SCIENTIFIC AMERICAN

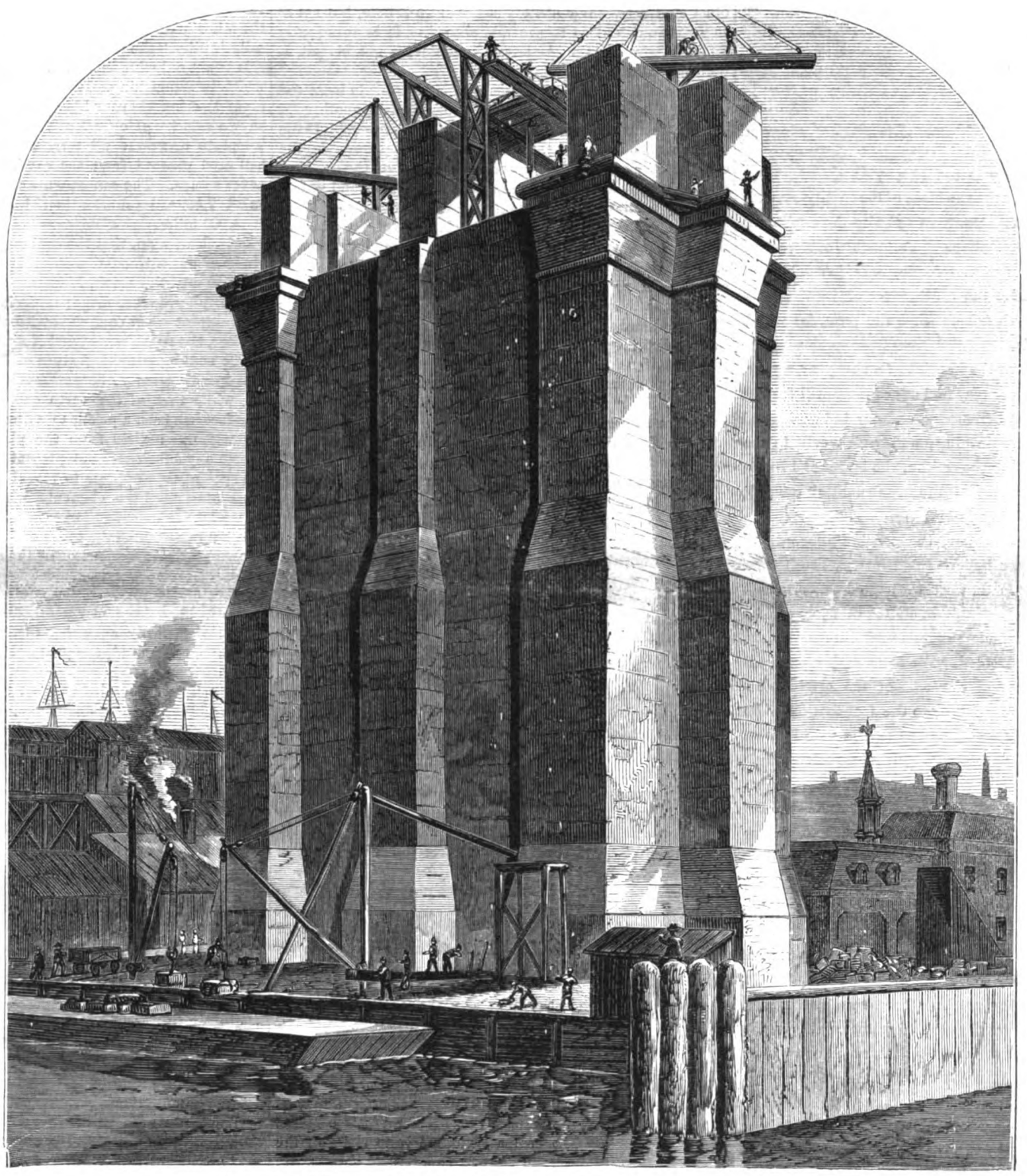
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVII.—No. 26. [NEW SERIES.] | NEW YORK, DECEMBER 28, 1872. | [$3 per Annum, IN ADVANCE.

THE BROOKLYN PIER OF THE EAST RIVER BRIDGE.

On either bank of the East River, two great piles of masonry are slowly rising. One, towering far above all surrounding buildings, stands out in bold relief on the Brooklyn shore; the other, at the present time, scarcely half as high, faces its gigantic mate from across the stream. A river 1,620 feet wide separates these monster structures, between which, in due time, will be extended the graceful fabric of the great suspension bridge.

Our illustration will convey an excellent idea of the Brooklyn or eastern pier, as seen from the wharf of the Fulton ferry. Its total elevation is 144 feet above the water. The three walls on the summit are at present 26 feet in hight, and after being extended upward some 50 feet additional, they will be arched over, thus forming two grand portals leading to the floor of the bridge. The structure consists of three piers, united by connecting walls ten feet in thickness, thus leaving two wells, each thirty-three by twenty feet in dimensions.



THE BROOKLYN PIER OF THE EAST RIVER BRIDGE.

The stone used in the construction is brought in schooners from various localities in Maine, and disembarked at Red Hook, N. J. Thence it is transported to the piers in scows, one of which is shown in the foreground of our engraving. On the Brooklyn pier, 82 courses have thus far been laid; the New York tower numbers but 52, one entire course having been recently lost by the sinking of the vessel of which it formed the cargo. The blocks, some of which weigh as much as eight tuns, having been brought alongside the wharf, are hoisted by derricks on to cars which travel on rails laid in various directions around the foot of the pier. Each stone is then wheeled around to the back of the tower and made ready to be elevated to the top when required. The hoisting is done by powerful engines which, with their boilers, are located at some distance to the rear of the structure.

Situated in the middle spaces between the piers and projecting over the summit, are two heavy iron pulleys, in line with which, and extending down along the masonry, are strong timbers, to take the chafe of the stone as it ascends. Leading from a large drum on one of the hoisting engines, is a wire rope, which passes up over the left hand pulley, thence down to and under the ground, being led along by a number of sheaves, thence up again over the right hand pulley, and finally down to the second drum and engine. To both of the parts of this continuous rope, extending up and down the tower, are attached hooks which engage the Lewis bolts inserted in the stones. These hooks are fastened to the rope, so that one is descending while the other ascends; or, in other words, so that the elevation of one block overhauls down the line to which another block is to be attached. As each stone reaches the top of the tower, it passes between the rails of a track laid on framework, lengthwise the summit, from right to left in the engraving. As it rises above this railway, a low car is shoved beneath it, when the stone is transported under one of the derricks shown in the illustration. The last mentioned appliances, of which there are two, are of wood, strongly made, and each is provided with a small double cylinder engine geared to a drum, which winds up the fall of the tackle. Steam is supplied in pipes led from the ground. The stone is raised from its carriage by one of these derricks, and, if belonging to either of the outer superstructures, it is at once placed in position. If it is destined for the middle wall, it is swung by a tackle from a car, actuated by hand mechanism and traveling on an elevated framework, and thus readily transported to the proper point.

At the time of writing, work upon the Brooklyn pier is nearly at a standstill; on the New York side it has entirely ceased. The cause, we learn, is the non-arrival of stone; though in any event not over two or three more courses could be laid on account of the increasing coldness of the weather. Labor upon the bridge generally is now, as it indeed always has been, no slight task. At first compelled to work in the dense atmosphere of the caissons, the men are now obliged to toil at a dizzy altitude, where, in inclement seasons, there is always a strong and bitterly cold breeze.

In order to inspect the progress of the work, we recently mounted some dozen or two staircases, built as a means of ascent in an angle of the wall, and succeeded in attaining the summit, though in a somewhat breathless condition. From the floor of the bridge, that is, between the superimposed smaller walls, the view is magnificent. The cities of New York and Brooklyn lie at one's feet, while the eye can reach far out into the Narrows, over to the hills of New Jersey, and up and down the length of the East River beneath. From the center of the span, when completed, a prospect will be afforded which, for grandeur, will have no rival in the world; but, in spite of such attraction, with the wind howling around one's ears and blowing with a force sufficient to render it dangerous approach to the edge, neither the top of the Brooklyn pier nor the middle of the future bridge will, we imagine, be largely frequented by sightseers in winter time. It is only necessary to pay a single visit to the breezy summit during the present weather to become fully convinced both of the above fact and also that the life of those who have to labor so far elevated skyward is not to be especially envied.

The solidity of the foundations has been thoroughly tested by the immense weight of these great towers which, we are in, formed, have given no evidence of settling. The entire weight of the bridge will be 4,900 tuns or, including that of snow, ice, etc., considered as transient, will amount to about 6,100 tuns. Its breaking strain is 30,000 tuns; that of each of the four main cables is 7,500 tuns, or, at the angle at which they will support their load, about 10,000 tuns. From the tower other cables extend to the floor of the bridge, so that taking into consideration their strength, with that of the four above mentioned, it is hardly probable that the structure will ever be loaded by a weight greater than one third its carrying capacity.

We shall, in all probability, have little to chronicle regarding this great engineering work until the return of spring. Title to the ground for the anchorages for the piers has not, as yet, been secured by the Bridge Company, and the cold weather, together with the deficiency of stone, will doubtless prevent, for the present, further additions to the hight of the towers.

Wetting Coal for Heating Boilers.

M. Seidler, in the *Practische Maschinen-Constructeur*, refutes the opinion, so generally prevailing, that wet coals burn better or produce more heat than dry ones. If the blacksmiths sprinkle their coal dust near the blast pipe with water, they merely do it to keep the top layer in shape. Wet coal burns as slowly as green wood, evidently from the fact that the water must evaporate before the fuel will burst out in flames. The author always obtained more steam by employing dry coal, and in a comparative trial, extending over a week, he saved fourteen tuns of coal by not wetting it.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year - - - - - - - - $3 00
One copy, six months - - - - - - - - 1 50
CLUB RATES { Ten copies, one year, each $2 50 — 25 00
Over ten copies, same rate, each — 2 50

TO BE HAD AT ALL THE NEWS DEPOTS.

VOL. XXVII., No. 26. [NEW SERIES.] *Twenty-eighth Year*

NEW YORK, SATURDAY, DECEMBER 28, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

THE END OF ANOTHER YEAR.

The present number marks the close of the twenty-seventh volume of the SCIENTIFIC AMERICAN and also the expiration of many thousand subscriptions. Following our general rule based on the desire of not forcing our journal upon those who may not desire the continuance of its visits, we cease forwarding it to subscribers when the term, for which they have prepaid, ends.

The next issue will bear the imprint of a new year, a year, we trust, which at its close may find our country still further advanced in prosperity and greatness, and our industries and manufactures even more thriving; and which will in the end, to the inventor and to the artisan, the brain and hands of the nation, be productive of those substantial rewards which their labors so richly deserve.

With reference to the volume, the concluding words of which we now write, we believe that without egotism we may truly assert that it is the best we have ever published. And we may add the conviction that in no other journal can the same amount of valuable and practical information be found, so attractively presented. We point with a pardonable pride to the number and character of the original engravings embellishing every issue; to the fact that fifty-two numbers so copiously illustrated and so replete with interest can be afforded at three dollars a year, less indeed than half the subscription price of the majority of our English scientific contemporaries. Other periodicals, both American and foreign, have repeatedly expressed a natural surprise that so low a rate can be maintained. The explanation is obvious: mechanics, inventors, manufacturers, engineers, chemists, indeed all interested in the industrial progress of the world, make up our list of subscribers; with such a patronage, failure is impossible; aided by such numbers, cheapness of our product is a necessary consequence.

To those who for many years have been constant friends, the promise of increased excellence during the coming twelve months, the assurance that, as in the past, no effort will be spared to make the SCIENTIFIC AMERICAN the leading paper of its kind in the world, seems almost superfluous. To others, the proof that former and similar pledges have been amply fulfilled is best found in our circulation, which though steadily increasing, is now larger than that combined of all other journals occupying a similar field. We have printed for some time past 50,000 copies per week, and we have every hope that before the end of 1873 this already large number may be augmented to 75,000.

In conclusion, we ask our old subscribers, many of whom for a score of years have appreciated and encouraged our efforts, not only to renew, but still further assist us by obtaining new names. As the last volume was better than its predecessor, so shall the coming series be superior to that just concluded, and thus we trust that each year may find us the same silent though faithful teacher and, as we advance, a wiser and better guide to all who, whether in the realm of science, industry or art, labor for the benefit of their fellow men.

PROPOSED CHANGE IN THE PATENT LAW.

We have received a copy of the proposed amendments to the patent laws, lately reported to the House of Representatives by the Committee on Patents, which amendments are understood to have originated with the present Commissioner of Patents, General Leggett.

The bill provides for the detachment of the Patent Office from the Department of the Interior, and the forming of a new department to be known as the United States Patent Office, the various appointments thereto and general supervision to be in the hands of the Commissioner.

The rapid growth of the Patent Office and its widespread influence upon the progress of the country seem to render this change desirable, and we should be glad to see it effected.

The bill next provides for the appointment of nine "chiefs of division" and one chairman of the board of appeals, at a salary of $3,500 each, who are to supervise and approve the work of the principal examiners, hear and decide all questions arising upon applications for patents and reissues, give judgments allowing and refusing the same, etc.

In other words, this is a provision to add a bureau of red tape to the business of obtaining patents, and to place unnecessary obstructions in the path of the inventor. One of the distinguishing features of the American Patent Law is the comparative absence of official circumlocution in the grant of patents. We say comparative, bearing in mind the superabundant interference of officials in such matters in other countries. We already suffer from it here, but not to so great an extent as it prevails abroad. It is sufficiently difficult now for the American inventor to get his patent promptly allowed.

It cannot improve the chances of the inventor to have the work of the principal examiners supervised by another set of examiners. We all know how such things work. If the examiner is of opinion that an invention is patentable, the chief of division will be just as likely to be of the contrary opinion. It is a matter of opinion on both sides, and unless the two parties were frequently to differ, the supervising chief would be apt to consider himself to be of little importance. The way to ensure official delays, circumlocution and red tapeism is to multiply officials and place one set to watch and criticize another set.

It seems to us that the new board of chiefs which this bill proposes is unnecessary. In former times, there was greater difficulty in making examinations at the Patent Office than now, for then there were no duplicates of the patents; but now the patents are printed, and the examiner is enabled readily to inform himself as to the state of the arts in his particular subdivision.

If the Commissioner needs more help in examining, let him have more examiners. But the plan of creating a body of nose-men to smell out and poke over the doings of the principal examiners, we believe to be unnecessary and injurious to the efficient working of our patent system.

Another section of the bill relates to the qualifications of persons or agents who represent the inventor in making application for a patent. Such agent is to be required to produce, to the Commissioner of Patents, satisfactory evidence of his fitness to practice before the Patent Office. It seems to us that the law is well enough as it stands. It provides that persons who, by their acts, prove themselves to be unworthy shall be prohibited from practice.

If the inventor may apply in person for a patent, he certainly ought to be at liberty to appear by a representative of his own choice. The new proviso prohibits this, and requires the inventor to employ some person upon whom the official unction of the Commissioner has previously descended. Here the unnecessary red tape and official interference again makes its appearance. Give the Commissioner the power to say who shall and who shall not have the privilege of practicing before the Office, and you increase the difficulties and expenses of obtaining patents.

If any changes are to be made in the patent laws, let them be in the interest of simplicity, freedom, reduction of costs, and generous encouragement of inventors. The proposed changes we have criticized are likely to have an opposite effect. We shall refer to the subject again.

TIDAL WATER POWER; A NEW AND USEFUL SUGGESTION.

Mr. A. E. Gordon, the editor of the New Brunswick, N. J., *Times*, has made a suggestion in reference to the utilizing of the power of the tides, which appears to us not only novel but practical and important.

The use of tidal water power to drive mills is common along our coasts. The ordinary method is to shut off the mouth of a small inlet by means of a dam having sluice gates to admit the sea water which, by the rise of the tide, enters and fills the enclosure. By the fall of the tide the enclosed water derives sufficient head to drive a turbine or other wheel, and so give motion to the mill. But when the tide again rises of course the head is destroyed, so that the mill can only run alternately, during two separate periods of a few hours each out of the twenty-four. It is this alternating and irregularity in the hours of motion, together with the periods of entire inactivity, that prevent the employment of this species of motive power for general industrial purposes.

The improvement suggested by Mr. Gordon consists in providing two water basins, both of which are to be shut off by dams from the sea. One of the basins is to serve as a constant supply reservoir of water, and it is to have a close dam of such width and hight that the tide water, when it has risen to within one foot of its normal hight, will begin to pour over the dam and quickly fill the reservoir. The dam of the other basin is to be provided with swing valves which permit exit of the water at low tide but prevent ingress of water from the sea. This basin, we will now suppose to be empty. The water wheel is to be placed between the two basins, and the fall of water from the reservoir into the discharge basin will afford continuous motive power so long as the supply of water lasts and until the rise of water in the discharge basin destroys the head. But as this latter basin is entirely emptied at every tide, the head will be always kept good, presupposing, of course, that the reservoir and the discharge basin are made of proper size. In respect to this last point, it is well known that basin capacity on our coasts is almost unlimited, and there are thousands of localities where extensive water powers may be thus provided and maintained at a comparatively small cost. We trust that Mr. Gordon will proceed to elaborate his plan and place it before the hydraulic engineers of the country for discussion.

THE PLANET JUPITER AS REVEALED BY THE MODERN SPECTROSCOPE, PHOTOMETER, AND TELESCOPE.

From a cosmical standpoint our sun is only one of the millions of stars which fill the infinity of space, and its annihilation would scarcely be perceived, while our moon is of no more consequence than a pebble on the seashore. From a terrestrial point of view, however, they are the most important heavenly bodies, and next to them comes the planet Jupiter, for reason of his immense size, which is more than twelve hundred times that of our earth and nearly equal to all the other planets taken together, for which reason Proctor calls Jupiter "the giant planet."

