorbent to use to give a hard and glossy finish? Would liquid glass answer the purpose?—A. A. D.

16.—I am building a cedar skiff and am desirous of making it as light as possible. Is there any preparation that I can use in the place of paint and oil that will be as good and weigh less?—J. H. R.

17.—What can I use for a light in a dark lantern for night hunting that will enable me to see farther than ordinary kerosene or signal oils?—J. H. R.

18.—Can there be telescopic sights adjusted to a rifle barrel that would be of use in night hunting, at a moderate cost?—J. H. R.

19.—I want a substance like glue, mucilage, or varnish with which I can give oak wood one or two coats, to keep it from burning, or else make it burn very slowly. I want to mix up liquid iron with it. I don't mind if the wood burns, so that it burns slowly.—W. H. P.

20.—How can I make a fireboard for a grate front? I have finished one, but it is wrinkled and full of folds. How can I stretch the cloth on the frame, and how can I paste the paper on the cloth so that it will be stretched smooth?—C. R.

21.—Will some one give a rule for laying out for dovetailing on a bevel, say for a hopper for a grist mill, or the corners of a carriage seat? I find very few mechanics who understand it.—T.

22.—I have a steam engine, cylinder of 1½ inches diameter, 3 inches stroke, which I wish to use for running a sewing machine, and perhaps some other small affairs about the house. How can I build a boiler for it that will be cheap and safe, and will run it at 150 revolutions a minute with 25 pounds pressure? Can I make one to go on a cooking stove, or would it be better to set a boiler into a common cylinder stove, or to make a boiler and furnace separate from any stove? What thickness of iron and how large should be the safety valve, and what should be the length of arm and the amount of the weight?—J. E. S.

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 $1·50 a line, under the head of "Business and Personal."

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

J. B., of N. Y.—Your windmill can, we think, be patented.

What is properly the damper in a stove? Is the movable plate next the pipe called the damper, or is the sliding plate in the front which shuts off the air properly the damper? I contend the plate which turns the fire under the oven is not the damper proper, but the regulator, and the valve in front is the damper. The dictionaries are not explicit enough to satisfy the understandings of different persons. Answer: We generally designate the movable plate or dish within or near the smoke flue as the damper, and the valve in front as the draft regulator. The plate that sends the fire around the oven might be called the oven damper or the oven regulator. It makes little difference what name you give to mechanical parts provided people understand what you mean when you speak.

Have any experiments been made with a sheet iron cylinder, filled with hydrogen or coal gas for the purpose of making an electro-magnetic helix out of it? If not, would you please to give me your opinion, whether such a helix would heat the gas, and cause it to explode, if there were a battery of 36 cells attached to it, or whether it would have no effect on the enclosed gas? The knowledge of whether it would have any effect on the gas would be a step forward to an important invention.—D. M. B. Answer: Experiments have been made. A sheet iron cylinder will not act as a helix with such a battery. The gas would not be perceptibly affected, and would not explode if it were heated. It requires to be mixed with oxygen in proportion approaching 2 volumes of hydrogen to one of oxygen to make it explosive.

Is metallic antimony a good conductor of electricity for a positive metal in a galvanic battery, and what is its conductivity relative to silver or copper? What number of copper wire would it take for an electro-magnet 3 inches long with a core of ¾ inch or 1 inch diameter?—C. B. Answer: Owing to the action of the acids, antimony would be a very poor material to use in a galvanic battery. In a thermo or dry battery it may be used to advantage. It is a much poorer conductor than silver or copper. As to magnet, make your core a little longer, say 6 inches, for the diameter you mention, and use No. 20 cotton or silk covered copper wire.

M. M. S. asks: Suppose 130 is the larger, and 28 the smaller gear on a lathe, can a screw be cut coarser than said gears will cut on same lathe without larger or smaller gears? Is so, how can it be done? Answer: There can no coarser thread be cut with those gears, except by the use of intermediates on a stud.

It is argued that a person travelling, either eastward or westward, around the world—say at the equator—would find on arriving at his starting point that he had either gained or lost one day of the week. Is this so?—J. R. T., Jr. Answer: Yes. Make a calculation on a terrestrial globe, and you will see for yourself.

S. H. G. says: In the schedule of charges adopted by the Institute of Architects, June 4th, 1866, I find the following: "Drawings as instruments of service are the property of the architect." I wish to know how the architect can recover plans after such service. Answer: In the same manner in which a person may recover any other property of his, which may be improperly detained by another,—by due course of law.

