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TWENTY INCH SMOOTH BORE GUN FOR THE RUSSIAN GOVERNMENT.

The weight of this weapon in a finished state is 44 2/6 2/2 tuns. The weight of the projectile to be employed—a cast iron spherical one—is 900 lbs. In trying the gun, in all 313 rounds were fired, the normal charge of prismatic gunpowder being about 117 lbs. The experiments of firing were conducted on the river Rama, the high bank across the stream serving as a butt, which was at a distance of about 1,400 yards from the the gun. The weapon was placed under an iron plated covering of a peculiar construction. On the discharge of the piece the concussion of the air was so great that in the village of Matoriloro, situated at a distance of one third of a mile, the chimney stacks fell in when the wind was blowing in that direction. The sound itself, although loud, was not deafening, and persons standing even under the iron-plated covering were able to support both the noise and concussion of the air. The iron gun carriage weighs 6 1/3 2/3 tuns. The breech of the gun is elevated and depressed by means of a screw ratchet key. For facilitating the running forward of the gun a system of cogwheels is introduced, and for the diminution of the recoil, and the hoisting of the charge and projectiles, special appliances are provided. The moving of this enormous mass of iron can be effected easily by three men.

After the introduction into the military art of rifled cannon, the conviction became established of their unconditional superiority over the smooth bores. As regards guns of small caliber this opinion may very likely be correct; but with respect to naval guns of the largest calibers, it would be difficult to give the preference either to the one or the other system. Without going into particulars of the merits or demerits of the one or the other description of weapon, we will point to one important difference in the effect of the spherical projectiles of the smooth bores and the oblong ones of the rifled guns; the latter will hit an iron-plated target at a greater distance than the former, and, so to say, pierce it through; on the other hand, the former will produce a far greater amount of concussion, shaking loose the rivets of the plates and bolts of the target, and bounding on the plates and cracking them. Besides the difference in the destructive action of these weapons, there is an enormous difference in the cost of production. Thus, for instance, according to a statement of Mr. Grasshof, the price of a 20 inch smooth bore gun will cost, when produced in quantities, about $8,000, where as an 11 inch steel rifled piece corresponding to the same could not be produced under $30,000.

MARINE CASUALTIES.

The report of Supervising Inspector General Nimmo, recently made public, furnishes the following interesting details relative to late casualties in river and ocean steamers. Full statistics are given for the year 1871, from which we find that sixty-five disasters by fire, explosion and wreck took place during that period, involving a loss of $3,600,661 and 363 lives. The average number of casualties above given is thirty-one per cent less than the average for the preceding three years; the average loss of property is nineteen per cent and of life four per cent less. Various modifications are suggested to the present laws, and more specific provisions are asked for regarding methods of investigation. The different catastrophes which have happened during the past year are recapitulated. The first case is that of the steamer Oceanus, which exploded on the Missouri river, killing forty-one persons. Then follows the Bristol casualty in Newport harbor; the burning of the Bienville and loss of forty-one lives; the sinking of the Metis, twenty-three lives lost; the bursting of the flue on the Dean Richmond, the fault in this case being ascribed to the failure of the manager of the line to have the boiler inspected after the steamer had been laid up for several months; lastly, the burning of the Missouri and the sacrifice of eighty persons closes the list.