It is not only his size, but everything in relation to him which is astonishing. His axial rotation of 10 hours is so rapid that masses near his equatorial zone are carried round with a velocity of over 7 miles per second, a velocity sufficient to overcome all terrestrial gravitation, as a cannon ball fired upward from the earth with this velocity would never return. The consequence of this is that Jupiter's polar axis is 7,000 miles shorter than his equatorial diameter, which is 82,000 miles.

It is clear, then, that the ordinary notion, the result of the study of our astronomical text books, that the planets Mercury, Venus, the Earth, Mars, are of about equal importance with Jupiter, is erroneous; those four inner planets are very insignificant when compared with the colossal outer planets, Jupiter, Saturn, Uranus, and Neptune.

The next remarkable feature of Jupiter is his low density, The specific gravity of his mass is not much above that of water, while that of the earth exceeds water six times; and this fact has been a puzzle to astronomers, especially as falling meteoric masses from the planetary space have never shown any substances not present in our earth, and also as the spectroscope appears to reveal to us that the whole universe consists of the elements which are all known to us by terrestrial investigation.

What can then be the cause of Jupiter's low density, when he is most likely a collection of the same elements and chemical compounds found on our earth? And here, three different kinds of investigation, each requiring its special apparatus, have been at command of the astronomers, and have satisfactorily answered this question. The first is the telescope, the second, the photometer, the third, the spectroscope.

The telescope revealed the fact that Jupiter is surrounded by a series of vaporous belts laying parallel to his equator. Some of these belts are creamy white, others of a copper color, becoming bluish near the poles. These belts are subject to immense changes. In 1860, a rift in one of them behaved so as to prove the existence during six weeks of a violent hurricane, raging over a surface equal to that of the whole earth, and with a velocity of over 150 miles per hour. Such a storm on earth would destroy every building, tree, ship, etc., in fact would totally desolate the earth's surface. In 1870, it was discovered that the creamy white belt on the equatorial zone became orange, lost its sharp outline, and showed appearances which astronomers compared with post-holes, pipe bowls, oval moldings, etc.; while at the present day Lassell, President of the Royal Astronomical Society of England, and Father Secchi, possessing the finest telescope in Rome, agree that Jupiter is now presenting a most wonderful aspect, which only can be explained by the hypothesis that what we see of his surface is nothing but vapors of different substances, and that thus the planet possesses a much higher temperature than our earth.

The photometric observations of Zöllner in Germany, and of Bond in America, prove that Jupiter gives more light than could be reflected at his distance from the sun, if it was only solar light which we see Zöllner found that he gives four times more light than would be the case if his surface was like that of our moon, and the conclusion to which we are driven is that the planet shines partially with its own light, is in fact red hot, and is surrounded by vapors.

The spectroscope has verified this view, and proved that the visible surface of the planet contains enormous quantities of aqueous vapor highly heated; in fact, it consists chiefly of superheated steam, of such very high temperature that it is self-luminous, and thus the planet itself is of a much higher temperature still.

The four satellites, in the meantime, are cold; they are so much smaller that they have cooled down far below the temperature of the planet, and may be inhabited, while the heat of the planet makes up for the great distance from the sun. Our earth and moon were probably once in the same condition, geology proving that the earth's crust was once in the fluid state, and our globe surrounded with red hot vapors. At that time the moon had probably not cooled down

to its present low temperature, and received light and heat from sun and earth both.

The proof of this condition of Jupiter's satellites is furnished by the observation that, when a satellite passes over the light disk of the planet, it forms a perfectly black spot, while its shadow is not black but shows the luminosity of the vaporous surface on which it fell. Perhaps this vaporous envelope is of great extent, and the solid or fluid nucleus of the planet is much smaller than Jupiter appears to us.

The conclusion then arrived at, by astronomers of the present day, is that, when comparing the sun, Jupiter, and the earth, Jupiter is midway in temperature as well as in size; the sun is about one thousand times larger than Jupiter, and Jupiter about one thousand times larger than the earth. While the sun is most intensely white hot, Jupiter is moderately red hot, and the earth only radiates obscure invisible heat.

PROGRESS OF THE HOOSIC TUNNEL.

The great railway tunnel through the Hoosic Mountain, near North Adams, Massachusetts, is progressing very effectively, and it is probable that the bore will be completed in October, 1873. The boring has for the past year or more been carried on at four headings, one on each side of the mountain and two, in opposite directions, from the bottom of a vertical shaft which is sunk near the middle of the mountain. The 12th of December was an eventful day among the workmen. After some unusually heavy blastings, a junction of the two headings between the east end of the tunnel and the central shaft was then effected, greatly relieving the contractors by the immediate drainage of the water from the central shaft. The central shaft is 1,030 feet in depth, and, since the junction was made, it is found to operate like an immense chimney, producing a strong draft through the whole length of the eastern section of the tunnel, a distance of nearly two and a half miles. It has not yet been ascertained what, if any, difference exists between the lines of the two borings which have just been united; but it is believed that there can be only a trifling variation. The working of the pumping machinery, previously required to keep the shaft free, was a difficult and expensive operation. The water will now flow down grade into the Deerfield river and the pumps may be removed. A distance of about four thousand feet remains to be cut in order to complete the bore. The total length of the tunnel will be almost five miles. It is the second longest tunnel in the world, the Mont Cenis bore, through the Alps, being nearly eight miles in length. But the St. Gothard tunnel, through the Swiss Alps, which was commenced during the present year will beat both of the above, as it will be thirteen and a half miles in length.

THE FIRE AT THE FIFTH AVENUE HOTEL.

The Fire Marshal of New York, after an exhaustive examination of many witnesses, is of the opinion that the recent fire at the Fifth Avenue Hotel was caused by accident. The testimony clearly shows that the flames originated in one of the servant women's chambers, through which passed the laundry elevator, the opening therefor being a square aperture, cased with dry wood, extending from top to bottom of the building, about ninety feet. This elevator opening formed, in effect, an immense chimney for the rapid progress of the flames. The woman who occupied the chamber testified that she was in bed, sound asleep, and awoke to find herself surrounded by flames. Her clothing was destroyed, the bed clothing on fire, and she herself was badly burned. She escaped into the hallway, and gave an alarm; but the fire had already traveled to the attic, and an alarm been given. The Marshal thinks that the woman, in getting into bed, probably stepped upon a match, which ignited her clothing; the fire smoldered for a while, but at last increased, the flames entered the elevator, the draft carried dense smoke to the attic, which there suffocated the eleven unfortunate females, who lost their lives long before the flames could have reached their bodies.

The evidence goes to show that the Fifth Avenue Hotel was well provided with the apparatus for extinguishing fires, in the use of which the men connected with the hotel are frequently drilled. All the floors are provided with water mains, to which hose pipes are kept constantly attached, and there are also steam pumps always in readiness in the basement. In the present case it was not half a minute after the alarm was given before some of the hose had been stretched and water directed upon the flames. But the fire had evidently been burning for some little time before its discovery, and it was then too late quickly to check its spread.

RETIREMENT OF JUDGE NELSON.

After nearly half a century's honorable service on the bench, Judge Samuel Nelson has retired from the Supreme Court of the United States, thus closing a judicial career, in point of time, unparalleled in the history of jurisprudence.

Judge Nelson was appointed Judge of the Sixth Circuit, which included Otsego county in this State, in April, 1823, and held the position until February, 1831, when he was made Associate Justice of the Supreme Court of the State of New York. In 1837 he succeeded Judge Savage as Chief Justice, and in February, 1845, he was elevated to the bench of the Supreme Court of the United States, being appointed by President Tyler. His most notable decisions were in the celebrated Dred Scott and legal tender cases, though especial deference has always been paid to his opinions in questions of admiralty law and intricate patent suits. In deciding the latter class of litigation, Judge Nelson has probably had a greater experience than any judge that has ever lived, and has won the highest honors for his strong common sense, broad views and ready grasp of the weightiest subjects.

The Judge has, with slight exception always enjoyed robust health, and has never been absent from duty at the State or United States Courts but one term, that of last year. At the closing session of the High Commission in the spring of 1871, he incurred a severe illness which confined him to his house for several months. From this he has since recovered and now, impelled by his weight of years and need of repose, retires from the position which he has so long and so ably filled.

While expressing our regret at the necessity which causes, to the inventors of the United States, the loss of so honorable, wise and faithful an arbiter, we but join in the general public opinion in thus placing upon record our earnest appreciation of the "purity, dignity and impartiality which have commanded the confidence, esteem and admiration of an entire nation, and the acknowledgement of jurists in other lands."

THE CENTENNIAL OF 1876.

The organization of the United States commission appointed under a recent act of Congress is now perfected, and two meetings have been held at Philadelphia. Funds are now needed to carry out this great and patriotic work; and, in order that our readers may understand the salient points of the undertaking, we extract the following from information furnished by Mr. J. V. L. Pruyn of Albany, the United States Commissioner from New York.

It is proposed to celebrate the one hundredth anniversary of American Independence by holding a Grand International Exhibition of the arts, manufactures and products of the entire world, in the city of Philadelphia in the year 1876. The United States Centennial Commission is made a body corporate authorized to issue stock to the amount of ten millions of dollars, in shares of ten dollars each, for the purpose of defraying the necessary expenses. Subscriptions will be received at all incorporated banks, State and National, and by numerous private bankers; the books will be opened for one hundred days, beginning in New York from November 21st. The stock is apportioned *pro rata* among the States and territories, according to their respective populations. In New York, the quota is $1,136,660.

We sincerely trust that this call for money for so laudable a purpose will meet with a most generous response. The exposition for which we have three years to prepare will be the grandest the world has ever seen; and we indulge in no egotism when we predict that it will throw far into the shade the World's Fairs of London and Paris, and even the much vaunted Vienna show.

It will exemplify the unprecedented progress of our nation during its brief existence of one hundred years; and, while attracting to our shores the products of other countries, will exhibit to the world at large not only what we have accomplished, but the vast resources of our territory remaining yet to be developed. Such an exhibition will be of incalculable benefit to the whole land, and we are confident that no efforts will be spared or assistance denied which will tend to make it a worthy commemoration of the greatest event in the history of the United States.

AMERICAN INVENTIONS IN EUROPE.

In referring to the dangers of infringement of his patent rights incurred by the American inventor contributing to the Vienna Exposition, we have frequently alluded to the fact that Austria is by no means the only country in Europe which, under cover of a so-called protective act, countenances the piracy of the property of strangers. The same is true to a greater or less extent in all the continental nations, though from the evidence of Mr. Henry Bessemer, the English manufacturer, recently published in our columns, and from the facts given below, it may be fairly conceded that the new German Empire rivals its southern neighbor in systematic injustice. The Paris *American Register* prints a letter from a correspondent in Berlin, in which we find it authoritatively stated that the Prussian field artillery, which figured so largely in the recent war, is the invention of a prominent American, who applied for a patent in Prussia some years since and was rejected. The inventor at the same time offered his invention to the Government and solicited a proof, but the Government condemned it without a trial. Later, under the noted Prussian manufacturer's name, Krupp, it became an invention and was adopted. The new small arm (described in our last issue) was invented by an American, and a patent applied for, but as usual the application was rejected. Trials were made with it before the Prussian Government, in 1868 which attracted little or no attention, but recently it also has been adopted under the name of a Prussian subject.

In further corroboration of the assertions above made as regards German injustice, we have lately received a communication from an American inventor, detailing his experiences in both Austrian and Prussian patent law. He favors us with the following copies of official letters received by him, and adds that they may prove of especial interest from the fact that the identical invention has since been adopted by the German Government and a patent thereon granted to a native of the country. We give the documents *verbatim* so that they may explain themselves:

[TRANSLATION OF REFUSAL.]

BERLIN, May 21, 1868.

The demand for patent, contained in the papers hereunto annexed, of the 21st of March, for improvements said to be novel in breech-loading firearms, with sliding and turning bolt, relates, according to the opinion of the Technical Commission charged to examine the patents, to the shape of the grooves and channels which serve to operate and secure the locking. As such they are not patentable, inasmuch as patents cannot be granted for modifications in forms already known. The assemblage of a spring, furnished with a hook on the locking piece in order to remove the cartridge shell from the gun, is a combination well known, and has been the object for many demands of patents. In consequence, the patent cannot be granted.

THE MINISTRY OF ETC., ETC.

[COPY.]

BERLIN, September 16, 1871.

To your application of August 30, we reply, returning documents, that the patent applied for Mr. Benjamin Berkley Hotchkiss, of New York, "improvements in projectiles," cannot be granted, because nobody can be prevented attaching to the point of a projectile a whistle, etc., to produce a loud sound.

Ministry of Commerce, Trade and Public Works,
IV. Department.
(Signatures illegible.)

These literal translations, we think, will supply adequate proof of the Prussian mode of conducting patent business. The plan is simply either to urge inventors to make experiments, and after all possible information is elicited to inform the would-be patentee that his device is no improvement or not enough of a one to justify the further proceeding of the trials, or else, to assert that the invention is a mere modification, and as such not subject to the grant of a patent. Of course it is practically impossible to discover where a modification stops and where an improvement begins.

Dismissing here the Prussian law, we have yet a few words to add regarding the Austrian regulations, in the shape of the following extracts taken from the letter of a practicing attorney in Vienna, sent to his American client and by the latter gentleman transmitted to us. The communication states that if the American Government would take cognizance "of the way in which patent affairs are treated in Austria, it might feel it a duty either to make the Austrian Government aware that it must either ensure protection for patents or the American Government would be obliged to warn its citizens from being entrapped by a mere show of protection at the exposition." Further "there is no doubt but that the ministry will not alter its proceedings, having given no order as yet." "Your papers have again wandered to the Polytechnic School, and if they do not call experts to inquire into the affair in your presence, so as to give you an opportunity to explain the matter, it is evident the suit will never be finished, except if they think it admissible to decide against you." The date of this document is October 26, 1872, proving that, as late as two months ago, nothing had been done to alter the existing laws.

There is little necessity of our entering further into the details of this subject. No treaty between the Austrian Government and our own has as yet been concluded, nor in the slow circumlocution of diplomatic negotiations is there much probability of anything of the kind being done in due season to prepare goods for exhibition. Moreover, there is no use in patching up a bargain with Austria and leaving Prussia untrammeled; there is just as much danger to be apprehended from one country as from the other. Altogether, we can hardly see how any new American device can be forwarded to Vienna unless the owner chooses to risk the dangers we have pointed out. If then it is expedient to send novel inventions, our display must necessarily be confined to already well known products, and in reference to these there must be a decided objection to Congress wasting public funds, by appropriating money sadly needed for many purposes of direct national benefit, solely to secure an advertisement for established and wealthy manufacturers.

SCIENCE RECORD FOR 1873.

The forthcoming volume of the above, for the new year, will be ready sometime in January, and promises to be a most interesting and valuable work.

The unexpected success which attended the issue of the volume for 1872 has encouraged the publishers to undertake its enlargement and improvement. The RECORD for 1873 will contain almost twice as much matter as the preceding volume. The new RECORD will have six hundred octavo pages, will be illustrated with a large number of engravings, and will contain accounts of all the leading facts of interest that have transpired during the preceding year in the various branches of science, embracing Chemistry, Metallurgy, Mechanics, Engineering, Railways, Navigation, Electricity, Light, Heat, Sound, Technology, Botany, Horticulture, Agriculture, Rural Household Economy, Materia Medica, Therapeutics, Hygiene, Natural History, Zoölogy, Meteorology, Terrestrial Physics, Geography, Geology, Mineralogy, Astronomy, Biography, Necrology, etc. In short, the general scientific progress of the world during the preceding year will be faithfully represented in SCIENCE RECORD for 1873. It will be a volume packed full of useful information, exceedingly convenient for reference, and should have a place in every library. Price $2. Published by Munn & Co., office of the SCIENTIFIC AMERICAN, New York.

NEW GALVANOMETER.—M. Bourbouze of Paris is the inventor of a new galvanometer. It consists of a magnetized steel balance beam, delicately poised and capable of being adjusted by means of sliding weights. This beam, which is enclosed in a coil of wire, is provided with a long pointer at its center, and the end of the pointer passes along a graduated arc. This galvanometer is so delicate that it shows a considerable deflection when the hand is brought near a thermopile connected with it.

MALLET'S METHOD FOR OXYGEN.