I have in my possession a stone, something similar, I presume, to diamond. Enclosed is a small piece, which I hope you will give a thorough examination. It has been tested by several in this place and they report it a valuable stone of some kind, but do not know for certain whether it is a diamond or not.—J. M. McN. Answer: The fragment sent is from a pure, limpid rock crystal; this it is, and nothing more. Of no value.

E. B. M., of Tenn.—The crystals are sulphuret of iron or pyrites, and are valueless.

J. H., of N. J.—The specimen you send is shell marl, that is, a mixture of clay and lime containing small bivalve shells.

J. A. B.—The mineral you send is chalcedonic quartz, of no special value,

W. S. H. says: How can I arrange the exhaust pipe to my engine, so as to get the greatest degree of heat in the water in the tank? And if I use a coil or worm, do I lose any power from back pressure? Also, what would cause blisters on the bottom of the boiler? And would they be considered dangerous with plenty of water in the boiler? Answer: To get most thorough utilization of the heat of your exhaust steam, lead it into a receiver near the lowest point and carry off such as remains uncondensed by a pipe from the top. Sprinkle your feed or other water to be heated, by a rose fixed in the upper portion of the receiver. The feed will thus be heated to the boiling point if properly arranged. Place your pump so low, or the receiver so high, that there will be a good head of water above it, or you will find pumping hot water a difficult matter. If you must draw and force your feed water with a single pump, you will be compelled to use a worm heater. If well proportioned, it ought to do good work without seriously increasing back pressure. Give it plenty of surface, and do not make the pipe too small. Large blisters are always dangerous.

S. W. H. says: Your decision between R. and W., page 394, in the matter of a balance wheel keyed on diagonally to the shaft, as shown in the figure. seems to me unsound. You admit that it will always tend to turn itself until its axis coincides with that of the shaft, and say, "this effort will be a constant one, tending to bend the shaft, but does not necessarily produce unsteadiness in the shaft." Now unless the shaft be infinitely inflexible (which was not in the proposition) it must yield to the unlimited effort to bend it; and if the shaft does yield it becomes crooked, and if crooked a greater weight will be thrown on one side of its axis than the other. In which case I think you will hardly maintain that its steadiness would not be affected under high motion. If machinists may key on their balance wheels at 45 degrees to thin axes and furnish shafts crooked to any degree without affecting the steadiness of the motion, I think that somebody deserves a patent for the discovery. Answer: If our correspondent will try the experiment, even with the extreme case supposed by him, he will find our decision confirmed, provided that his bearings are not left loose, if he experiments with a horizontal shaft. With a vertical shaft, he may even leave his bearings quite loose and still obtain steady motion, unless the driving force act as does gravity in the first example. Cam shafts often illustrate this case, and our correspondent will readily be able to confirm what has been stated. We shall be glad to publish the result of his experiments should he take sufficient interest in the subject to make them.

H. B., page 373, Vol. XXVII., wants the working part of a rammer or scraper, to work in the ground among gravel. Chilled cast iron will suit his purpose better than steel, as it is harder than most merchantable steel can be made, and far cheaper. It can be had in almost any car wheel foundery where No. 3 cold blast charcoal iron is used. Let H. B. support the working edge if possible with fine cast iron, which need not be chilled. If he wants holes in the chilled part, they should be round or oval, not square, as a square corner affords a fine starting point for a fracture. Those holes should be cored. It is very hard to drill chilled cast iron unless provided with suitable tools.—P. McC., of N. J.

J. W. B., page 362, Vol. XXVII., wishes to know how to make good cider. Take good sound apples (the sweeter the apples, the richer the cider; although apples slightly tart make cider of the best flavor) late in the fall, the later the better, before freezing. Early apples and wind falls may do for vinegar, but will not make cider that will keep any length of time. Fill the barrel full, put in the cellar, take out the plug and let the cider ferment for about ten days, keeping the barrel full with cider made at the same time. In this way most of the pomace is thrown out. This, however, is not very essential. After the cider has worked about ten days, take a long slim bag that, when filled, will go in at the bung hole, put in about one pound of English mustard for every 30 gallons, and drop into the cider, then cork the barrel air tight and let it stand about three weeks, then draw off into another barrel. Or put back in same barrel after thoroughly cleansing it; see that the barrel is full, then cork tight. Cider treated in this way will remain unchanged until warm spring weather, when it may be bottled for summer use. Cider will gradually get hard if the barrel is daily drawn from; in that case bottle when the flavor just suits. Sulphite of lime kills the life of cider and renders it as flavorless and worthless as dish water.—E. H. R.