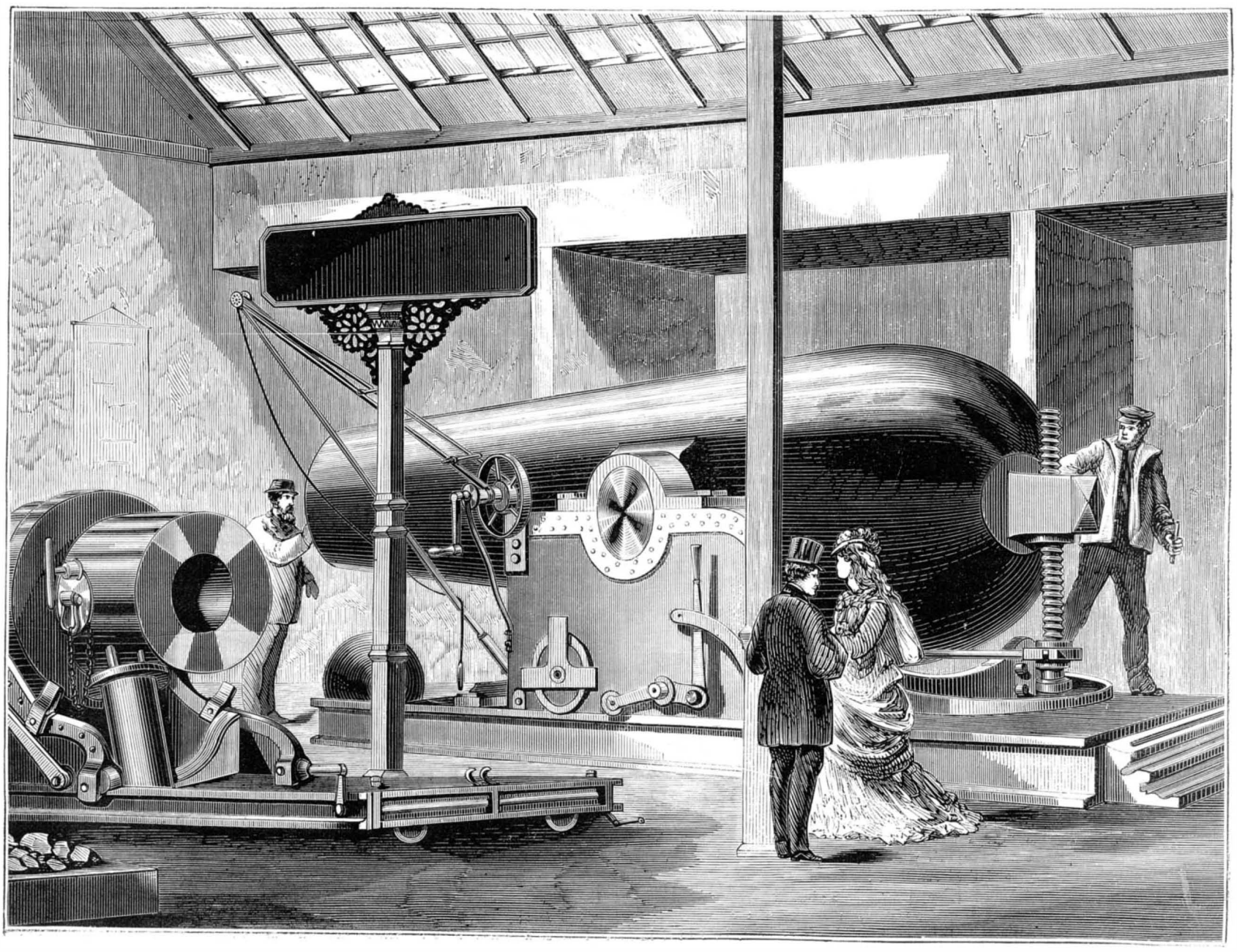
Strict discipline and repeated drilling of the officers and crews of sea-going vessels is earnestly recommended. A uniform system of tests for boiler plates is suggested, and the principal manufacturers have been called upon to present plans of testing machines. A series of general experiments upon safety valves is also recommended, which shall be of the most exhaustive character. Further tests of steam boilers, similar to those made at Sandy Hook, are called for, and especially upon boilers of the various forms used on vessels of the seaboard, of the lakes, and of the Western rivers. It is suggested that passenger steamers be allowed to carry petroleum which, in the opinion of experts, shall be perfectly safe, and amendments to the law are recommended which will authorize the immediate seizure of explosive or dangerous articles shipped contrary to the law.

The steamboat inspectors' service consists of a supervising inspector general, 10 supervising inspectors, 36 inspectors of hulls, 36 inspectors of boilers, 3 assistant inspectors of hulls, 3 assistant inspectors of boilers and 8 clerks of inspectors.

The report concludes with the expression of the hope that in the future there may be a free and friendly interchange of views between this service and all the interests of the country affected by our laws for the preservation of life and property on steam vessels, and that such intercourse may result in the best attainable security for human life and the highest degree of prosperity for our commercial interests.

A PLANET BETWEEN MERCURY AND THE SUN.—Mr. J. R. Hind, the astronomer, shows that there is a high probability that a planet circulates between Mercury and the sun, having a period of revolution of about nineteen days. Mr. Hind suggests that, on March 24 next, the sun's disk should be watched, as a conjunction of this hypothetical planet with the sun will occur about 10 A. M. on that day.