This method is based upon the property of water to retain the oxygen of the air in preference to the nitrogen. Atmospheric air, as well known, is composed of 20·55 parts oxygen and 78 16 parts nitrogen, by volume, the remainder being carbonic acid and vapor of water. The air dissolved by rain water of a temperature of 50° Fah. has been found to consist of 33·76 parts oxygen, 64·47 parts nitrogen and 1·77 parts carbonic acid, by volume, showing thus an increase of 13·21 parts oxygen and a decrease of 13·69 parts of nitrogen. One quart of water, according to Dalton, is capable of dissolving 2·44 cubic inches of air. This dissolving action of water is correspondingly increased by pressure, and Mallet has made use of it in the following manner and by the apparatus represented in our engravings. There is a series of chambers, A, B, C, etc., eight in number, consisting of strong sheet iron, almost entirely filled with water. There is also a series of double acting air compression pumps, a, b, c, used in connection with the chambers as shown. The pistons and slide valves of these pumps are all moved by the same shaft. Piston of pump, a, in its descent presses atmospheric air at p into chamber A. m is a perforated plate, so arranged that the air may be divided and pass up through the water in fine streams. In its passage through the same a part of the oxygen is absorbed and retained in the water, while the air, deprived of oxygen (the nitrogenized air) rises to the upper part of the chamber. When the piston of pump, a, descends, piston b ascends, and *vice versâ*, and when stopcocks, E, E, E, are opened, those at their right are closed, and *vice versâ*. This latter operation is performed by hand and by the system of paralellograms indicated. For the better understanding of the working of the apparatus, we will suppose that the pumps have been in operation for a short time. The first, third and fifth chamber, etc., in the position of the pistons as indicated, will contain nitrogenized air in their upper portions; in each succeeding one, the portion of nitrogen is less than in the preceding chambers. The second, fourth and sixth chambers contain, on the other hand, in their upper portion an oxygenized air, the air being more highly charged with oxygen the more chambers it has passed through. When the first piston descends, the nitrogenized air from the top of chamber A is carried over through pipe C to the upper side of the piston in cylinder a; simultaneously the nitrogenized air in the top of chamber C is drawn into pump c. This air is drawn into the cylinder when the piston goes down, and is discharged therefrom at the arrow into the surrounding air, when it rises. In its descent, fresh portions of atmospheric air are driven into chamber A. Now as to piston C, it is evident that, when it rises, an exhaustion takes place in chamber A; hence the oxygenized air, which, up to this moment, has been dissolved in the water, is caused to escape and is drawn over below cylinder b. When piston b descends this air is forced through pipe C into the water of chamber B. In its passage through the water, oxygen is again absorbed and retained, while the air deprived of oxygen rises to the upper part of the chamber. While piston b descends, this air is drawn through C in the direction of the arrow into the cylinder, which it aids to press downwards, and when piston b rises, it escapes in the direction of the small arrow into the surrounding atmosphere.

The same operation repeats itself in the succeeding chamber C. In the positions of the pistons, as represented, the of pump b, however, is charged with nitrogenized air. Chambers A and C hold nitrogen in their top portions. The oxygenated air in cylinder of pump c is forced over into chamber C, and so forth. To the last chamber a simply acting pump is attached for the purpose of drawing the oxygen, now almost pure, into the gas holder, in which it is retained for use. The air, after having passed through eight chambers, consists of 97·3 volumes oxygen and 2·7 volumes nitrogen, the presence of this amount of the latter gas, for most technical purposes, being quite unimportant. The machine described has been in use in Frankfort-on-Maine for more than two years, and the oxygen produced by it is used by Philipps in his new system of illumination, which consists in the combustion of a highly naphthalized fluid (carboline) by means of oxygen in a lamp constructed for the purpose. The inventor uses only air of 53 per cent oxygen, and claims that it gives the same intensity of light as pure oxygen. The light of this lamp is equal to one hundred candles or to ten ordinary gas flames. It is bluish white, and is very similar to the magnesium or electric light.

THE APPLICATION OF CHEMICAL FERTILIZERS TO HORTICULTURE.

M. Jeannel, says *Les Mondes*, has made a series of experiments in the Jardin d' Acclimation in Paris, in the use of chemical fertilizers in the process of horticulture. It has been found that plants can receive, in solution with the water with which they are irrigated, the mineral constituents necessary to their organism, and which manure does not furnish until decomposed in the soil. The following results are given of three specimens of potted plants:

First series: Plants cultivated in sand watered with ordinary water; plants cultivated in mold similarly irrigated; plants cultivated in sand supplied with common water and receiving weekly a portion of mineral manure in solution. The truly extraordinary success, says the author, of the latter mentioned specimens can hardly be imagined. They became doubly developed, more green, and flowered far more profusely than the plants raised in mold. Naturally, he adds, the plants cultivated in sand without the aid of the fertilizer proved puny and miserable. Second series: Two specimens of each plant were placed in pots of exhausted earth, one receiving ordinary water, the other a weekly supply of the mineral manure. The latter flourished with a most luxuriant development of both floral and foliaceous organs. Soil watered with these mineral ingredients, it is stated, never becomes exhausted. The constituents that the plant abstracts are daily returned. M. Jeannel has produced a *Tradescantia virginica* in a two liter pot, the earth of which has not been changed for fifteen months. The plant forms a tuft of exquisite green over 1·6 meters in length and ·8 meter in diameter. The proportions and ingredients of the chemicals used are as follows:

Nitrate of ammonia	400
Biphosphate of ammonia	200
Nitrate of potash	250
Chlorhydrate of ammonia	50
Sulphate of lime	60
Sulphate of iron	40

Pulverize, mix, and preserve away from moisture. The method of employing the above compound is quite simple. It suffices to dissolve 4 grammes of this mixture in a liter of common water, and to give to each plant weekly 25, 50 or cylinders of pumps a and c hold oxygenated air; the cylinder even 100 grammes of the solution independently of the ordinary waterings. It is recommended to place the pots on plates and to regulate the quantity of the fertilizer applied by the size of the former and the development of the plants. The cost of the compound should not exceed three francs (sixty cents) per kilogramme; so that one liter of the solution, serving for forty weekly waterings, need not cost more than one fifth of a cent to replenish.

This fertilizer is but moderately useful for leguminous and is hurtful to saxifrageous and bamboo plants; it retards the germination of the latter and hinders the growth of the young shoot.

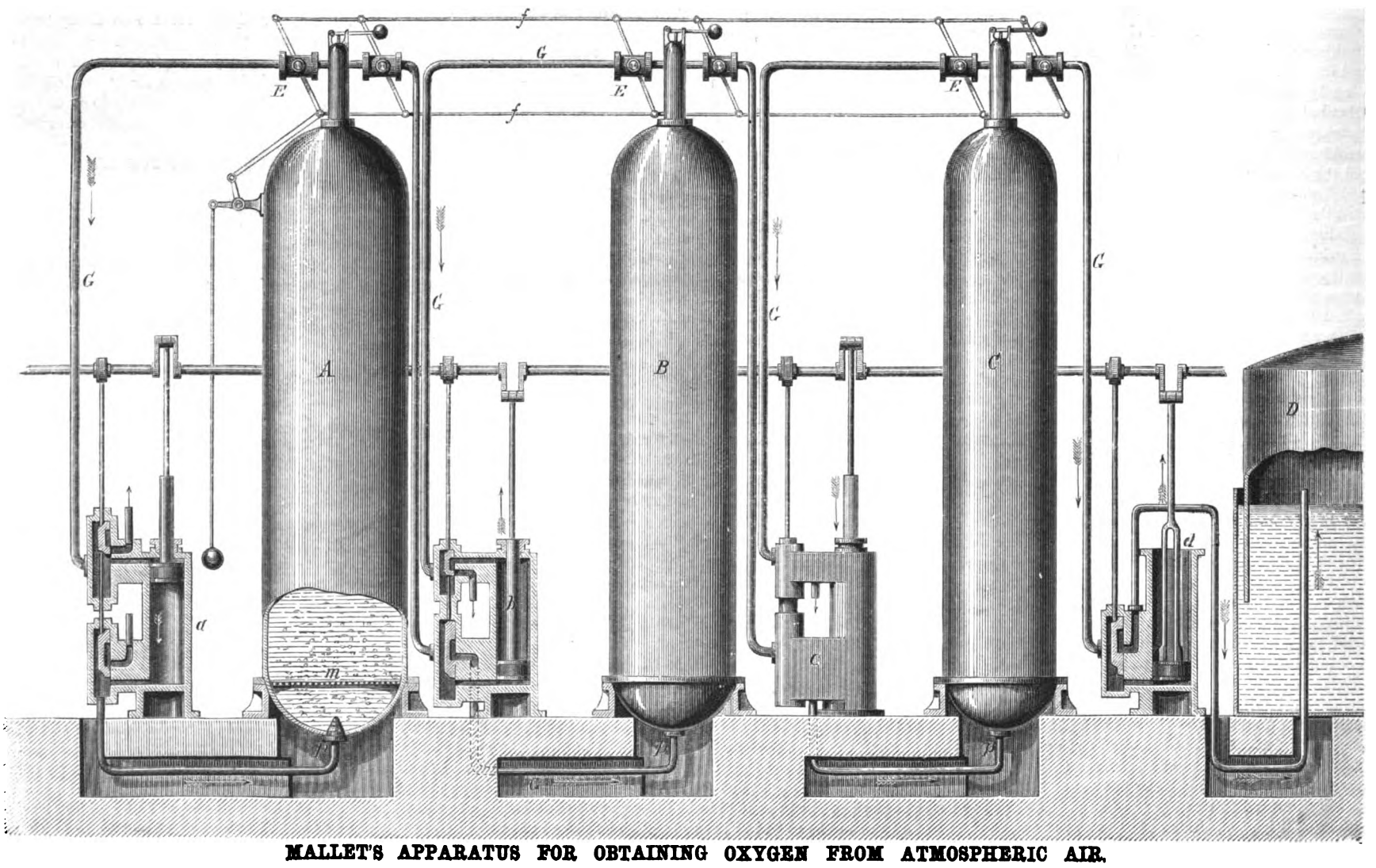
Prussian vs. English Guns.

Many of our readers have, no doubt, noticed in the papers, says the *Engineer*, statements, quoted from the *Börsenzeitung*, as to the startling results recently obtained at Berlin with the new 11 inch Krupp gun against iron plates in August last. According to the *Börsenzeitung*, the 11 inch gun, with a success exceeding "all expectation," has driven its shot through a "12 inch solid plate, a wooden backing of 26 inches, and an inch plate or skin," after which it had "a considerable amount of force left in it." We do not hear at what range this took place, which is an important element in the question, but we understand that 100 yards is the one generally adopted, and report says that a charge of about 70 lbs. was employed. We speak, however, subject to correction; we have accepted the facts as represented by our German contemporary, and proceed to give the results obtained here most nearly bearing on the question.

Our own 11 inch gun about July, 1871, fired four rounds against a structure known as No. 33 target, at Shoeburyness, consisting of 8 inches iron, 6 inches wood, 5 inches iron, 6 inches wood and 1¼ inches of skin. The range was 200 yards. Three rounds were fired with charges of 85 lbs., and the last with 75 lbs. of pebble powder—one shell and three shot being used. In every case the projectile completely penetrated the target and passed on, and this being so, we presume we may safely add, in the words of our German friends, that "it had a considerable amount of force left in it." Indeed in one instance we can speak more definitely, for a deep indentation was made by the shot's point in a plate some distance to the rear and in the line of fire.

We are next informed that the Krupp 10 inch gun is expected to penetrate the same target as the 11 inch. This is, however, only an expectation, based on the assumption of an increase of charge not yet determined, to which is added as a crowning triumph that the 12 inch Krupp is expected to drive its 660 lbs. projectile through plates from 15 inches to 16 inches thick. Our readers will find recorded in the *Engineer* of June 28th the actual effect produced by our 12 inch 35 tun gun against the above mentioned No. 33 target strengthened by a front plate 4 inches thick, on June 20th last. We may here state briefly that the projectile, fired with a charge of 110 lbs. of pebble powder at a range of seventy yards, drove its head and shoulders through 18½ inches of iron and 12 inches of teak. As a shell the effect was less, but the conditions of the question were complicated by the introduction of an air space.

CAUSTIC LIME, freshly slaked, is often an excellent preparation for a crop on a clay soil.



MALLET'S APPARATUS FOR OBTAINING OXYGEN FROM ATMOSPHERIC AIR.

[Reported for the Scientific American.]

ELECTRICITY.

A Lecture delivered by President Henry Morton, at the Stevens Institute of Technology, Hoboken, N. J., December 8, 1872.

In the second lecture of the series, President Morton confined himself to the consideration of the different ways in which electricity passes from one object to another, and in treating of these he adopted, for commencement, the customary division into (1.) Conduction, (2.) Convection, and (3.) Discharge.

When electricity passes tranquilly through bodies without making any special manifestation of its presence, it is said to be conducted, and the bodies which convey it are called conductors. The best conductors are, as is well known, the metals, and the poorest, such substances as glass, hardened rubber, dry wood, and dry air. It is Professor Morton's opinion that damp air may also be a non-conductor, and that it has been classed with conductors because bodies exposed to it are apt to be covered with a film of moisture and then conduct electricity.

RED LEAD GLASS UNFIT FOR INSULATION.

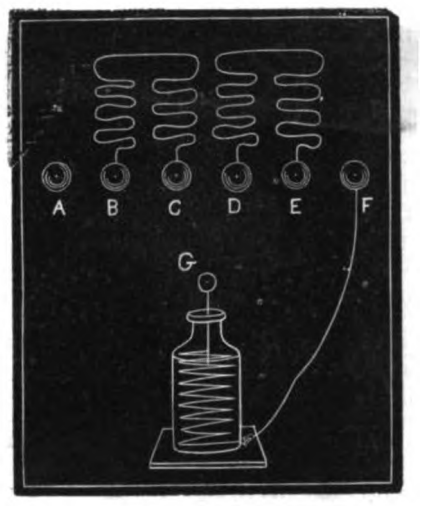
Another remark was made, in this connection, which is, in our opinion, of importance to such of our readers as have to do with the construction of electrical apparatus; it is that red lead, although one of the best of non-conductors, will render glass a very good conductor, if it enters into its composition. Such glass, which is usually of high refracting power, and therefore brilliant in appearance, is utterly unfit for purposes of insulation.

The subject of convection was but briefly alluded to. It takes place when electricity passes from an excited body into the air and sets the particles of the latter in motion. This motion was made visible in the preceding lecture, by placing a candle near the brass point of an electrical machine. The candle was nearly blown out, so strong was the current of air produced by the escaping electricity.

ELECTRICAL DISCHARGE.

What is called an electrical discharge takes place in three different ways. When an electrical machine is excited in a dark room, a glow is frequently observed around the plate or cylinder. This is one form of a discharge. Another is seen at the brass points of the prime conductor of machines, where it becomes manifest as a luminous pencil or brush. The most important, however, is what physicists call the disruptive discharge. When an obstacle is opposed to the progress of electricity of sufficient strength or tension, the electricity leaps over it, and a spark of greater or less brilliancy is the result. Now, this spark has enabled Wheatstone to measure the velocity of electricity by the following ingenious method.

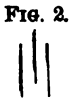
FIG. 1.



VELOCITY OF ELECTRICITY.

A coil of copper wire, a quarter of a mile long, connects the two brass balls, B and C, in Fig. 1, and another similar coil connects the brass balls, D and E. F is connected with the outer coating of a charged Leyden jar. Now, if A is connected with the inner coating of the jar, a discharge will take place, and the spark will jump from A to B, from C to D, and from E to F. The three sparks, however, are not simultaneous, although the interval between them may be very small. The electricity requires a certain time to pass through the half quarter of a mile of copper wire from B to C and from D to E. To measure this interval, Wheatstone caused these sparks to be reflected in a rapidly revolving mirror, where they appeared in three lines of light of equal length, the middle one lagging somewhat behind the other two, as in Fig. 2. The mirror revolved 800 times a second.

FIG. 2.



On measuring the distance which the middle line was behind the others on the cylindrical mirror, it was found to be about ¼°. The time it took the discharge to travel from B to C and from D to E, that is, a quarter of a mile, was $\frac{1}{360} \times \frac{1}{800} = \frac{1}{1152000}$ of a second, which would give for electricity a velocity of 288,000 miles per second. We are far from obtaining such velocity, however, in our telegraph wires; and Faraday has shown that the nature of the conductor and the intensity of the electrical charge causes the velocity to vary.

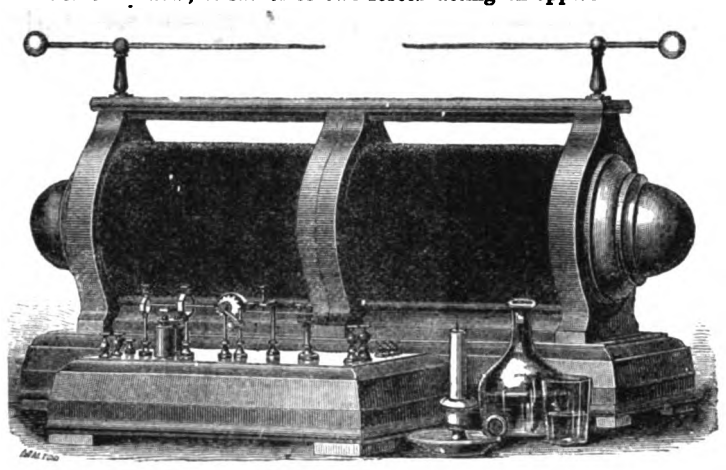
THE NATURE OF ELECTRICITY.

There is another point of considerable theoretical interest attached to the above experiment. As our readers are doubtless aware, there are two theories, or rather hypotheses, by which physicists seek to explain electrical phenomena. The real nature of electricity being entirely unknown, these hypotheses serve only to arrange and classify the facts, thus rendering it easier to remember them. Unless one of them, therefore, is disproved, it is merely a question of convenience which shall be preferred. They are known as the single fluid and the double fluid theory.

Since the text books generally regard the above experiment as demonstrating the incorrectness of the former theory, Professor Morton showed the theory to be capable of explaining the phenomenon as well as the other.

We quote the following paragraph, pointed out by the lecturer, in Müller's "Chemical Physics," page 853, for the two-fold purpose of giving the two fluid theory explanation and showing the opinion of one of the leading writers:

"This experiment affords a convincing proof of simultaneous action and reaction in the operations of electricity, and of its existence as a duplicate force; at the same time that a positive influence leaves the inner coating, an equal amount of negative influence leaves the outer coating, and these two neutralize each other at the central point of the conductor, that is, between C and D in Fig. 1. It appears from this experiment that Franklin's theory, though in many cases a simple and convenient mode of explaining facts, is not the true representation of the phenomena. The theory of two fluids, or rather of two forces acting in opposite directions, seems, by this experiment, to be demonstrated."



THE RHUMKORFF COIL.—FIG. 3.

According to Franklin's theory, however, the electricity entering at A acts upon B by induction, pushing the electricity from B into C. This crowding out of B's electricity takes place, however, against its natural resistance, and consequently C will then be charged less strongly than A. It will have to wait for re-inforcement before it can leap to D. The same thing, however, does not take place between E and F; for although E acts on F by induction, yet there is no resistance to counteract, the electricity naturally and easily passing out of F into the earth.