To W. S. H., page 362, Vol. XXVII.—I have seen as smoky days in July as ever I saw in the fall, and several in succession. The leaf burning theory will hardly do for July.—E. H. R.

To tin brass pins, etc., the goods are to be cleaned free from oil; then an earthen pot is to be prepared. First a thin sheet of block tin is to be put at the bottom, then a steam pipe is to be introduced nearly down to the same; next put a layer of the goods, then a sheet of tin as before, next more goods, and so till it is filled. Then fill up with water till all are covered, throw in some cream of tartar and turn on the steam just enough to keep boiling. After whitening, rinse in clear water, and pass through saw dust. In a small way, I have whitened ordinary tinner's ware by covering with tin foil, and boiling over the fire, filling up the water as it evaporated.—W. A. B.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Bursting Strains of Boilers. By T. W. B. and E. E.

On a Geometrical Problem. By H. B.

On Vulcanized Rubber and Rubber Belts. By A. E. V. E.

On Certain Remarkable Effects of the Solar Rays. By G. R.

On Perpetual Motion. By W. J. A.

On the use of Belts for Machinery. By W. G. B.

On the Action of a Balance Wheel placed out of right Angle on its Shaft.—By H. C. K.

On Scientific and Mechanical Possibilities. By J. E. E.

On Steam Presssure. By F. G. W.

Recent American and Foreign Patents.

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

SPRING BED BOTTOM.—Henry E. Maker, South Framingham, Mass.—The object of this invention is to furnish a spring bottom for beds; and it consists in slats resting upon pins which pass loosely through holes in cross bars. The ends of the pins rest upon wires which connect pairs of springs. The slats are placed longitudinally or at right angles with the cross bars on the tops of the pins, and are in themselves elastic, so that they give or conform to the tension of the springs and weight on the bed.

SPRING BED BOTTOM.—John Ralston, Mansfield, Ohio.—This invention has for its object to furnish an improved spring bed bottom, and it consists in two sets of slats, upper and lower, held apart by cross bars having between them spiral springs. Said cross bars as well as the slats are elastic and give further spring to the bed.

GARBAGE BOX.—Moritz Bacharach, of New York city.—This invention relates to a new garbage box, which is to be placed upon the sidewalks near the gutters of streets in cities and towns, and within which, to some extent, the moisture contained in the offal will be separated from the solid matter and ejected into the gutters. The invention consists in making the garbage box with an opening in the top and with a perforated false bottom, and in arranging on its side a door above the false bottom and an opening beneath the same.

FEED WATER APPARATUS FOR STEAM BOILERS.—John W. Youman, Mobile, Ala.—This invention relates to a new and improved mode of introducing feed water into steam boilers. The feed water pipe passes through the rear head and extends forward to near the front head of the boiler, and returns back to and through the rear head. This pipe is located at or near the water line, and near the shell of the boiler. The feed water, in passing through and before it reaches the return portion of the pipe, which is perforated, will become heated to near or quite the boiling point, and the sediment contained therein will be deposited in the pipe, and may be blown off from time to time through a small blow off pipe extending through the rear boiler head. This perforated tube may be larger in diameter than the other part, and may be arranged in the boiler so as to be just submerged. In this position it will serve as a surface blow off by shutting off the feed water.

FENCE.—Edward M. Crandal, Marshalltown, Iowa.—The invention consists in an arrangement of rails, posts, and braces to form a cheap, strong, and durable, yet easily transported, fence. The corner post consists of four uprights, connected together by transverse bars, extending outward laterally in different directions so as to support the braces. The uprights are also connected together by rails, upon which the rails of the fence rest, the ends of the rails being notched and held down by wires. The uprights of the post are placed at a sufficient distance apart to admit the rails and allow the fence to be extended at right angles in either direction. The other posts are made in a similar manner, but with two uprights, with braces extending in each direction to keep the fence upright, except that, at proper intervals—say once in four or five rods,—braces, which support the fence longitudinally, are added. The fence may be made with any desired number of rails, and each one may be removed separately, so that a gateway may be made between any two posts for the passage of teams, stock, or for other purposes.

BED, SOFA, AND LOUNGE BOTTOM.—Royal Jennings, Racine, Wis., assignor to himself and Wallace H. Jennings, of same place.—This invention relates to a new construction of bed, sofa, and lounge bottom, which is very light, graceful and elastic, and at the same time durable and cheap to make. The invention consists in the arrangement of wire springs, clasps, and a wire or cord bottom. The spiral springs are of suitable number, each having its two ends formed into hooks. The outer ends of these springs are, by the hooks thereon, fastened to screws or pins that project from the upper faces of the end rails. When all the springs have thus been placed, a wire or string is fastened with one end to a pin of an end rail, then carried loosely along the outer sides of pins that project from the side rails, laid around a pin on the opposite rail, carried back to the first end rail, and hooked to the first spring thereon, and so brought back and forth and hooked to the several springs, and finally fastened with its other end substantially as with the first. All the while the string or cord is left quite slack. Subsequently it is drawn tight by small clasps that are hooked over adjoining lengths of the wire at proper intervals.

SLOP PAIL.—John S. Jennings, Brooklyn, N. Y.—This invention consists of a detachable seat for slop pails, also a cover therefor, detachably connected with it, the seat being detachably connected to facilitate the cleaning of the pails, which can be done much more readily and thoroughly when the seat is detached than when not so, as they have been heretofore made.

FEEDING CANALS.—James G. Brewer, Lone Tree, Nebraska.—This invention consists in an improved mode of conducting water from rivers which flow over shifting sands or quicksands into canals or races to enable the water to be used as a motive power. The inventor drives piles into the bottom of the river, or into the sand near the river, so close together as to exclude both sand and water, or at least the sand, and inclosing a larger or smaller space, according as more or less water is required. The piles form a close curb all around the inclosed area except an opening for the canal or race. The water rises through the sand in the curb, which forms the beginning of the canal, and flows through the said canal or race to the place where it is to be used. Should the sand rise with the water, the sand may be kept back by wire screens, which, in this case, will not choke, as the water rising through the clean sand is free from sediment. This invention enables the water of the Platte, Arkansas, and other similar rivers, to be used for water power, which heretofore has been impossible.

MITTENS.—John L. Whitten, Essex Junction, Vt.—This invention relates to the construction of mittens made, either in whole or in part, of leather, and consists in the mode of cutting the leather, and in the patterns for the parts of the said mittens.

MEDICAL COMPOUND.—Herman Themel, Esconawba, Mich.—This invention relates to a new medical compound, which is intended for use against stomach diseases in cases of cholera, etc. It is composed of the following ingredients: bog bean, wormwood, juniper berry, valerian, gentian, potash: the remainder, alcohol or alcoholic liquor—such as whisky.

FENCE.—Harrison McMullin, Batesville, Ark.—This invention has for its object to furnish an improved fence. It consists of a number of planks resting above each other and supported by blocks of stone or wood. The low wall thus made is surmounted by crossed stakes and a rider.

CAR COUPLINGS.—David Walter, Evansport, Ohio.—This invention consists in a gravitating self-coupling hook, which is raised by the link when it enters the buffer, and engages said link automatically, which said hook is provided with a rolling or oscillating guard, which falls between the link and the point of the hook whenever the end of the link is thrown upward more than is usual in the ordinary working conditions—as, for instance, when a car jumps the track and effects the uncoupling, so that the cars remaining on the track will not be forced off by one already off.

GRANARY.—Charles T. Moorman, Jr., Jamestown, O.—This invention has for its object to furnish an improved granary, which shall be so constructed that rats and other vermin cannot get into it, which shall be firm and solid, will not "creel" with weight, will protect the grain better and may be readily moved without injury to the building. The entire granary is supported upon posts which are set at an angle of about forty degrees, and are arranged in pairs, the upper ends of the posts of each pair being firmly secured to each other. Hanging posts are inclined at an angle of about thirty degrees in the opposite direction from the above mentioned posts. By other and suitable construction the granary is fully protected from rats and other vermin, as the inclination of the exposed parts affords them no chance to stand or sit and gnaw.

EARTH AUGER.—Isaac N. Pyle, Cameron, Mo.—The invention consists of an earth borer in which two jaws are affixed to the lower ends of upright arched plates, which are, respectively, attached to the pendent arms of a shank. This shank is double, its upper or stem parts being held together by means of straps placed around them. A wedge can, from below, be forced in between the parts of the shank to spread the jaws and plates to a suitable extent. The plates are slotted, and are secured to the pendent parts of the shank. Two other curved plates are placed between the plates and have jaws flexibly attached to their lower ends, and are only used in sand. The jaws serve as valves to let the sand in and prevent its escape, thus constituting a trap in which the sand bored out will be collected convenient for removal.