The lecturer then proceeded to experiment. The source of electricity was the enormous Rhumkorff induction coil of the Stevens Institute. This instrument gives a spark 21 inches in length.

HOW ELECTRICITY MOVES.

To impress the fact that electricity will not confine itself to one path if any obstacle is interposed, but will leap in different directions, a large sheet of metallic paper, suspended on a banner, was connected to one pole of the coil. A long wire from the other pole, insulated by a glass tube, was taken by the lecturer and made to touch the metallic surface of the paper, which had previously been crumpled so as to break the metal. When the room was darkened, vivid forked lightning shot over the paper in different directions, leaping over the cracks in the metallic surface.

The back of a mirror was connected with one pole of the coil, while the other pole was presented to the front of the mirror. The electricity jumped along the surface, in order to make connection by passing over the edge to the silvering behind. The flashes together with their reflection in the mirror formed a very brilliant and effective experiment.

The greater part of the electricity will pass through the way in which it finds the fewest obstacles, and we can therefore determine its passage beforehand. The lecturer had prepared a pane of glass, on which were pasted narrow strips of tin foil close together. These he had cut at intervals with a penknife, in such a manner as to cause the spark, in passing, to exhibit the design of a butterfly.

LIGHTNING RODS—AN ARTIFICIAL THUNDERSTORM.

The practical value of the knowledge of this tendency of electricity to select several paths was illustrated by a little model of a house furnished with a lightning rod only on one side. If the thunderstorm comes from the other side, it may strike that side notwithstanding the lightning rod. On darkening the room, and approaching the house from the unprotected side with the wire from the coil, the lecturer caused an artificial thunderstorm to burst upon the house, and the audience could see one portion of the flash enter the lightning rods, while another struck the side of the house. Combustibles previously placed in the model burst into a blaze, and showed the disastrous effects of insufficient protection.

TENSION AND INTENSITY OF ELECTRICITY.

When considerable electricity is set free at once it has what is called tension, or force, to overcome obstacles. While the spark from the Rhumkorff coil is about twenty-one inches long and faint blue, its electricity, when bottled up in a Leyden jar and then set free in one single spark, is intensely brilliant, and sounds like the report of a pistol. By making the electricity pass through his condenser, consisting of a number of glass plates coated with tin foil and connected like a battery of Leyden jars, Professor Morton obtained a spark fourteen inches long, which was of intense brilliancy and accompanied by a loud noise. (See Fig. 4.)

DURATION OF THE ELECTRIC SPARK.

The extremely short duration of the spark was shown by causing it to illuminate a rapidly revolving disk of paper containing a number of slots. Although it was moving so rapidly that the slots could no longer be seen, it seemed to stand still every time the spark flashed; it had no time to move perceptibly while the spark lasted. Short as is the duration of the spark of a Leyden jar, Professor Rood, of Columbia College, has shown by his beautiful researches that it is composed of several. (*American Journal of Science and Arts*, 1871, p. 160). This was exhibited by means of a revolving disk containing four slots, which was illuminated from behind by means of the electric spark. Each slot appeared like two or three, showing that the spark must be composed of two or three. Professor Rood found the duration of a single spark to be less than ninety-four billionths of a second (·000,000,094), a quantity which is entirely inconceivable.

ELECTRICAL FLOW IN VACUO.

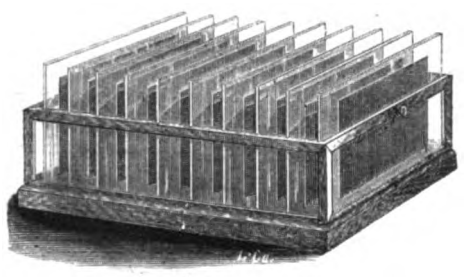
The most beautiful experiments of the evening, however, were those illustrating the electrical discharge in a vacuum, or rather in exhausted glass tubes containing minute quantities of various gases and vapors. The most magnificent colors and soft tints of light were produced as the discharge passed. Some of these tubes, known as Geissler tubes, were arranged on frames to show the contrast of their colors, but there was one especially, containing, near its two ends, several globes blown one inside of the other, and filled with minute quantities of hydrogen, carbonic acid, and nitrogen, which showed the splendors of the light to the greatest advantage. In it, too, was perceptible that curious classification or layering of the electric light, which has never been satisfactorily explained. A large number of the tubes were connected together, forming a circle over five feet in diameter, with a large initial S in the center, also composed of tubes. When the spark was passed through them the effect of the different soft colored lights was entirely beyond our powers of description.

Gassiot's cascade was also shown. It consists of a goblet made of uranium or canary glass, and coated partially with tin foil. When this was placed under a receiver of the air pump, the air being exhausted, an electric spark made itself luminous (fluorescence being a property of uranium glass), and it seemed as if floods of yellow light were welling up from the interior of the goblet and gently flowing over its sides.

CONTINUOUS LUMINOSITY.

The concluding experiment showed the effect of an electric spark on circular tubes filled with traces of anhydrous sulphuric acid. These have the curious property of continuing luminous for about half a minute after the electricity has ceased to pass. Becquérel supposes that the particles have the property of keeping up the vibration after the cause has ceased to act; but it seems as though this were but another way of stating the fact instead of an explanation. Others

FIG. 4.



endeavor to explain it by supposing chemical decomposition takes place, and that the afterglow results from the recombination. It hardly seems possible, however, that the infinitesimal quantity of sulphur they contain is able to keep burning for half a minute. For this reason we are still obliged to wait for the true explanation of this, as indeed of many other phenomena in electricity.

Taking Cold.

If a cold settles on the outer covering of the lungs, it becomes pneumonia, inflammation of the lungs, or lung fever and in many cases carries off the strongest man to the grave within a week. If cold falls upon the inner covering of the lungs, it is pleurisy, with its knife-like pains and its slow, very slow recoveries. If a cold settles in the joints, there is rheumatism with its agonies of pain, and rheumatism of the heart, which in an instant sometimes snaps asunder the cords of life with no friendly warning. It is of the utmost practical importance, then, in the wintry weather, to know not so much how to cure a cold as how to avoid it.

Colds always come from one cause, some part of the body being colder than natural for a time. If a person will keep his or her feet warm always, and never allow himself or herself to be chilled, he or she will never take cold in a lifetime; and this can only be accomplished by due care in warm clothing and avoidance of drafts and exposure. While multitudes of colds come from cold feet, perhaps, the majority arise from cooling off too quickly after becoming a little warmer than is natural from exercise or work, or from confinement to a warm apartment.

THE educated live longer than the illiterate: the rich, longer than the poor; the good, longer than the bad.

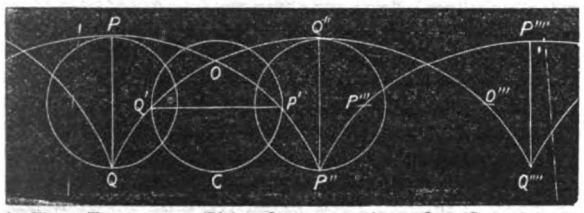
Correspondence.

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

Comparative Velocities of Different Points on a Driving Wheel.

To the Editor of the Scientific American:

As some of your readers have asked for information on this subject, I send the following for the benefit of A. P. C., and others:



1. Since P moves to P′ in the same time that Q moves to Q′, their average velocities will be respectively as the distances, namely, the average velocity of P, is to the average velocity of Q, as distance PP′, is to distance QQ′. But PP′=2*r* $\sqrt{2}$, and QQ=2*r*(2− $\sqrt{2}$), *r* being the radius of wheel; therefore, vel. of P : vel. of Q :: $\sqrt{2}$: 2− $\sqrt{2}$ :: 1·414 : ·586. It will be seen that the average velocity of P, thus far, is more than double that of Q.

2. At P′ and Q′, the velocities are equal.

3. The average velocity of P, from P′ to P″, is to the average velocity of Q, from Q′ to Q″, as ·586 is to 1·414.

4. The average velocity from P to P″ is the same as from Q to Q″.

5. The velocity at P, Q″, P‴, etc., is a maximum; at Q, P″, Q‴, etc., a minimum.

6. The velocities are the same at P and Q″, at Q and P″, at Q′ and P′, at O, and at any two points on the same horizontal line.

7. The velocity of P is inversely the same as that of Q; or, in other words, P ends with the velocity at P″ that Q starts with, and P starts with the same velocity that Q ends with at Q″.

8. While the center moves a distance equal to $2\pi r = 6{\cdot}283 \times r$, the point P moves over a distance equal 8*r*.

J. T.

Indiana University.

Remarkable Astronomical Phenomenon.

To the Editor of the Scientific American:

On Friday, December 13, 1872, there was a brilliant display on the surface of the sun, of the hidden forces within. The sky was cloudless, and at a little past ten o'clock, A. M. I was observing the sun with one of my transit instruments, for the purpose of adjusting the lens, when there appeared streaming forth from the western limit of the sun something similar to the flashes of the aurora, which obscured so much of its advancing edge that I could not proceed with the adjustment until matters became more quiet. Some of the flames reached to a distance, outward from the surface, equal to one eighth of the diameter of the sun, which would amount to over 100,000 miles. These appearances subsided in about 15 minutes after I first noticed them.

For the last five years there have been but very few clear days in which I have not spent more or less time in similar observations, but have had no good evidence of any such disturbance before, and had no reason to look for such things, as I only employ one lens, and that is of very low power. I hope the astronomers at some of our observatories were fortunate enough to be at their eyepieces at the time; if so, I trust we shall, from some of them, have a full description of this interesting phenomenon. EDWARD PREVEAR.

Leominster, Mass., December, 1872.

The New Ships for the Pacific Mail Company.

To the Editor of the Scientific American:

In your issue of December 14, in an article entitled "Revival of American Ship Building," you inform the public that the two steamers for the Pacific Mail Steamship Company have lately been launched at Wilmington, Delaware.

The Colon was built by the Delaware River Iron Steamship and Engine Works, situated at Chester, Delaware Co., Pennsylvania, (John Roach & Co's. yard), and launched Nov. 16, more than a week prior to the launch of the Acapulco at Wilmington, Delaware, on which account the Colon gets the engines which are being or were built in Scotland for the one that should be first launched. The Delaware River Iron Steamship and Engine Works have the sister ship nearly ready for the water and are preparing to lay the keels for two more ships for the Pacific Mail Company, which are to be 420 feet over all; which, when done, will be the largest vessels ever built in this country. I do not like the Scientific American to be in error; I quote it too often. N. RULOW.

Chester, Pa.

The Antiquity of Man. Letter from Professor Kirkwood, LL.D., of the Indiana State University.

To the Editor of the Scientific American:

Your paper of October 12, owing to some unusual delay, did not reach me till this morning. It is not proposed to renew the discussion on "Theology and Science." To most of your readers any further agitation of the subject would perhaps be undesirable. In a scientific paper, however, facts should not be given without careful scrutiny. I beg therefore to correct the following statement of a correspondent on page 228 of your current volume:

"The greatest age of human antiquity, if theology is true, as maintained to-day is less than six thousand years, beginning in the days of Adam and Eve. Yet the Chinese records in astronomy go back twenty thousand years. The eclipses and conjunctions of planets in the days of Fedo, 10,000 years ago, have been recalculated by Baily and other astronomers, and they have mathematically demonstrated the truthfulness of the Chinese astronomical records, showing a difference of time of but fifty-one seconds."

Now the earliest eclipse of which the date has been preserved occurred in the twenty-second century before the commencement of our era. This is recorded in the Shoo King, "which is considered by the Chinese as the most ancient of their books." See Chambers' Descriptive Astronomy, page 198, the Memoirs of the Royal Astronomical Society, vol. XI., page 47, and the Monthly Notices of the Royal Astronomical Society, vol. XXIII., page 238.

The statement quoted in regard to planetary conjunctions is no better sustained. The most ancient account of an occurrence of this kind is found, it is true, in the Chinese annals. Its date, however, was but 2,449 years before the Christian era. See Observations of Comets, extracted from the Chinese Annals, translated by John Williams, F. S. A., one of the Secretaries of the Royal Astronomical Society, and first published during the past year.

In regard to the antiquity of man I express no opinion. But a cause, however good, cannot be permanently promoted by a loose statement of facts. DANIEL KIRKWOOD.

The November Meteors.

To the Editor of the Scientific American:

Since November 27, I have looked in vain for some notice of an unusual meteoric shower that took place at that time. I first noticed it at seven o'clock, P. M., and called my wife to see the celestial display. By facing in opposite directions, we were able to count more than three hundred meteors, of various sizes and degrees of brightness, in half an hour. Had the sky not been partially obscured by clouds, we doubtless could have counted many more. From the decrease in the frequency of their fall, we inferred that the finest part of the display had escaped our notice. They radiated in all directions from a point in the constellation *Perseus*.

D. B. MOAK.

Norwood (near Cincinnati), O.

Condition of the Patent Office.

The Secretary of the Interior, in his recent annual report, says: The number of applications for patents, including reissues and designs, during the year ended September 30, 1872, was 19,587; the number of applications for extension of patents, 284; the number of applications for the registering of trade marks was 589. During the same time were issued 13,626 patents, 233 extensions, 556 certificates of registry of trade marks, and 3,100 caveats have been filled. This shows a small increase over the number of the preceding year. The fees received during the same period, from all sources, amounted to $700,954.86, and the total expenditure to $623,553.90, making the receipts in excess of the expenditures to the amount of $77,400.96.

Over 200,000 applications for patents have been filed since 1836, and about 133,000 patents have been granted. The drawings, models, and files accompanying these applications must be so classified and arranged as to facilitate access to them, otherwise there would be constant danger of duplicating patents upon the same invention, and each year's accumulation adds largely to this danger.

The Commissioner urges the importance of a separation of the Patent Office from the Department of the Interior. The matter is embraced in the bill now pending before Congress for a reorganization of the Bureau.

The work of the Office has been conducted in the most satisfactory manner during the entire term of the present Commissioner (General Leggett), and I most cheerfully attest his efficiency and capacity for its manifold and delicate duties.

Researches on Santonine.

Santonine is the active principle of the *semencontra*, and for some years past has been prepared on a large scale for therapeutic purposes. M. de Saint Martin, says in *Les Mondes* that if santonine is, as claimed, really a phenol, its formula, $C^{30}\,H^{18}\,O^6$, indicates that, by its methodic reduction, there should be obtained, 1st, a diatomic phenol, $C^{30}\,H^{18}\,O^4$; 2d, a monatomic phenol, $C^{30}\,H^{18}\,O^2$, and 3d, a carburet of hydrogen, $C^{30}\,H^{18}$. This last carburet would present the composition of a homologue of napthaline, isomeric or identical with amyl-naphthaline. The author states that he has prepared monatomic phenol $C^{30}\,H^{18}\,O^2$ and designated it by the name of *santonol*. In a crystalized form, it resembles the stearine which separates itself in fatty bodies. Liquid santonol is a very alterable substance, turning brown under the influence of air.

A Stolen Lens Recovered.

The object glass of the Alleghany Observatory, at Pittsburgh, Pennsylvania, which was mysteriously stolen on a dark night some time ago, has been found and restored to its place in good order. Its value was $4,000. It was carried off by an intelligent sort of a thief who probably expected that a reward would be offered for its return, enabling him to make a little money by the operation. He deposited it in a stable, and his pal stole it from him. But it finally came into the possession of the police and it was carried home.

WE are desired to direct attention to the advertisement in another column addressed to the Board of Managers of the American Institute.

Aniline Inks—Interesting Experiments.

The beauty and variety of aniline dyes has, for a long time, induced manufacturers to use them for the making of inks. Formerly, red inks were prepared from cochineal and ammonia, and blue inks from Prussian blue and oxalic acid; but an exceedingly cheap red ink may be made by simply dissolving a little gum in a very diluted solution of aniline red. This ink may be immediately used, and the solution must not be too strong, or the complementary color (green) will appear. Violet and blue inks, with and without a greenish tint, are now much used. The so-called *blue soluble* is readily available for making them. It is prepared like red ink, and the same is the case with the "patent violet." Aniline dyes may also be employed for the preparation of sympathetic inks, which formerly were very much in vogue. Letters written with aniline red will disappear when exposed to the vapors of ammonia, in which case we obtain the colorless rosaniline, which is scarcely or not at all visible. After some time, especially if warmed a little, the letters appear again in their original beauty. Nicholson's blue yields a still more beautiful sympathetic ink. To produce it the blue is dissolved in a solution of borax, to which a little gum is added. When used, this ink is scarcely perceptible, but when exposed to the vapor of muriatic or acetic acid, the characters appear in dark blue; but they disappear if exposed to the vapors of ammonia.

The following is an interesting experiment, and may be of interest to popular lecturers on chemistry: White flowers, made of paper, and white silk ribbons may be variously colored, without any one recognizing how it is done. It is a well known fact that if an aniline dye, in the state of a very fine powder, is spread over a sheet of paper, and the loose dust removed, there remain imperceptible particles, which, however, are sufficient, if dissolved, to intensely color the whole sheet. To this end it is only necessary to moisten the paper with strong alcohol, or with a solution of alcohol and acetic acid. This experiment may be carried out by making roses or other flowers from paper. White roses, if covered with fuchsin in the form of dust, when immersed in spirits of wine or other proper solvent, are immediately changed to beautiful red roses. Silken ribbons may be treated in a similar manner. By dropping a few grains of aniline dyes into wine glasses and adding a solvent, variously colored liquors may be obtained by means that few persons are able to detect. A white liquid may be colored red, and decolored by adding ammonia. In fact, many interesting experiments can be performed with these dyes.

The Freezing of Water.