BAKE PAN.—Richard D. McDonald, Jersey City, N. J.—This invention relates to apparatus to be placed in ovens for baking bread or roasting meats, and all similar purposes; and it consists in the mode of connecting the parts together, or more definitely in a beveled flange around the edge of the upper part of the pan. The angle of this flange, from a vertical line, is designed to be about the same as that of the sides and ends of the lower part of the pan, and is designed to form, with the lower part, a tight joint, so as to confine the gases or steam generated in the pan from the article being roasted or baked.

BURIAL CASE.—Collins C. W. Morgan, of Holly Springs, Miss.—This invention relates to connecting the two parts of a burial casket—made of terra cotta or other suitable material—by means of clips or clasps, and to constructing said clips or clasps with handles, thereby dispensing with the necessity of the handles ordinarily provided for coffins.

SUBSOIL PLOW.—Christian Myers and William Gummow, of Marysville, Cal.—The invention consists in the mode of adjusting the subsoil plow, whereby it can be shifted independently and also arranging it with the common plow in such a manner as to avoid the necessity of the off horse walking over the loosened bottom of the furrow or in a very deep furrow, as in subsoiling in the common way. It also avoids the tramping or packing of the loosened earth in the bottom of the furrow, common to the ordinary way.

BRACELET.—William Edge, of Newark, N. J.—This invention has for its object to improve the construction of chain work bracelets, so as to better adapt them for keeping their form when worn, while at the same time making them more beautiful and elegant in appearance. It consists in a bracelet formed by turning the edges of a piece of chain work down over the edges of a metallic plate.

DRAWERS.—John Bellamy, of New York city.—This invention consists of drawers for men's wear, in which the parts forming the legs are cut by novel patterns, the outlines of which are of such form that with inflexible material the legs may fit the wearer tightly and not draw or bind across the knees, as drawers of inflexible goods now are apt to do unless made uncomfortably large.

FEATHER RENOVATOR.—Theodore J. Adams, of Ansonia, Conn.—This invention has for its object to furnish an improved apparatus for renovating feathers, moss, hair, etc. In using the machine, the substance to be renovated is placed in an inner cylinder through a door, which is then tightly closed, and steam is admitted through a hollow gudgeon which enters the inner cylinder through the perforations of the wall and a pipe, which insures the substance being thoroughly acted upon, the steam entering the substance both from the outside and center. When the substance has been sufficiently steamed the steam is shut off and the door opened, allowing the moisture to escape, the heat communicated by the steam being sufficient to evaporate all the moisture and thoroughly dry the substance.

LETTER BOX.—Anna T. Sinclaire, of New York city.—This invention has for its object to construct a letter and newspaper drop box, whose contents will be protected by a false bottom whenever the lid is opened, so that the fraudulent removal of letters or papers is effectually prevented. The invention consists in forming the said false bottom of two hinged plates that are arranged within the box and connected with the lid, or secured in such manner as to overlap each other when the lid is opened, and drop apart when the same is closed.

HAND VISE.—Thomas Overton, of Corpus Christi, Texas.—The object of this invention is to furnish an implement or tool for the use of mechanics, which can not only be used as a hand vise for holding small articles, but which can be attached to bits or augers for gaging the depth of the hole bored, and also countersinking such hole for screws. A slot is provided in the screw head, for convenience in setting saws.

FOLDING BOX BED.—Alfred G. Bayles, of New York city.—This invention has for its object to furnish an improved folding box bed, which, when folded, will occupy but little space, while at the same time furnishing a convenient receptacle for clothing and various other articles, and which, when opened out, will furnish a complete bed. The box or body of the bed is made in two parts which are hinged to each other at one side, and may be opened out. The spaces on which the two parts of the mattress rest are made of such a depth that the edges of said parts may project sufficiently above the mattress to give space for the bed clothes, so that when the bed is made up and the edges of the bed clothes tucked in around the edges of the mattress, the box may be opened and closed without disturbing the make up of the bed. The adjacent edges of the two parts of the box, upon its hinged side, are cut away so that they may not inconvenience the sleeper, the mattress, when the bed is opened out, bulging over said recessed edges so as to be continuous. The edges of the part opposite the hinges may be provided with a board, which, when the box is opened, serves as a foot board to the bed. The bolster, when arranged for use, is placed upon a partition, the ends of which rest upon inclined cleats attached to the box, and the inner edge of which is hinged to the edge of the horizontal partition. The part of the box beneath the partitions is divided into three spaces adapted to hold clothing and other purposes.

MACHINE FOR CUTTING NAIL PLATES.—Thomas Searle, Pottstown, Pa.—The invention consists in constructing and combining a feed table, feed rolls and clamp rolls with sheet cutters, so that a pair of tongs may pass freely and conveniently nearly up to the cutters, and thereby cause nearly the whole sheet of metal to be utilized. Secondly, it consists in bringing the frame that holds the feeding mechanism so that it may be turned back from the cutters and allow easy access to them. Thirdly, it consists in causing the feed rolls to rotate a little after the sheet has reached one or both of the gages so as to insure that any slight disarrangement which may have taken place will be remedied and the sheet presented to the knives always at exactly the same angle.

IMPROVEMENT IN THE ART OF DENTISTRY.—Robert Arthur, M. D., Baltimore, Md.—The invention consists in a method of separating or spacing teeth by means of a thin abrading disk, which is rotated between them, and which completes the operation in greatly less time, with much less pain and annoyance to the patient, and in a far more workmanlike manner.

RAILWAY SNOW PLOW.—Jerome B. Hulbert and James Anderson, of Hermon, N. Y.—The invention consists, first, in making the lower part of the sides of a snow plow vertical, and the upper part of said sides backwardly sloping, so as to cause the snow to rise as it is pushed laterally after passing the point, and the less compacted upper portion thereof to be turned over one side of the track. Secondly, it consists in hinging the sides of a snow plow so as to adapt it to light or heavy snows. Thirdly, it consists in the mode of combining an open front plow and screw with elevations, drive mechanism, and air forcing-apparatus for compressing, elevating and discharging snow,

COMBINED CHAIR AND BED.—Jonathan H. Green, of Louisville, Ky.—This invention consists in a chair composed of a supporting frame having legs, a seat frame hinged to said frame, and a back frame having arms attached thereto, and hinged to said seat frame so that the parts of chair may be unfolded to make a bed.

STEAM BOILER AND FURNACE.—George W. Lascell, Syracuse, N. Y., assignor to himself and Hugh Robinson, Jersey City, N. J.—This invention has for its object to furnish an improved boiler and furnace for generating steam and for heating and evaporating purposes, which shall be so constructed as to consume the smoke and combustible gases that may be developed in the combustion of the fuel, and which shall, at the same time, be simple in construction and of greater steam generating, heating, or evaporating power than boilers and furnaces constructed in the ordinary manner. The tops of the fire chambers are left open, and the air to support the combustion passes in through the said open tops and passes down through the dead coal to the live coal in the lower part of said chambers, where the combustion takes place. The smoke and gaseous products of combustion pass through openings or flues in the side of the lower part of the boiler, where they mix with air entering through perforations in the bottom of said boiler and are consumed. The perforations in the bottom of said boiler are regulated by means of a damper. The walls of the boiler are made double to form a water space. The water spaces between the double walls of the fire chambers are connected by pipes, into one of which the water is introduced from the pump or reservoir. The other end of the pipe, that is broken to connect with the pump or reservoir, is connected with the space between the double walls of the boiler, so that the water, before passing into the boiler, circulates around all the fire chambers. The spaces between the double walls upon the opposite sides of each fire chamber are connected by pipes which are coiled or zigzagged across the inner ends of said chambers so as to be exposed to the heated products of combustion as they pass from said chambers into the interior of the boiler. The water space between the double walls of the boiler is made wider at the lower than at the upper part to form a contracted well or chamber, into which the smoke and other combustible gaseous products of combustion from the fire chambers are introduced, and in which they are burned by the aid of the air introduced through the openings in the bottom of the boiler, which openings are regulated by the damper to introduce exactly the amount of air required to effect their thorough combustion. The lower part of a water pipe is coiled to form a dome-shaped partition at the top of the contracted part or combustion well, in which the gases are consumed, which dome-shaped coil, in a measure, checks the ascent of the smoke and gases and secures their perfect combustion. This pipe may pass up into and be combined with the dome or steam chest. The steam is conducted away through the pipe. The incombustible products of combustion pass up, through short pipes inserted in the double walled top of the boiler, into the space between the said top and the bottom of the dome, whence they pass into the space inclosed by the jacket, which incloses the dome and projects down along the sides of the boiler. The lower end of the jacket is left open, and is surrounded by another jacket which incloses the lower part of the boiler and the lower part of the first jacket, and extends up so as to overlap the lower part of the dome. The bottom and the top of the second jacket are closed, and the incombustible products of combustion escape from its upper part into the flue.