Dr. G. Krebs has devised a very simple arrangement, by which it is possible to show to an audience that water may be cooled considerably below 0° C. without freezing. He takes a tube 18 centimeters long and 1 centimeter wide, made of thick glass, closed at one end and furnished with a bulb. After thoroughly cleansing by heating sulphuric acid in it for some time and rinsing repeatedly with distilled water, he draws out the upper end to a long point. This point is kept dipping in distilled water, which has been boiled for some time. Every time the bulb is heated and allowed to cool, a little water enters. This is repeated until the tube is full clear up to the point. Then the point is made to dip into purified mercury and heat is applied to the bottom of the tube until the water reaches only half way up in the bulb, when the point is quickly sealed up by melting.

Placed in a freezing mixture, say of water and nitrate of ammonia, side by side with water in an open tube, it can be taken out and handled after the latter is frozen, without being congealed by the agitation. After the water in the open tube is completely frozen, that in the closed tube will freeze suddenly, if it is strongly shaken up and down once.

Experiments on Certain Points of the Physiology of the Pneumo-Gastric Nerves.

MM. Legros and Onimus, says *Les Mondes*, have studied the influence upon the movements of the heart, in warm and cold blooded animals, caused by excitement of the pneumogastric nerves, according to the intensity and especially with reference to the number of excitations given at a time.

The number of necessary excitations in order to lead to the stoppage of the heart varies considerably in the two kinds of animals. While from 15 to 20 intermittances per second are necessary in the case of a warm blooded animal, two or three are sufficient for one of cold blood, especially in a state of hibernation. With the latter, less excitement is necessary to arrest the action of the heart, in proportion as the animal is weakened. With a warm blooded animal, whatever may be the intensity of the excitements or the number of intermittances, the complete cessation of the heart's motion has never been attained in less than from fifteen to thirty seconds. After the motion has ceased, there supervene, in spite of the continuance of the excitation, contractions, few it is true but strong and progressively augmenting in number.

A DISPATCH from Tripoli (Syria) announces the arrival in that city of several engineers sent from Constantinople by M. Pressel to construct the railroad proposed by Midhat Pasha. This line will connect the Mediterranean and the Persian Gulf. It will pass by Palmyra, cross the Euphrates, Mesopotamia, the Tigris, and will terminate in Bagdad, where it will meet the road, already begun, from the Persian Gulf.

AT the Imperial Arsenal at Constantinople, an iron-clad war vessel is ready for launching. This is the first ship of this kind that has ever been constructed in Turkey after Turkish plans with Turkish material and by native workmen.

SCIENTIFIC AND PRACTICAL INFORMATION.

NITROGEN GAS.

This neutral, lazy gas is little used, excepting where an experiment requires to be performed in an atmosphere free from oxygen, as in making amorphous or red phosphorus; and even here carbonic acid gas will work as well and is more easily prepared. For lecture room experiments, to show the properties of nitrogen, it is generally obtained from the air by burning phosphorus under a bell jar of air. A neater method, and one that furnishes it in a steady current, is by heating nitrite of potassium. Take a strong solution of caustic potassa, and pass into it a current of nitrous acid, generated from starch and nitric acid. When the solution has become strongly acid, stop the current of nitrous gas and neutralize the solution with potassa. This solution of nitrite of potassium will keep well until needed. When about to generate the nitrogen gas, place one volume of this solution in a retort fitted with a tubulated receiver and a delivery tube leading into the pneumatic trough. Also place in the receiver three volumes of a saturated solution of chloride of ammonium. Heat gently to about 125° F. The decomposition is as follows: $KNO_2 + NH_4Cl = KCl + 2H_2O + 2N$. The chloride of potassium remains in the retort, the water is caught in the receiver, and the nitrogen is given off from the delivery tube.

SOME EXPERIMENTS WITH PERMANGANATE OF POTASH.

When a hot concentrated solution of permanganate of potash is dropped carefully into a test tube containing a small quantity of glycerin, a very violent chemical action takes place; a portion of the glycerin is carbonized and thrown out of the test tube. Oxalic and formic acids are also produced. With ordinary alcohol, permanganate of potash produces a violent reaction, as has been frequently explained in scientific journals.

Oil of aniline is violently decomposed by a hot solution of permanganate of potash, but the resulting vile-smelling compounds have not yet been studied.

SEPARATING WOOL FROM COTTON IN MIXED FABRICS.

Two cases may naturally arise: First, where the rags used are in great part cotton, and it is desired to destroy the woolen fibers in order to use the cotton for paper stock. Second, where the wool predominates, so that it is more profitable to destroy the vegetable fiber and preserve the wool.

1. The wool remaining after the mechanical separation of the rags is mostly destroyed by the alkali wherein the cotton is boiled before bleaching it. If it were attempted to dissolve out all the wool with alkali, it would be too expensive and would not pay. In this case what is known as Ward's method is employed. The rags are subjected to the action of superheated steam under a pressure of 3 to 5 atmospheres. At this temperature, the wool is converted into a black friable substance, which is easily separated by mechanical means as a dry powder. This powder is an excellent fertilizer, containing 73 per cent organic matter, and from 10 to 12 per cent nitrogen.

To destroy the vegetable fiber and preserve the wool, several methods may be used. The rags may be soaked with water containing 5 to 10 per cent sulphuric or hydrochloric acid, slightly pressed out, and then dried on the floor of a room heated to 190° or 212° F. for some hours. As the water evaporates, the acid becomes more concentrated and converts the cellulose into sugar and a gummy substance. Kopp considers the following the most rational and cheapest method: The rags are put in a bath of 100 parts acid and from 300 to 500 parts water, then taken out and allowed to drain, and are slightly pressed out, then dried slowly in a room in a current of air at a temperature of from 160 to 195° F. for many hours. When the wool is of very good quality, instead of using sulphuric or hydrochloric acid, oxalic acid or chloride of aluminum is used. These substances destroy vegetable fibers without perceptibly attacking the wool.

CHLORALUM.

Upon examining various disinfecting preparations of the Chloralum Company, in London, Professor Fleck, of Dresden, found that it compares with the following ordinarily used and less expensive deodorizers and disinfectants:

	Parts putrefying matter.
Bleaching powder or chloride of lime disinfects.....	100·00
Burnt lime "	84·6
Alum "	80·4
Sulphate of iron "	76·7
Chloralum "	74·0
Chloride of magnesium "	57·1

The chloralum is prepared by treating ferruginous clay with crude muriatic acid, and decanting the liquor, which constitutes the disinfectant. The residue is sold as "Chloralum Powder." The author discovered in the latter 0·72 per cent chloride of arsenic, 0·55 chloride of lead, 0·37 chloride of copper; but the preparation in the liquid form yielded less lead and copper. The author warns the public against the use of these antiseptics, or whatever they may be called, for ulcers or for use as a gargle in diphtheria or sore throat, for which purposes they have been recommended. The translator would remark that the so called "Bromo-Chloralum" of American manufacturers is a different and perfectly non-poisonous preparation, it being a concentrated solution of aluminum chloride and bromide, while the English chloralum consists principally of chloride of aluminum.

ARTIFICIAL SKINS FOR SAUSAGES.

In Würtemburg there has been started a new industry, which consists in the manufacture of skins of parchment paper for sausages. This artificial product is considerably cheaper than the natural one; it is not subject to fermentation, and is distinguished by its cleanliness. It is made by means of machines, in the thickness of ordinary writing paper, and samples may be obtained by writing to Carl Brandegger, at Ellwangen, and enclosing the amount of the postage.

BOAT LOWERING APPARATUS.

A correspondent, R. B. F., of Mass., says: "In your No. 20, page 315, there is a description of a boat lowering apparatus, by E. J. Hill, Pimlico, England, whereby the ends of a boat are held by tackles and "slip hooks;" so that, on touching the water, the boat is released at once. If the water be smooth, this is all very well; but if it be rough, there will be great danger of the forward end being released first. I have seen this slip hook or one like it at the Navy Yard here."

List of Naval Subjects.

The council of the Institution of Naval Architects, London, have prepared the following list of subjects, which they desire to submit to the members and associates of the Institution, and others interested in shipbuilding, as questions on which they will be glad to receive communications for the annual general meeting in April (2d to 5th), 1873. It is requested that all such communications may be forwarded to the secretary of the Institution not later than 28th February, 1873:

1. The construction of vessels for coast defence.
2. The effect on naval construction of torpedoes, or other modes of submarine attack.
3. On the results of the best modern practice in ocean steam navigation, with reference to the latest modern improvements—such as surface condensation, superheating, compound engines, and the like; also the value of each of these taken separately, and especially the results of any actual experiments to test this point.
4. On the friction developed in marine steam engines of different forms; and on the difference between the gross indicated horse power developed in the cylinder and the net effective horse power available for the propulsion of the ship after working the air pump, slide valves, and other moving parts of the engine.
5. On economy of fuel in marine engines, with detailed results.
6. On marine boilers, their rate of combustion, and the proportioning of their various parts.
7. Information as to the deterioration of marine boilers supplied with water from surface condensers and the remedies for this.
8. Description of any improvements in the details of construction of marine engines.
9. On methods for starting, stopping, and reversing marine steam engines of high power.
10. Details of any experiments tending to throw light upon the theory of the steam engine.
11. On the life and cost of maintenance of merchant steam ships.
12. The design and construction of yachts.
13. On legislative interference with the construction, stowage, and equipment of ships.
14. The effect on shipbuilding of Lloyd's rules, the Liverpool rules, and the rules of other similar societies for the classification of ships; and on ships not classed.
15. On methods for the proper strengthening of ships of extreme proportions, and on the precautions necessary to insure their safety at sea.
16. On the straining effects of engines of high power on the structures of ships, and the arrangements necessary to obviate them.
17. On the present state of knowledge on the strength of materials as applied to shipbuilding, with especial reference to the use of steel.
18. Description of any vessel actually built, or in course of building, exhibiting great novelty in its principles of construction.
19. The preservation of a ship's internal structure from the effects of bilge water, leakage from cargoes, etc.
20. On the masting and rigging of ships, and on iron and steel masts and yards.
21. On ships' boats, and on apparatus for lowering and disengaging them.
22. On machines for economizing labor in the construction of ships.
23. On the use of machinery for economizing labor on board ship, whether merchant ships or ships of war, and whether for loading or manœuvring.
24. On the best method of clearing vessels of water in the event of a leak, and on any novel form of ship's pump.
25. On the means of accurately measuring the speed of ships.
26. On instruments for measuring and recording the rolling of ships, both as to time and extent of roll.
27. Actual measurements or records of sea waves; their hight, length, periodic time, and speed of advance; or their profiles.
28. On the measure and amount of resistance opposed to a ship's progress by the water through which it moves.
29. Exact information (either experimental or theoretical) on the efficiency of propellers.
30. On the ventilation of ships by natural and forced drafts, with details of any system in actual operation.
31. On the economic value of form and proportion both in merchant vessels and in ships of war.
32. On floating structures for special purposes—such as docks, lighters, tank vessels, light ships, telegraph ships, and others.

THE cotton crop of the United States for the present year has been favorable. The total product for the year is 3,500,000 bales of 465 lbs. each

Value of Scientific Study.

Professor Jenkin, of Edinburgh University, on recently assuming the duties of the Chair of Engineering, founded by the late Sir David Baxter, made an admirable address to his class on the above subject, from which we take the following:

The originality which suggests novel enterprises—the common sense which judges the soundness of an undertaking—the experience which specifies the quality of every material required, and the manner in which old well known details are to be carried out—the business habits and sagacity which guide men in the superintendence of work and workmen—the clear head which understands obligations imposed by a contract, and which can write a document having a definite meaning—still more the glorious faculty of invention, by which a man creates, as it were, a new thing, and gives new power into the hands of his fellows—these qualities or faculties are all useful to the engineer in the highest degree, and neither I nor my colleagues can give them. The old self-made, unscientific engineers possessed them, and in virtue of them became what they were and are. Unscientific untaught men, who have these qualities, will still become engineers in spite of scientific rivals. All this I willingly concede; yet I claim that scientific teaching will help most those men who would do most without it, and that it will render useful even an inferior class of men, who without it would be helpless and useless. Originality is not damped but guided by science; common sense suffers no wrong at the hand of knowledge; experience is not weakened by the power of calculation; education does not debar men from a knowledge of the world; the clearest head is strengthened by scholastic training; and the inventor is guarded from countless disappointments by obtaining the power of calculating results without, in every case, testing his suggestions by actual and costly experiment. In a word, scientific knowledge makes the great man greater, adding to his powers, and it guards the weaker brethren from many follies.

Discovery of New Fossils.

Professor O. C. Marsh records the discovery of remains in the eocene of Wyoming which clearly indicate several representatives of the lower *quadrumana*. Although these fossils differ widely from all known forms of the above group, their more important characters show that they should be placed with them. The genera *Lemnotherium Thinolestes* and *Telmatolestes* especially have the principal parts of the skeleton much as in some of the lemurs, the correspondence in many of the large bones being very close. The anterior part of the lower jaws is similar to that of the marmosets, but the angle is more produced downward and much inflected. Some of the species apparently have forty teeth.

The large carnivore, recently discovered by Professor Marsh, is of a genus quite distinct from *L. ferox*. The canines and premolars of the lower jaw somewhat resemble those in the hyena, but there are only two incisors in each ramus. The remains indicate an animal about as large as a lion. The genus they represent may be called *Oreocyon*, and the type species, *Oreocyon latidens*. An interesting addition to the reptilian fauna of the cretaceous shale of Kansas is a very small saurian, which differs widely from any hitherto discovered. The only remains at present known are two lower jaws, nearly perfect, and with many of the teeth in good preservation. The jaws resemble in general form those of the mosasauroid reptiles, but, aside from their diminutive size, present several features which no other species of the group has been observed to possess. The specimen clearly indicates a new genus which may be called *Colonosaurus*, and the species may be named *Colonosaurus Mudgei*, after the discoverer, Professor B. F. Mudge.

Few Guns and Poor Powder.

Would it not be more advisable for Congress, instead of appropriating half a million dollars to pay for the pleasure trips of a commissioner and a score of assistants to the Vienna Exposition, or to assist a body of manufacturers who need ne such aid to forward their goods to European countries, to devote such money to protecting our harbors so that the iron clad vessels of foreign nations would be prevented from steaming up to our very wharves? The ordnance officers of the army state that our sea coast fortifications are armed with but 317 fifteen inch guns, all told; that the powder in the magazines was all made during the war and is of small grain, besides being damaged by age for use in these great guns, and that there are only on hand eighty projectiles for every fifteen inch gun, of which number only ten are solid shot.

Practical School for Weaving.

The organ of the German wool industry publishes the programme of the above school, situated in Grünberg, Silesia. In this institute the following branches are taught: Shaft (or treadle) weaving, and weaving with the Jacquard loom in all its details, the weaving of woolen shawls, the weaving of velvet, plush, and carpets, the preparation of mordants and dyes, and chemistry as applied to dyeing. The pupils are practically instructed in executing patterns in colors, in designing, warping, in operating with the reading and stamping machine, and in weaving after known and self-invented patterns. They are made acquainted with the drawing and designing of the patterns in simple and compound forms, with the construction of the different machines, and other branches too numerous to be mentioned here.

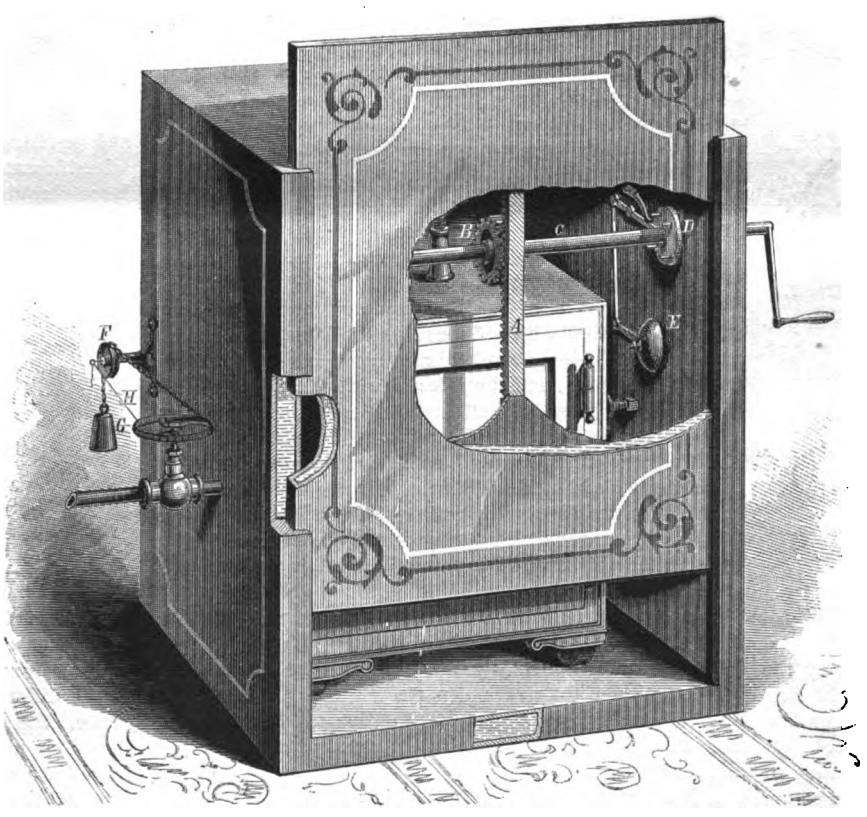
A PATENT, granted not long ago to a Mr. Keep for a stove, contains no less than sixty-two different claims for improved parts. Some of them are exceedingly small points.

IMPROVED SAFE PROTECTOR.

Our engraving represents a new portable safe protector designed to render ordinary fireproof safes more secure by enclosing them in an iron case, made with double walls, the hollow space between being filled with water. A continuous supply of the latter is maintained by connecting the protector to a suitable reservoir, situated in the upper part of the building, or to the ordinary water mains. The details of construction as represented in the illustration are as follows: The rectangular case is composed as above stated with double sides, top and bottom. The door is made to slide up and down in grooves and is all hollow; and, by suitable connection to the supply, is filled with water. The safe, which may be of any desired variety, is shown through the broken away portion of the door, and is firmly held in position by jack screws set up between it and the inside of the case.

The mechanism for opening the door consists of the rack A, attached on the inner side, in which works the pinion B, on the shaft C. This shaft is held in bearings in the sides of the case and is turned by means of the crank shown. The outside end on which the handle fits projects in a recess so that it is flush with the exterior of the wall and may be of any peculiar or contorted shape so as to render an ordinary handle inapplicable. On the shaft just inside of the casing is a disk, D, on which are a number of pins, which, when the shaft is rotated, strike in succession and so raise a lever which is suitably connected with the gong, E, causing the latter to sound and thus act as an alarm.

At the left of the drawing is represented the supply pipe and valve, in a groove on the rim of the wheel of which is wound a small chain which passes over the pulley F, and sustains the weight G. As it is designed that, when in ordinary use, the casing shall not be filled with water, this apparatus is an ingenious means of admitting a supply automatically whenever necessity arises. The weight is sufficiently heavy to turn the wheel and so open the valve, but is prevented from so doing by the piece of common string H. In case of fire, however, this cord is at once consumed and the weight, falling, causes a constant supply of water to be admitted. Suitable vents may be provided to relieve the steam pressure due to intense heat. The water cannot rise to a temperature beyond 212° Fah, and as this is necessarily far below that which the interior safe is capable of withstanding, the protective qualities of the latter are greatly enhanced. The portability of this device will render it superior to the similar method lately suggested, and in some localities practiced, of placing the safe in a permanent brick vault made with water connections.



BROOK'S EFFECTUAL SAFE PROTECTOR.

Patented October 1, 1872. For further information relative to the sale of the entire right, etc., address the inventor, Mr. James W. Brook, Lynchburgh, Va.

About Walking.

A gentleman who lately made a pedestrian tour, from Portland, Oregon, to San Francisco—some eleven hundred miles—gives the following particulars relative to the experiences of his party:

Before starting, I was strongly urged to wear shoes ("English walking shoes") and my own prejudices were in their favor, but careful deliberation told me of the fearful dust to be encountered, following, as we would have to, most of the way, a thoroughly traveled road that had not seen rain for months, and also of the necessity of having to take boots or shoes off many times each day to bathe the feet. This decided me in favor of high top boots, the wisdom of which I had no occasion afterward to doubt. The pants were also protected from the dust by being worn inside of them. The feet can be saved much irritation and many blisters by the use of insoles (boots or shoes having been made large enough to admit them). The greater friction between an easy fitting boot and the foot is at the fore part of the front foot. Every time the heel raises, the relative position of the foot and the sole of the boot must change, causing great friction, as the entire weight of the body is upon the foot at the time of change between foot and boot. An insole, if a trifle shorter than the boot, will take much of this friction from the foot, as it must then take place, to a great extent, between the insole and sole of the boot. A second insole will relieve the foot still more. They will also furnish the additional advantage of relieving the feet when much swollen, by taking them out. No matter how toughened the feet become, they will blister very readily if rapid walking is persisted in, say for three or four hours, while, at a pace that is not unduly exhausting the system, they will not feel the slightest discomfort.

We practiced bathing feet, hands, and heads very often, say from three to six times a day, when water was found, and when we were tired and exhausted it would have a very exhilarating effect.

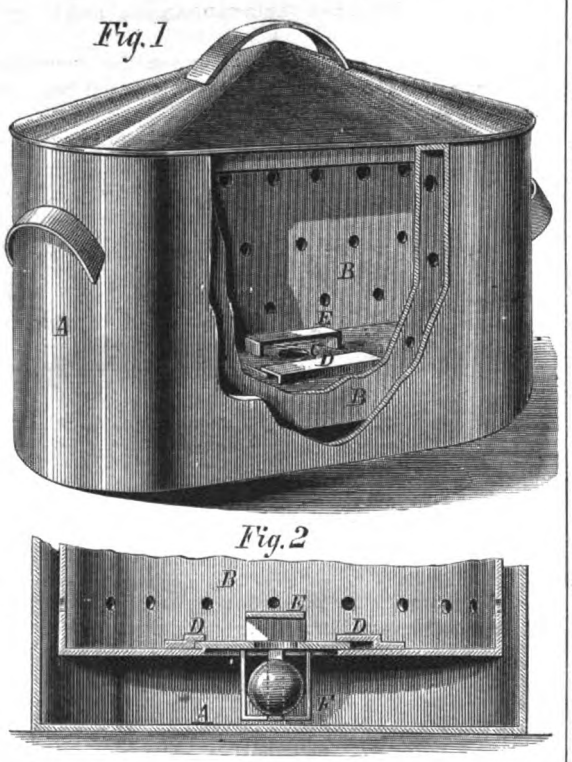
Rapid walking, "spurts," at the rate of four miles an hour, of two or three hours duration, or long marches, say twelve miles or more, without a halt, is very exhausting. If indulged in, in the early part of the day, it will incapacitate one for the balance of the day, or if at the close of the day, its effects will be felt the following day. The same will apply to ascending high hills or mountains. Movements in such instances should be sufficiently moderate to avoid getting into a "pud" or perspiration, more than when moderately walking on the level.

The Graham crackers, upon which we principally existed, were baked hard and dry like sea biscuit, and we found it necessary to moisten and soften them before eating, and we resorted to the use of boiling hot water, breaking the crackers into it, and allowing them to absorb all the water they would. The hot water seemed so grateful to us that we soon fell into the way of taking it freely, and were often astonished at the quantity we consumed. Its use did away with much of our thirst while walking, and was beneficent in all of its effects. I venture the assertion that there is a virtue in the use of hot water, where great exertion is to be endured, that is not generally understood. By hot water I mean water that has been made to boil and then taken as hot as it can be borne; tepid water is unpalatable.

In our preparations, it was proposed that we carry sun umbrellas. I did not second the proposition, believing their use would not compensate the trouble of carrying them; I yielded, however, and subsequent experience convinced me of their great value to us. Our estimate was that we could perform one fourth more with than without them, whenever the temperature was above 90°.

PUTT'S WASH BOILER.

The steam clothes washer herewith illustrated consists of an outer boiler, A, and an inner boiler, B, securely soldered together at their upper edges. The boiler, B, as shown



through the broken away portion in Fig. 1, is constructed smaller in size than the boiler, A, so that a suitable space is left between the two. The inner receptacle is perforated with a number of holes, which gradually increase in size, those nearest the top being the largest. Through the middle of the bottom is made an aperture, which is covered by the plate, C, shown more clearly in section in Fig. 2. This plate is held in strips, D D, one of which is wider than the other, so that the plate may be applied and removed by slipping its edge so far beneath the wider strip that its other edge may be inserted and withdrawn past the edge of the narrower strip. The piece, E, is used to cover an orifice in the plate, C, so as to prevent the same becoming clogged by the clothes, and also serves as a handle. Attached to the lower side of the plate, and surrounding the abovementioned aperture therein, is a slotted tube or tubular frame, F, in which is placed a ball, which is retained from falling out by wire or other suitable means. Lastly, the apparatus is closed by a cover fitting tightly into the mouth of the boiler, B.

In using the device, the plate, C, with its attachments, is removed, and a quantity of soap and water is placed in the bottom of the boiler, A. The plate is then fixed in position, the clothes put in, and the apparatus set over the fire. As the water becomes heated, the steam raises the ball, which thus closes the bottom orifice. The water and steam are then forced up between the walls, thence through the perforations in the sides of the inner boiler, and so pass laterally and at the same time, entering through holes above the clothes, percolate through the garments. This invention has the merits of both ingenuity and simplicity, and will doubtless prove a useful convenience in the laundry.

Patented through the Scientific American Patent Agency, Nov. 19, 1872. For further particulars address Mr. W. C. Putt, Ludlow, Champaign Co., Ill.

Man Engines.

For the purpose of lifting the miners out of deep mines without the use of rope and kibble, man engines were invented 40 years ago by Bergmaster Dörrell, of Clausthal, in the Upper Harz, when he used two pump rods, which, side by side, went up and down a shaft, and fixed to them small platforms and handles at all those points of the rods which came opposite after every stroke. So, by simply changing his stand after each stroke, from one rod to the other, a man would be lifted up to the surface without any exertion. This ingenious system, says a correspondent of *Engineering*, was soon imitated in other parts of Germany, Belgium, France, and England, and generally special machinery was designed to drive these man engines. At the deep silver lead mines of Przibram, in Bohemia, since 1854, in the Maria shaft, a direct acting man engine, with two steam cylinders and cataract reversing gear, has been employed, both rods being connected by chains which run over pulleys; the great wear and tear of the latter, however, the great pressure of steam required, the inequality of the engine stroke when differently loaded, and other inconveniences, caused this direct acting engine to be abandoned and replaced by another indirect acting man engine in the Anna shaft. This latter was constructed so as to transmit the up and down motion from a rotating crank by two pump crosses—by-the-bye, exactly the same principle which was originally employed by the inventor. This system is now quite successful at Przibram, and a small condensing steam engine, working expansively, is quite sufficient to work it with the greatest safety and regularity, a brake attached to the flywheel controlling the engine with certainty, whenever required. The engine reaches a depth of 400 fathoms, and 3,000 men go up and down it daily, in about 9 hours (3 hours for each shift); it makes four to five strokes per minute of 10 feet each, requires 6·2 to 6·9 lbs. of coal per hour, and per effective horse power, and costs from 2s. to 2s. 3d. per horse power in 24 hours. Quite recently the old engine in the Maria shaft has been also replaced by a similar one, only the stroke of the rods has been increased to 12 feet.

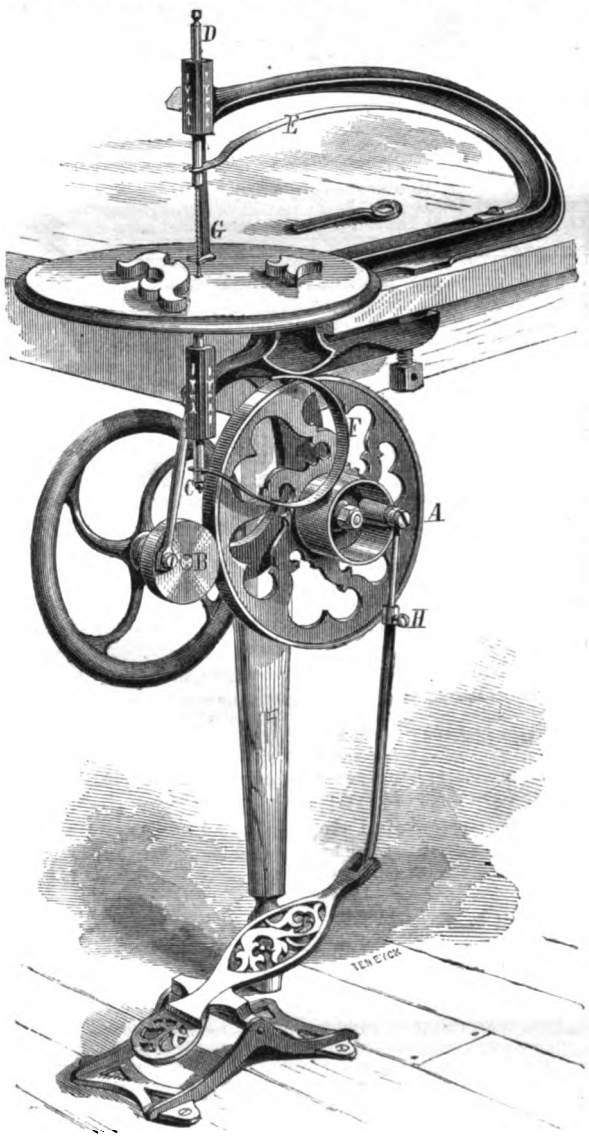
Centrifugal Drying Machine.

MM. J. Decondin and Co., of Paris, have, according to the *Engineer*, invented a new type of centrifugal machine, which presents certain advantages. The employment of such machines has, as is well known, been largely extended in dyeing operations, in sugar factories, and generally in all industries where it is desired to express liquids from solids. They consist of cylinders pierced with holes to receive the material from which more or less moisture is to be extracted. The cylinders revolve at very high speeds on vertical shafts, and the centrifugal force drives out the liquid. The machines in general use are open to objection, on account of the trouble they give the workmen from mechanism placed above the cylinder. In the apparatus of MM. Decondin this objection is removed. The following particulars relating to its constrution are extracted from the *Annales Industrielles*: The cylinder carries in its center a vertical tube, closed at the upper end, the level of which corresponds with the top of the cylinder. This tube rests at the end on a fixed axis, upon which the whole revolves. The cylinder is thus placed in a condition of stable equilibrium. A pinion, fastened to the central axis, is connected to the bottom of the cylinder, and movement is communicated to this pinion through a pair of horizontal toothed wheels, of a vertical shaft, some bevelled gearing, and driven by hand or off a pulley. The price of the apparatus, including cover, etc., varies from £10 to £32.

REMARKS.—The above is one of many examples of the adoption of American improvements in Europe. The idea of removing the mechanism from above the machine, out of the way of workmen, suspending and driving the dryer from below, was patented in this country several years ago, and dryers working in this manner have long been in operation here.—EDS.

AMATEUR'S JIG SAW.

We illustrate herewith an ingenious form of jig saw, designed especially for amateur use. It is portable and readily attached to a carpenter's bench or an ordinary table, by means of the screw clamp, as shown. The cast iron arm terminates in the guide, D, in which works the spindle to which the upper end of the saw is attached in the ordinary adjustable manner, its lower extremity being similarly held in the guide underneath the table. A constant tension of the blade is maintained by the bent springs, E and F. Motive power is communicated from the treadle, which may be attached, at any convenient point on the floor, to a rod which forms a sleeve for a smaller rod, which is connected with the crank of the large wheel, A. The object of making the rod in two portions is that it may be adjusted to suit any hight of table and afterward held in position by the set screw at H.



Around the circumference of the wheel, A, is placed a covering of leather, by the friction of which the pulley, B, and the fly wheel connected therewith are actuated. By means of the pitman, as shown, motion is transmitted to the saw. G is an adjustable metal foot designed for holding the work in place while being operated upon.

The machine is both simple and durable in construction, and, as a means of developing a mechanical taste in the young, will prove both a useful and instructive gift. It will readily cut out brackets, book racks, and other ornamental articles, and thus may be used for profit as well as for amusement.

Patented through the Scientific American Patent Agency, July 23, 1872. For sale of rights, agencies, and for other particulars, address the inventor, Mr. Samuel N. Trump, or Mr. C. N. Trump, machinist, Port Chester, N. Y.

GOVERNMENT TELEGRAPHY.

The *Telegraphic Journal* is the name of a new monthly periodical lately established in London, of which the first number is now before us. It is printed in magazine form, and contains much valuable matter relating to telegraphy. In England, as our readers are probably aware, the telegraphs are now owned and worked by the government. A bill is now before Congress intended to effect the same thing in this country. It is therefore interesting to know how the plan of government telegraphy works, practically, in Great Britain. On this subject our new cotemporary, the *Telegraphic Journal*, says that, in theory, it is good to have the government own the telegraphs, but in practice it is bad. It takes a longer time to send messages than formerly. The man who expects, in England, to send a message fifty miles by telegraph quicker than he can send it by railway, is generally disappointed.

Labor Strikes in England.

Recent telegrams from England bring the news of the strike of five hundred of the stokers employed by the London gas companies. This is but a continuation of the uprisings which are disturbing the industries of Great Britain and which evidence the unsettled state of the labor question in that country. Policemen, and employees of the civil service and of the post office have in turn attempted to obtain increased wages by organized resistance, and now the stokers have followed their example, to the great inconvenience of a large portion of the inhabitants of London. The city has been at night in a state of partial darkness, and several of the theaters were compelled to omit their performances. Large numbers of the disaffected workmen have held meetings and processions, and many have been arrested and imprisoned under charges of conspiracy.

The probabilities are that this, as was the case with the preceding strikes, will result in the defeat of the laborers, but which ever way the conflict ends, it is plainly evident that a readjustment of the system of work and wages in England is fast becoming a necessity which that country can ill afford to neglect.

Facts concerning Bees.

When the queen bee is forcibly taken away from the hive, says the *American Bee Journal*, the bees which are near her at the time do not appear sensible of her absence, and the labors of the hive are carried on as usual for a time. It is seldom before the lapse of an hour that the working bees begin to manifest any symptoms of uneasiness. They are then observed to quit the larvæ which they had been feeding, and to run about in great agitation to and fro; and on meeting with such of their companions as are not yet aware of the disaster which has befallen them, they communicate the intelligence by crossing their antennæ and striking lightly with them. The bees which receive the news become in their turn agitated, and spread the alarm further. All the inhabitants now rush forward, eagerly seeking their lost queen. But, finding search useless, they appear to become resigned to their misfortune, the tumult subsides, and if there are worker eggs or young larvæ in the cells, preparations are made to supply the loss by raising a new queen, and the usual labors of the hive are resumed.

For feeding bees: Take at the rate of five pounds of refined or white sugar, two gallons of soft water, one tablespoonful of salt, ten grains of cream tartar; put all together, bring to a boil, skim and, when cold, add eight ounces pulverized slippery elm bark, or fine oat meal, stir it well, then feed in the hive. During the summer, use but four pounds of sugar.