CAR COUPLING.—C. S. Flower, of Kickapoo City, Kansas, and C. F. Graves, Hickory, Iowa.—This invention has for its object to furnish an improved car coupling, which shall be so constructed that it will uncouple automatically should one or more cars get off the track, turn over, or drop down below the level of the other cars. Upon the forward end of the draw bar is formed the bumper head, which is attached to the car in the ordinary manner. The forward part of the bar or head becomes gradually wider, and upon the upper side of its forward end is formed a strong upwardly projecting flange for the lower end of the coupling pin to rest against to sustain the draft, and which is made in the arc of a circle. A block, made of cast iron, is pivoted, toward its rear end, to the bar. Its forward end does not extend quite to the flange; to its side edges are bolted bars or plates made of wrought iron, and the forward ends of which extend forward to the flange, and are notched upon their lower edges to fit upon said flange. To and between the forward ends of the bars is swiveled a short bar through which the coupling pin passes. By this construction should one or more of the cars get off the track or turn over, the block will swing around upon its pivoting bolt, and as soon as the end of the coupling pin has slipped from the end of the flange, the swiveled bar will turn, allowing the coupling link to slip from the coupling pin. By suitable construction, when the cars are in proper position upon the track, a spring holds the block down upon the draw bar; but should one or more of the cars drop below the level of the other cars, the forward end of the block will be raised, compressing the spring and raising the lower end of the coupling pin above the flange, allowing the swiveled bar to turn and the coupling link to slip from the coupling pin.

BRICK MACHINE.—Henry B. Ramsey, Rockville, Ind., assignor to A. K. Stark, of same place.—This invention relates to the class of brick machines adapted for a simultaneous and continuous working and discharge of the clay. The lower end of a vertical shaft revolves in the center of the bottom of a tank attached to the frame. The upper part of the shaft revolves in bearings attached to the upper part of the frame, and to its upper end is attached the sweep or lever by means of which the power is applied. To the shaft within the tank, and at different hights, are attached radial knives or arms by which the clay is worked into proper condition for entering the molds. The lowest knife revolves near the bottom of the tank and is so formed as to force the clay through an opening in the forward part of the said bottom, made of the size of a brick. An adjustable frame is secured to the frame below the tank to support the molds. The molds are inserted beneath the middle part of the tank from one side. To a shaft pivoted to the lower part of the frame work are attached arms which project upward and press against the rear side of the mold last inserted and push it forward beneath the openings into position to receive the clay. By suitable mechanism the molds may be moved forward twice at each revolution of the shaft. The rock shaft is drawn back to its place, when the arm is released, by a coiled or equivalent spring, and it may be operated by hand to move the first mold forward beneath the openings before the machine is started. As the filled molds move out upon the frame, they are removed by the off-bearers.

CORN HARVESTER.—Jacob Bowers, Iola, Kansas.—This invention has for its object to furnish an improved machine for cutting and shocking corn. The wheels, are securely attached to the axle, so as to carry the said axle with them in their revolution. The forward part of the platform is pivoted at its rear end to the frame, so that the forward end of the said part may be raised and lowered to cut the corn higher or lower, as may be desired. The forward end of the pivoted part of the platform by suitable means is held in any position into which it may be adjusted. To the forward end of the pivoted part of the platform are attached two stationary knives, the inner edges of the forward parts of which incline from each other, to serve as guides to bring the stalks into proper position to be cut by a vibrating cutter, which is pivoted to the platform. The forward part of the side edges of the cutter are made inclined or curved, to adapt it to serve as guides to conduct the stalks into proper position to be cut, and the rear part of the side edges concaved to give them a better hold upon the stalks while cutting them. The cutter is vibrated by the advance of the machine. To the platform are attached two upright frames, between which the corn stalks, after being cut, are carried back to the rear part of the platform. To the top bars of the upright frames are attached springs which are designed to keep the corn stalks from falling forward while being carried rearward. Proper means are provided to serve as a reel to sweep the top parts of the corn stalks into the space between the upright frames and hold them in, or nearly in, a horizontal position. A further combination of ingenious devices removes the corn shock from the platform and sets it on the ground.