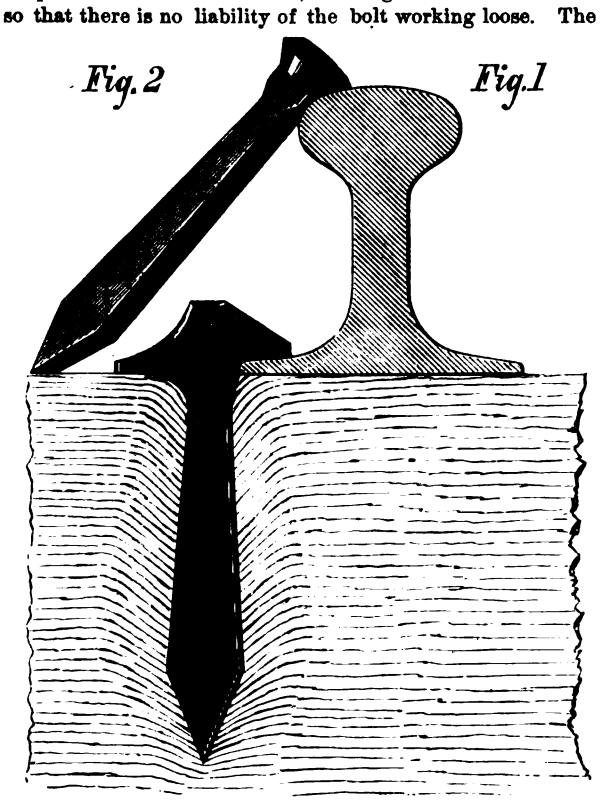
Italian bees gather much larger stores of honey than the black bees. Dzerzon, the great German apiarian, after many years experience, says that the profits of his apiary have been doubled since their introduction. They are also much more peaceable than the black bees.

Artificial Volcanoes.

M. Hochsteller has made, at Vienna, an experiment which imitates on a small scale the eruption of volcanoes. It is based on the property, possessed by sulphur when melted under the vapor of water having a pressure of three atmospheres, to absorb a certain quantity of the water, which afterwards escapes in the form of vapors during the cooling. In operating on a quintal of sulphur, a superficial crust formed, an opening being made in which, pieces of sulphur emerged, accompanied with explosions and puffs of vapor. At the end of an hour it formed a cone, having a diameter of from 30 to 50 centimeters at the base and about 8 centimeters in hight, exactly resembling the volcanic cone resulting from the successive accumulations of lava streams.

IMPROVED RAILROAD SPIKE.

The invention herewith presented furnishes two improved forms of railway spikes, one for holding the rail to the tie, and the other for bolting down the chair. The engraving shows the construction of the device so clearly that but little explanation is necessary. The shape of the head of the rail spike, Fig. 1, is such as to afford a large holding surface, while the lower portion, being gradually widened, is well adapted to clinch in the wood, bending the fiber downward so that there is no liability of the bolt working loose. The



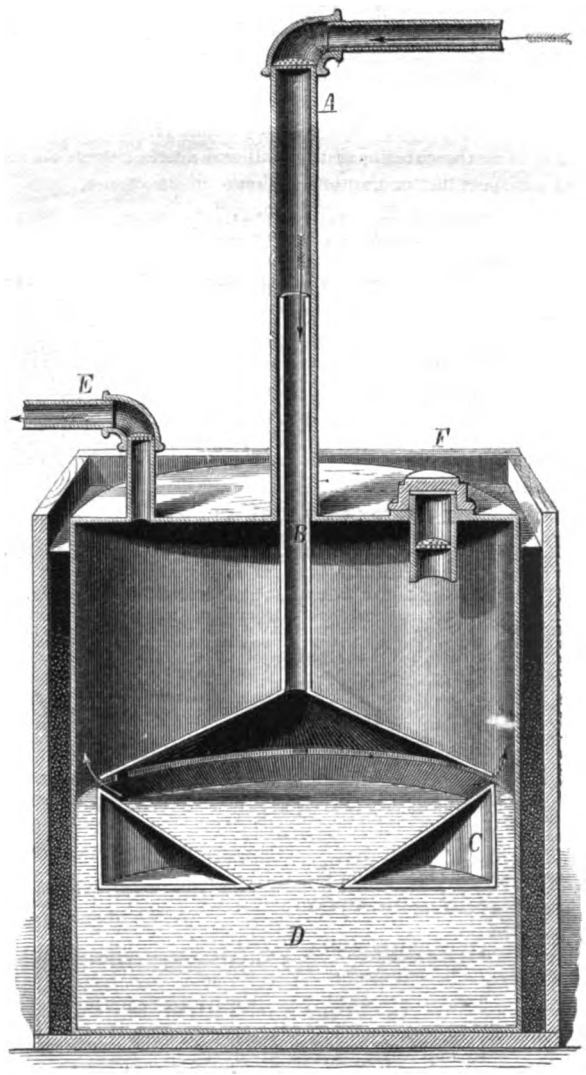
chair spike, Fig. 2, is made with a round head, and, being otherwise constructed on a similar principle to that above described, it possesses the same advantages. The practical utility of the invention is plainly evident, and as its expense is necessarily no greater, it will doubtless be preferred to the straight and less effective spike now in use.

Patented Nov. 12, 1872. For further information address Henry Stibbs, 25 North Paca street, Baltimore, Md.

DAYTON'S GAS CARBURETTER.

This invention, illustrated in section in our engraving, is one of the best forms yet devised for carburetting ordinary street gas, and thus causing an economy in its use, both by increasing the illuminating power and largely diminishing the rate of consumption. The apparatus, the simplicity of the construction of which is clearly indicated in the engraving, affords a means of combining the gas, as supplied in the mains, with the vapor of a low distillation of petroleum, a heavy product, and not the light gasolene ordinarily employed in air gas machines.

Entering in the direction of the arrow, and passing down the tube, A, the gas flows through the interior pipe, B, which fits loosely in the larger tube; thence it descends into the conical deflector, by which it is brought in contact with the vapors arising from the hydrocarbon. The liquid, D, is poured into the receptacle through the opening at F, and supports a



peculiarly shaped float, C, which is attached to the deflector. It is evident that, as the level of the distilled product is lowered, the float descends, carrying with it the deflector and pipe, B, so that every portion of the liquid will be completely utilized. The gas, after being enriched with the vapors, arises in the direction of the arrows, between deflector and float, into the body of the apparatus, and finally makes its exit by the tube, E.

It will be noticed that the gas does not pass through the hydrocarbon, but is deflected so near to its surface as to become thoroughly impregnated. That this method is practically successful, repeated tests have well demonstrated. Experiments conducted in our presence, using the same burner, and comparing the light obtained by street gas with the same after passing it through the machine, indicated not only a plainly increased light, but the meter showed a direct saving of some forty per cent in the quantity of gas burned. As the cost of the material used is quite small, the system must necessarily insure a great economy. The inventor states that he has determined by actual practice that two barrels of the liquid will supply twenty burners for one year, and that forty-five gallons produces 10,000 feet of excellent gas. The apparatus can, of course, be made of any size, to hold either a small amount or several barrels; it is well protected by casing and by safety gauze at every outlet.

In order to determine exact data relative to the increase of light obtained, Professor Henry Wurtz, of this city, a well known expert in such matters, communicates to us the following results of experiments: He considers the invention both simple and cheap in construction, and in his report states that the tests were made on the gas of the New York Gas Light Company, the value of which, as supplied in the city mains at 12 o'clock meridian, was found to be 17·55 sperm candles for five feet burned per hour. The device above described converted the same gas to a power of 33 candles for the same volume per hour.

Patented Oct. 8, 1872. For further particulars address the inventor, Mr. H. G. Dayton, Maysville, Ky.

THERE are, at present, three submarine telegraph cables between America and Europe. A new cable is soon to be laid by the French company, and still another by the Great Western Telegraph Company, making five in all. The total amount invested in all these cables will be thirty millions of dollars.

PATENT OFFICE DECISIONS.

Improvement in Stove Pipe Elbows.

LEGGETT, *Commissioner:*

The applicant seeks a patent on his device as a new article of manufacture. He takes a stove pipe elbow, after it has been finished, and dips it into a vat of molten solder.

The references show that buckets, water pipes, etc., were before made and prepared in exactly the same manner as applicant's device is prepared. It is preposterous to suppose that the mere application of this coating metal to an article so analogous as a sheet metal stove pipe possesses any element of novelty or indicates any exercise of the inventive faculty. One man discovers that he can take a water pipe, dip it into molten solder, and thereby coat it and protect it from corrosion. He makes application and obtains a patent for the same. Another man makes a stove pipe, coats it in the same manner and by the same process, and claims a patent for the same. If this second can be granted, then there is no reason why fifty thousand patents may not be granted for coating in the same manner fifty thousand different articles of manufacture. This simple aspect of the case is sufficient to answer it without further examination.

It was never the design of the patent law to grant a separate patent on every possible application of a process. To do so would be a fraud upon inventors and the public alike.

The decision of the Examiners-in-Chief, rejecting the application, is affirmed.

Perforated Sheet Metal Pipe.

APPEAL OF HALL AND HALL.

LEGGETT, *Commissioner:*

Applicants claim "a perforated sheet metal pipe, constructed substantially as and for the purpose described." This pipe is to be used, in connection with manufacturing establishments, for the purpose of extinguishing fires. It is extended along the ceiling of a factory, and water, being forced into it by suitable apparatus with which it is connected, makes its exit through the perforations, and is distributed beneath like rain or spray. This general device is old, as shown by the references. If the applicants were the first to produce sheet metal water pipes, or if they were the first to make smooth holes in them, or if they had discovered a new process of making smooth holes, they would have good ground for a patent. As it is they have no ground, for they have made no invention. They have, doubtless, been misled by supposing that, in the process of manufacturing, the stage at which they make their holes, whether before or after forming the pipe, has anything to do with conferring upon the pipe itself, as a finished article, the element of novelty.

The decision of the Board, rejecting the application, is affirmed.

Improvements in Rolling Mills.

APPEAL OF JOSEPH L. PENNOCK.

LEGGETT, *Commissioner:*

The object of applicant's invention is to convey a pile from the bed of a heating furnace to the rolls of a rolling mill. He accomplishes it by means of power-driven hauling mechanism, which withdraws the heated pile from the furnace and deposits it on a platform of a crane that swings it round and delivers it to the rolls. It is shown by the Examiner and illustrated in applicant's argument that similar mechanism has been employed to drag the pile from the furnace on to a platform of a truck which delivers it to the rolls. Applicant has substituted a crane for the truck in this case. But, as is well known, cranes are in common use for conveying heated piles to be forged and rolled. In substituting the crane applicant has effected a saving, and in the details of his device has exhibited invention. It is not, however, of a very comprehensive character, in view of the references, and I think does not justify a claim so broad as the one under consideration. It is, in my opinion, fully comprehended in the second claim, which has been allowed.

The decision of the Board is affirmed.

DECISIONS OF THE COURTS.

United States Circuit Court, District of New Jersey.

WELLS *vs.* GILL *et al.* SAME *vs.* YATES *et al.*

Wells' Patent for Manufacturing Hat Bodies.

This was a motion for a provisional injunction in a suit in equity brought by Eliza Wells, administratrix of the estate of Henry A. Wells, deceased, against John Gill and George H. Gill, for an alleged infringement of letters patent for a machine for making hat bodies, the original patent having been granted Henry A. Wells, April 25, 1846, and the reissue, under which the suit was brought, bearing date May 19, 1868.

The main question involved, besides that of infringement, was the effect to be given to a judgment in favor of the patent previously rendered in the trial of an action at law in the Circuit Court for the Southern District of New York; it appeared that such judgment had been taken up by a writ of error to the Supreme Court of the United States, and that the cause was still pending before that tribunal.

The motion was heard by Mr. Justice Strong, of the Supreme Court, and his honor, Judge Nixon.

In connection with the above there was argued a similar motion in the suit of *Eliza Wells, administratrix, &c.*, vs *Yates, Wharton & Yocom;* the questions involved in the two motions being the same.

The opinion of the Court was delivered by Mr. Justice Strong, holding that the complainant is entitled to an injunction. But, in view of the fact that the judgment in the Circuit Court of New York may be reversed, an injunction should be withheld if the defendants give security for the payment of the profits they may derive from the use of the invention, and for the damages their use may cause to the complainant. Bond to be given in the penal sum of $30,000.

The same order in the case of *Wells* vs. *Yates* et al.

E. N. Dickerson for complainant.

Soule & French for defendants.

Supreme Court of the United States.

THE GORHAM MANUFACTURING COMPANY, appellant, *vs.* GEORGE C. WHITE.

Design Patents.

Appeal from the Circuit Court of the United States for the Southern District of New York.

The complainants are the owners of a patent, granted on the 16th day of July, 1861, to John Gorham, Gorham Thurber, and Lewis Dexter, Jr., for a new design for the handles of table spoons and forks, and their bill charges that the patent has been infringed by the defendant. The validity of the patent is not denied, nor is it controverted that the defendant has sold spoons and forks which had upon them designs bearing some resemblance to the design described in the complainants' patent. But it is contended that none of the designs on these articles thus sold are substantially the same as the design covered by the patent, and that they are all independent of any thing secured to Gorham, Thurber, and Dexter, the patentees.

Mr. Justice STRONG delivered the opinion of the Court, holding as follows:—

The acts of Congress, which authorize the grant of a patent for designs, contemplate not so much utility as appearance; and the thing invented or produced for which a patent is given is that which gives a peculiar or distinctive appearance to the manufacture or article to which it is applied.

It is the appearance to the eye that constitutes mainly, if not entirely, the contribution to the public which the law deems worthy of recompense, and identity of appearance or sameness of effect upon the eye is the main test of substantial identity of design.

It is not essential to identity of design that the appearance should be the same to the eye of an expert. If, in the eye of an ordinary observer, giving such attention as a purchaser usually gives, two designs are substantially the same, if the resemblance is such as to deceive such an observer, and sufficient to induce him to purchase one supposing it to be the other, the one first patented is infringed by the other.

COMMUNICATIONS RECEIVED.

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

On an Improved Conservatory. By F. W. P.

On Instinctive Marriage. By W. T. R.

On the Darwinian Theory. By M. R.

On the Wheel Question. By J. A. B., and by J. B. J.

On A Means of Saving Life in Case of Disasters at Sea. By F. H.

On a Geometrical Problem. By O. W. G.; also by M. F., and by G. B. L.

On Self Propelling Fire Engines. By F. G. W.

On the Injury of Trees by Lightning. By F. S. R.

On a Recent Boiler Explosion in Ohio. By J. A. W.

On a New Method of Feeding Canals. By B.

On Human Antiquity. By D. K.

On Insensibility. By E. H. R.

On Perpetual Motion. By I.

On the August Meteoric Display. By J. B.

On the Separation of Ramie. By M.

On Terrestrial Heat. By W. L. W.

Facts for the Ladies.—Mrs. G. A. Blanchard, Raymondville, N. Y., has used her Wheeler & Wilson Lock-Stitch Machine in tailoring since 1865, and it is as good as new; has done the sewing for a family of seven persons, attended to her household duties, and earned $200 a year; says that any one owning a Wheeler & Wilson Lock-Stitch Machine can earn a respectable living. See the new Improvements and Woods' Lock-Stitch Ripper.

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.

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.

R. and A. say:—Is it possible to bring such an intense degree of heat upon a leaden pipe, say ¾ inch, that the heat would melt the pipe provided a continuous stream of water runs through the pipe? Is it possible to melt a pipe at all under those conditions? Answer: Yes. It is possible to melt a lead pipe under the circumstances you mention. One method of doing so would be to girdle the pipe with a platinum wire, heated to white heat by galvanic battery. It would quickly melt the pipe through.

W. B. asks:—At how many strokes per minute would it be most economical to run an engine the cylinder of which is fourteen inches and the piston stroke thirty inches? I am running it at 60 strokes per minute without a cut-off. I have plenty of steam, but do not get power enough at 60 strokes. Answer: Your engine, if of 14 inches diameter of cylinder and 30 inches stroke of piston, well made and well taken care of, ought to run without difficulty up to a speed of 80 revolutions a minute. If as carefully proportioned as the Allen engine, it would work well at double that speed, but it is improbable that you will succeed in going above our figure, just given.

S. says:—I am a fireman on a locomotive, and while running I notice that the indicator on the steam gage points to one hundred and twenty. While the engine is at rest and the boiler cold, the indicator points to ten; what is the actual steam pressure? Answer: We cannot tell you. The only way to determine it is to test your gage by comparison with a standard. Probably your pressure is between 110 and 120 when indicating the latter figure. Test it if you would be safe.

S. G. S. says:—How can I cheaply and simply generate a gas so irritating as not to be borne by air breathing animals? Answer: The gases generated by the burning of tobacco will perhaps answer your purpose. Florists use the weed to destroy insects on plants.

C. H. G., of N. Y., says:—We have just completed a reservoir to supply our city with water, which has about 250 feet fall. The water is pumped from the river, to the top of College Hill where the reservoir is located, by powerful engines, so that we shall have a plentiful supply for years to come. When the project was first proposed, it was mentioned as an inducement that those requiring a small amount of power (there are quite a number here) could use it more economically by various water motors than they could steam power. Other cities were quoted as an example. But now when we have water in plenty, all are afraid to try, some saying that it will cost too much, others that we have not water enough, and all hang back waiting for somebody to make a start. I wish to ask: What diameter would a turbine wheel require with 250 feet fall, and how many gallons water would it use per hour, to run two small back geared foot lathes, having 4 foot beds and 12 inch swing, used for light work, and how much would such a wheel cost? From this standard, the probable cost of any requisite power can be obtained. Answer: The smallest and cheapest wheel that you can find in the market will drive your two lathes of 12 inch swing. They will require less than a quarter horse power, and your wheel should use less than 300 gallons of water an hour under such a great head. Write to any good wheel builder.