TERRA COTTA GRAVE COVER.—Collins C. W. Morgan, Holly Springs, Miss.—This invention consists of a terra cotta cover for graves, being in the form of an inverted hollow cover adapted to inclose the mound, with a base resting on the ground around it, the base being a large projecting flange with a groove descending from the head to the foot, and forming a water course for conducting the water shed from the cover into a gutter at the foot to prevent it from washing the earth away around its base.

WASHING MACHINE.—John Turner, Oakdale Station, Pa.—This invention has for its object to furnish an improved washing machine, and it consists in the two closely slotted self-adjusting racks and the vibrating lever presser, slotted at right angles with the racks. The clothes to be washed are divided, and part is placed upon each side of the presser. As the presser is moved in either direction, the clothes in front of said presser are forced against the rack, the pivots of which enable the said racks to adjust themselves so that the clothes may be pressed evenly. As the presser retires, the clothes fall back into the water to be again saturated.

WHEEL FOR VEHICLE.—Walter D. Howell, Newburgh, N. Y.—The main body of the hub is cast with a closed outer end and with a solid ring flange for the outer edges of the inner ends of the spokes to rest against. At the inner side of the flange is formed a ring groove to receive the inner ends of the spokes, the shoulder at the inner side of said groove being made low. The inner ends of the spokes are made widest at their extreme ends, and a ring plate is made, somewhat dishing so as to press against the edges of the said spokes. Upon the outer side of the plate is formed a circular bead, which fits into a circular groove in the side of the nut, so as when the nut is screwed up to hold the segmental plate securely in place. Putty, with iron filings mixed into it, may be placed between the plate and the edges of the spokes to give the said plate a firmer hold upon the said spokes. Upon the inner surface of the hub is formed an offset or shoulder, and in the inner surface of the inner end of the hub is cut a screw thread into which screws a tubular nut, and when the hub and nut are screwed together it will be impossible for the wheel to work itself loose or off. By this construction a chamber is left between the end of the halved nut and the shoulder, which is designed to be filled with sponge, and thus to serve as an oil reservoir, into which oil may be poured.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted.

FOR THE WEEK ENDING DECEMBER 3, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

On each Caveat	**$10**
On each Trade-Mark	**$25**
On filing each application for a Patent (seventeen years)	**$15**
On issuing each original Patent	**$20**
On appeal to Examiners-in-Chief	**$10**
On appeal to Commissioner of Patents	**$20**
On application for Reissue	**$30**
On application for Extension of Patent	**$50**
On granting the Extension	**$50**
On filing a Disclaimer	**$10**
On an application for Design (three and a half years)	**$10**
On an application for Design (seven years)	**$15**
On an application for Design (fourteen years)	**$30**

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APPLICATION FOR EXTENSION.

Application has been duly filed and is now pending for the extension of the following Letters Patent. Hearing upon the applications appointed for the day hereinafter named.

23,263.—BOTTLE STOPPER FASTENING.—H. W. Putnam. February 26, 1873.

EXTENSIONS GRANTED.

22,165.—PUMP.—A. Cooley.
22,364.—CAR SEAT AND SLEEPING COUCH.—P. B. Green.
22,232.—HORSE RAKE.—C. Garver.
22,310.—MACHINE FOR MAKING NUTS.—J. B. Savage.
22,311.—LAMP SHADE SUPPORTER.—W. F. Shaw.

DESIGN PATENTED.

6,281.—NEWEL POST.—R. Lowry, Nashville, Tenn.

TRADEMARKS REGISTERED.

1,075.—MOWER, ETC.—Adriance, Platt & Co., Poughkeepsie, N.Y., and N.Y. city.
1,076.—ISINGLASS.—Cape Ann Isinglass and Glue Company, Rockport, Mass.
1,077.—CONFECTIONERY.—H. Chaurant & Co., New Orleans, La.
1,078.—SUGAR CURED HAMS.—J. GRUBB & Co., Cincinnati, O.
1,079.—DRESS TRIMMINGS.—W. I. Peake, New York city.

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AND HOW TO OBTAIN THEM.

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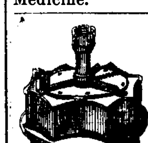
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