J. M. F. says:—I enclose a "magical fish;" please explain why it moves when placed on the hand. The motion is not from heat, as it will not move when placed over a warm iron, nor does it move when placed on other parts of the body, say the leg. Are you correct in your answer to F. H. N., page, 346, in reference to the report of two guns being heard farther than one? Suppose one man could throw a stone 100 yards. Then place 50 men there, and let them throw. No stone would go over 100 yards, but there would be many more stones in the air. Is it not so with regard to sound? The report of 50 guns would be much more intense within a given circle, but would it be a greater circle than if made by one gun? Answer: It is the warmth with moisture from the hand that causes the thin membrane to expand and contract and thus to wriggle. Your illustration of the throwing of stones does not apply to the throwing of sounds. In the case of the stones each individual exerts his strength on a separate body. But when a number of persons join in simultaneously making sound, they exert their united strength to move the same body, namely, the air; and it necessarily follows that they will unitedly cause the air to vibrate for a greater distance than could a single individual.

J. N. writes as follows:—There is a discussion going on in our shop on the subject of friction, and Morin's experiments have been quoted in support of the theory that friction is proportionable to pressure and independent of the extent of the bearing surfaces when they are of the same quality and not in any way injured. Will you inform us if Morin's experiments were carried far enough, and if they are to be depended on as being reliable? Answer: Morin's experiments are generally considered standard and perfectly reliable. The only difficulty in applying known laws of friction to actual examples arises from the uncertainty of our determination of the limits of pressure which may injure or change the character of rubbing surfaces.

S. M. H., who states that he is a machinist, suggests that street cars may be driven by compressed air, to be carried within suitable cylinders, placed upon the car. Also that canal boats may be propelled by means of traction engines running on the track instead of horses. Both of these ideas are very old, have been frequently and successfully tried and have been repeatedly described in the SCIENTIFIC AMERICAN.

E. O. J. says:—In answer to G. P., who wishes to know the fastest time on record made on any railroad in this country or in England, I would say that in June, 1855, the locomotive Hamilton Davis, on the New York Central Railroad, with six cars, ran fourteen miles in eleven minutes, seven seconds. This is on record.

To J. S. E., query 7, page 298.—From the center of gravity of any triangle let fall perpendiculars on the sides of the triangle. In each of the three quatrilaterals thus formed, one at each angle, inscribe circles, which will be the circles required. (See "To inscribe a semicircle in a right angled triangle," in any geometry).—B., of Mass.

Recent American and Foreign Patents.

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

STAVE EQUALIZER.—Elijah P. Spaulding, of Murfreesborough, Tenn.—A pair of circular saws, preferably mounted on the same arbor, are placed as far apart as the required length of the staves to be cut. A pair of disks mounted on a horizontal shaft, parallel with the shaft in front of it, work between the saws by lapping them back to a place where the attendant who supplies them to the carrier may take them away. The table is capable of swinging up and down to adjust it to the said carrier for having the right inclination to deliver the staves properly, and it may be fastened at any required inclination. Preferably, there will be two pins in each disk, so that they take two staves at each revolution. If the staves are to be sawn off square at the ends, the two disks will be of the same size; but if they are to be beveled for tapered casks, one disk will be larger than the other, so as to present the staves obliquely, and the difference in the size of the two disks will vary as the taper of the cask varies. When the disks are of different sizes, their faces will be correspondingly beveled. Interchangeable disks of the different kinds required will be used for adapting the machine to cut the staves to any required bevel.

WARPING MILL.—John W. Fries, of Salem, N. C.—This invention has for its object to so arrange the heck of a warping mill that the yarn wound upon the warp cylinder will not become entangled while being dyed or prepared after its removal from the mill. The invention consists in applying to the hook a vibratory motion, whereby the threads are laid diagonally, so that the threads of the same layers will not be quite parallel and those of overlying thicknesses will cross each other and not be parallel, thus preventing their becoming entangled.

ROTATING READING TABLE.—Thomas Cartwright, of New York city.—This invention has for its object to furnish an improved rotating reading table or book support for attachment to circular and octagonal tables that are supported upon a pedestal, and it consists in the rotating arm, adjustable rod, and gas pipe provided with plugs or stopcocks at its ends, stationary or jointed gas burners, and an adjustable book rest, in combination with each other and the pedestal of a table.

HAND CORN SHELLER.—Julius O. Fraiser, of Worthington, Ind.—This invention has for its object to furnish an improved hand corn sheller. The base of the sheller is a board, plank, or block, six inches, more or less, in length and breadth, and one inch, more or less, in thickness. To the ends of a U-shaped steel spring, the middle part of which is bolted to the base, are bolted two semi-tubular jaws, having teeth formed upon their inner or concave sides, so that when the ear is forced through the space between the said jaws, the teeth may remove the kernels from the cob, the said jaws being held forward upon the ear by the elasticity of the spring, which elasticity also enables the jaws to adjust themselves to and operate effectively upon ears of different sizes.

WOOD SCREW.—John S. Armstrong, of St. John, Canada.—This invention consists in a screw provided with a nick widening from the center toward the circumference, to allow the edge of driver to be pressed up and wedged tightly near the center.

COTTON PLANTER.—Henry A. Ridley, Jacksonport, Ark.—This invention has for its object to furnish an improved seed planter, designed especially for planting cotton seed. To the rear end of the beam is attached the body of the planter, which is made somewhat in the shape of the hull of a ship, to adapt it to press open the furrow to receive the seed. Just in front of the body is attached a plow, to open the furrow. Suitable mechanism gives a faster or slower feed as desired, and also keeps the seed stirred up so that it will not clog, and so that it will pass out freely.

WASHING FLUID.—Martha A. Sanderson, Fremont, Mich.—The object of this invention is to provide efficient means for lessening the labor of washing clothes, and it consists in a fluid composed of alcohol, camphor gum, aqua ammonia; and a second mixture of hot rain water, sal-nitre, borax and saleratus. When the above two mixtures have stood twelve hours, they are mixed together with rain water in a glass or stone vessel, and kept tightly corked for use.

RUDDER.—Richard H. Thomas, Kid's Grove, near Stoke-on-Trent, England.—This invention consists of a rudder of two blades, arranged side by side, one on each side of the axis, and distant from each other so as to allow a solid flow of water between them, being connected at top by a horizontal bar or disk to the axis or shaft. They are also connected in like manner at the bottom to a pivot stepped in the projecting end of the keel, and also divided at or near the middle vertically, and similarly connected by disks or bars to a journal fitted in a block in which the projecting end of the propeller shaft is also journaled, so as to strengthen the rudder and support the propeller shaft.

APPARATUS FOR CHARGING BLAST FURNACES.—William A. Miles, Salisbury, Conn.—This invention relates to improvements in the mechanism for charging blast furnaces, and more particularly to the charger for which the United States letters patent No. 130,652 were granted, the 20th day of August, 1872. The present invention consists, principally, in making the sliding bottom plates of the charger inclined on their upper faces, and also in making the stationary upper and lower guides of these plates, or either of them, hollow to admit water or air circulation, and prevent the heat of the furnace from burning them. Finally, the invention consists in the use of friction rollers above and below the sliding plates to facilitate their movement.

RAILROAD RAIL JOINTS.—John McLean Staughton, Riverton, Ky.—This invention has for its object to furnish an improved rail joint, which shall be so constructed as to hold the ends of the adjacent rails level, so that one cannot rise above the other, so that the two ends cannot sink down at an angle with the body of the rails, and which will give the joint greater strength and equal flexibility with the other parts of the rails. It consists in the fish plates made with the fish belly curve upon the middle part of their lower edges, and in the adjacent ends of the rails having their flanges cut away for a less distance than the length of the fish plates.

NAIL MACHINE.—Henry Reese, Baltimore, Md.—The invention consists in drawing the end of a heated rod into a round pointed blank between two surfaces that move in reverse directions and with the same velocity; in then shaping said blank with dies; and in a peculiar mode of applying the brushes, shockspring and raised edges on the drawing faces.

HOSE PROTECTOR.—Isaac P. Maxwell, Baltimore, Md.—The invention consists in forming a hose jumper in three readily detachable sections.

STAVE JOINTER AND CROZING MACHINE.—John McGrew, Ravenswood, West Va.—The invention consists in arranging one or more pairs of angle shaped knives to reciprocate over a bearing roll upon which the hoop is feed intermittently, for the purpose of notching the hoop and allowing it to take the bulge necessary in barrels. Secondly, the invention consists in a peculiar mode of intermittently moving the roll, feeding forward the hoop, and then holding it while the said notches are cut.

COMBINED LADDER AND SCAFFOLD.—Robert L. Upchurch, Pana, Ill.—The invention consists in constructing an article adapted to use by painters, carpenters, and others as a scaffold, and to be employed at the sides of walls and corners to serve as an ordinary step ladder when folded, and as a fruit ladder when reversed.

TURBINE REACTION WATER WHEEL.—John McGrew, Ravenswood, West Va.—The invention consists in combining with the inner chute of a turbine wheel a series of peculiarly constructed buckets that by their relation to the discharge apertures utilize all the pressure of the water. Secondly, it consists also in providing the chute ring with a vertical circular flange by which great steadiness and uniformity of motion is secured to the wheel. Thirdly, it consists also in placing a gate on the inside of the chute and adjusting it by a reciprocating slide on the outside, whereby the quantity of water admitted may be nicely and easily graduated.

KNIFE SCOURER.—Frank O. Harvey, Kansas City, Mo.—The invention consists in making a knife scourer of a trough, a stationary pad block, and a hinged and handled pad block; whereby the labor of scouring is sensibly lessened, while the rapidity of its performance is greatly increased.

PIPE MOLDING MACHINE.—Dennis Long, Louisville, Ky.—The invention consists in the application to molding machines of a movable table resting on a foundation plate and provided with one or more seats for the flasks and patterns; in the peculiar form of pattern, which is enlarged at both ends as compared with the turned off intermediate portion; and in the construction of movable seats for the end of pattern and flask. The lower ends of pattern exercise a pressure upon the sides of mold as it is withdrawn, which compacts and condenses the sand.

SPARK ARRESTER AND SMOKE CONSUMER FOR PASSENGER LOCOMOTIVES.—Wm. Martien, Baltimore, Md.—The invention consists in arresting the smoke, sparks, and cinders at the top of smoke stack and forcing them by an air draft from front of locomotive down a tube, and into a chamber where the cinders are stopped, while the smoke is carried around and emptied into fire box.

SPARK ARRESTER AND SMOKE CONSUMER FOR FREIGHT LOCOMOTIVES.—Wm. Martien, Baltimore, Md.—The invention relates to that special class of locomotives which are used for freight cars, and consists in combining with a hooded smoke stack a bibranched pipe through which are forced the cinders, sparks and smoke, the two former into cinder boxes prepared to receive them and the latter into the fire box. It also consists in utilizing the cinders to create friction on the track by transferring them to sand box wherefrom they are distributed, upon the track and in front of drive wheels, at the will of the engineer.

DRIVING GLOVE.—Edwin V. Whitaker, Gloversville, N. Y.—The invention relates to a new article of manufacture, which is to be used in driving or riding horses or other animals, and which consists of a mitt having the four fingers covered in pairs so that one of the reins will pass as usual between said pairs, while two fingers being in each pocket or envelope will coöperate in keeping one another warm. It also consists in the pattern which is preferably employed for cutting out said mitt.

AUTOMATIC FEEDING LAMP.—Dr. Samuel K. Jackson, Norfolk, Va.—The invention consists in automatically maintaining the desired oil level in a beacon lamp by means of hydrostatic pressure applied so as to take advantage of the different specific gravities of oil and water, and so as to cause the water to feed itself and take up the space gradually vacated by the oil. This lamp furnishes a continuous light by night and day for a long period without requiring any attendant to trim or replenish it, and supplies a want which has been long felt by the commercial public. It would seem that this invention must greatly facilitate transit through our bays and harbors since safety will be equally secured for navigation by day or by night and even with comparatively inexpert mariners. The pilotage also, which has hitherto been regarded as such an onerous burden upon certain classes of vessels, it is calculated, will be sensibly lessened.

BUTTON.—Spencer B. Lane, Waterbury, Conn.—The invention consists in forming the perforated head of a button with lips and the shank with a bifurcation, by which they may be connected. The upper end of the shank is forked, to enter with its prongs two apertures in the head of the button or stud. These apertures are formed in said head by punching, but so that no material is removed; consequently, the material between the apertures is turned up to form two lips. After the prongs of the shank are passed through the holes of the head, said prongs are bent apart and clinched upon the button, the pressure upon them also bending the lips over the prongs. The lips serve thus to hold the prongs down upon the head and steady the entire connection of parts.

WASHING MACHINE.—Edmund E. Flint, Tonawanda, N. Y.—This invention relates to a washing machine. The suds box of the washing machine is of semi-cylindrical shape, of wood or other material, and supported on stand ards. The rubber is segmental, the rubbing surface being formed by diamond shaped slats or rods. This rubber is attached to the lower ends of vertical slotted bars, whose upper ends are connected by a transverse handle. A shaft serves as the pivot of the rubber when the same is vibrated. A roller bottom is put within the suds box beneath the rubber. In operation the rubber is vibrated by hand, and moves over the roller bottom, the articles to be cleaned being between the rollers and slats. A wash board fastened to the top of the rubber can be used for hand washing by placing the rubber against one end of the suds box.

PITMAN CONNECTION FOR HARVESTERS.—William Ferris, Pleasant Plain, Ohio.—This invention has for its object to furnish an improved device for connecting the sickle bar and pitman in reapers and mowers, taking up the play beneath the knife bar and pitman, enabling the wear to be conveniently taken up, and which will greatly diminish the wear and lessen the draft of the machine. It consists in the tapering hole formed through the eye of the sickle bar and the branched ends of the pitman, having a screw thread cut in the said hole in one or both of said branches and the wooden pin, to form a connection between the sickle bar and pitman of a harvester or mower.

FLY TRAP.—Addison M. Chapel and James G. Hubbard, Pittsfield, Mass.—This invention has for its object to furnish an improved fly trap. It consists of a cylinder caused to revolve by clockwork mechanism, and which is covered with fly bait. On alighting thereon, the flies are carried into a semi-circular cavity, from which they are by suitable means prevented from escaping. A scraper brushes them off the cylinder into a passage through which they emerge into the cage.

INDIA INK SLAB.—Julius Speyer, Terre Haute, Ind.—This invention has for its object to furnish an improved slab, designed chiefly for the use of draftsmen in grinding India ink sticks, and for holding the liquid ink and preserving it from evaporation. It consists in forming a grinding surface and an ink well in the upper side of the slab or block, and a chamber in the under side of the same, in which the stick may be deposited when not in use.

BOTTLE PACKER.—Robert T. Penick, St. Joseph, Mo.—This invention has for its object to furnish an improved device for packing bottles and packages of bottles in sawdust, short shavings, rice husks, etc., and which shall correctly and uniformly regulate the space between the bottles, and between the bottles and the sides of the box in which the bottles are to be packed.

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On appeal to Examiners-in-Chief	$10
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APPLICATIONS FOR EXTENSIONS.

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

22,885.—HARVESTER.—W. K. Miller. January 22, 1873.

23,097.—MACHINE FOR CROZING BARRELS, ETC.—H. Littlejohn. Feb. 12, 1873.

23,105.—CONSTRUCTION OF STEAM VESSELS.—J. Montgomery. Feb. 12, 1873.

EXTENSIONS GRANTED.

15,995.—BREECH LOADING FIRE ARM.—G. W. Morse.

22,213.—RAILROAD CAR BRAKE.—A. L. Whipple.

DISCLAIMER.

15,995.—BREECH LOADING GUN.—G. W. Morse, Washington, D. C.

DESIGNS PATENTED.

6,269.—BILLIARD TABLE.—O. D. Benjamin, Toledo, Ohio.

6,270.—NURSING BOTTLE.—M. S. Burr, Boston, Mass.

6,271.—COOKING STOVE.—E. Bussey, Troy, N. Y.

6,272.—PRINTING TYPE.—J. M. Conner, New York city.

6,273.—BROOM.—G. F. Gale, Philadelphia, Pa.

6,274.—IRON FENCE.—C. F. and J. M. Hankey, Danville, Ill.

6,275.—SODA WATER APPARATUS.—G. F. Meacham, Newton, Mass.

6,276.—TWINE HOLDER.—E. J. Steele, New Haven, Conn.

6,277.—FIRE SET HOLDER.—E. J. Steele, New Haven, Conn.

6,278.—BILLIARD TABLE.—J. Syrcher, Buffalo, N. Y.

6,279.—BELL STAND FOR HARNESS.—A. E. Taylor, New Britain, Conn.

6,280.—CORAL BOOK STAND.—S. L. Westerfield, New York city.

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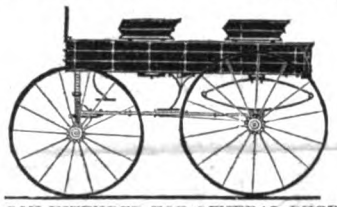

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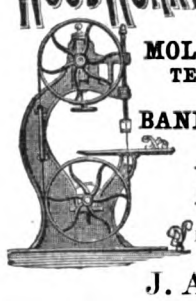

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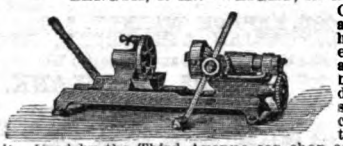

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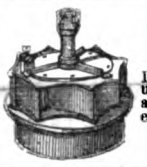

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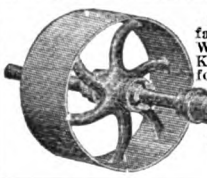

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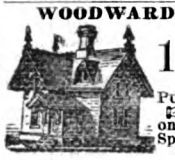

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