A CORRESPONDENT writes us that, while visiting the Library of the British Patent Office, in London, he noticed that the SCIENTIFIC AMERICAN attracted a larger number of readers than any other scientific publication there taken. This is an interesting fact, and holds good wherever our paper is taken. The regular weekly edition of the SCIENTIFIC AMERICAN is nearly equal to the combined number of all other scientific papers in the world.



TWENTY INCH SMOOTH BORE GUN FOR THE RUSSIAN GOVERNMENT.

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THE PROPOSED HALF MILLION GRAB.

As Congress has now assembled, and in view of the extraordinary influence which will be brought to bear upon that body to obtain a large appropriation in order to cover the expenses of American Commissioners and exhibitors to the Vienna Exposition, we deem it advisable to present a recapitulation of the various objections which we have urged against such proceeding, and also a brief review of the facts regarding the Austrian patent laws and similar enactments of other European countries, the condition of which forms the basis of our opposition. The reader will therefore find in the following a succinct *resumé* of the various arguments which we have from time to time advanced, and from which, in connection with the published and opposite views of the United States Commissioner, General Van Buren, an intelligent idea of the controversy may be obtained.

According to the rulings of the Austrian patent law, patents in that country must be worked within one year of their date of issue; working before application for a patent, or between the dates of application and issue, is not a compliance with the law. Not only the device but all its parts must be made in Austria and sworn to be in exact conformity with the drawings and specifications filed. There is no provision whereby a suit may be terminated. The infringer, after the case is completed and he finds himself beaten, has only to assert that the inventor has not properly proved his working. The suit is then re-opened, and the same ground gone over, and this can be done as often as the infringer chooses, during the whole life of the patent. If an inventor allows two years to pass after working his patent the first year, without manufacturing it again, his letters become void. As regards the practical working of the above regulations, we have presented sundry communications from American inventors in Austria tending to show that Americans have never succeeded in getting a favorable decision in that country, and detailing individual experience, proving that so far from the government supporting the injured party, it actually seeks means to aid the infringer in his piracy.

Not only are the Austrian laws thus oppressive, but the regulations of adjacent European countries are equally unjust. We note in English journals repeated complaints of the unlawful seizure of patented articles displayed in the Paris Exposition of 1867, and we find it stated that inventions supposed to be protected by a special certificate, in that Exhibition, have been patented by Continental people. That the facts of the case are fully appreciated in England is proved both by the warnings of the press and the appropriation by Parliament of but £6,000 ($30,000) to assist English representation. The practice under the Prussian law—the Austrian practice is little better—is strongly condemned in evidence given by Mr. Henry Bessemer, the great English steel manufacturer, before a Parliamentary committee. He states that, after disposing of the use of his process to Krupp, the German founder, the latter, according to law, applied to the Prussian Patent Office for a patent on the same. The authorities first declared the invention to be not new, then temporized for a long period and finally denied the application on the ground that a description of the process was published in the English Blue Book, which volume circulated in Prussia. Mr. Bessemer adds "that is universally the way in Prussia, unless it is some paltry thing, merely to keep up the appearance of granting patents, they give an occasional patent in that way, but they receive always the drawings, the fees and the description from the English patentee, which is published there for the benefit of the Prussians. . . Having obtained all the information from an English patentee, they make it public in their country, and then say it is not new." Other cases are on record where patents on inventions have been refused, and after the denial the government has quietly proceeded to manufacture the articles. Especially is this true of military goods.

Under the existing patent law of Austria, a valid patent cannot be had if the invention is exhibited in Austria prior to the application for a patent. By a recent modification, the Director of the Exposition is empowered to except from the operation of the above clause such inventions as may be exhibited at the Exposition, and to grant a certificate to that effect in such cases as he chooses.

It is hardly necessary to say that, as a protective patent measure, this certificate is worthless. There is, therefore, plainly no ground for the assertions of the United States Commissioner that it is a patent or in any way operates as such. The most that it does is to fix a time during which an invention may be exhibited in Austria before being patented, and it then leaves the inventor to the tender mercies of the old and unaltered law. We therefore strongly deprecate any appropriation of the public funds in support of this great show business until Austria modifies its laws and consents to grant to our inventors the same enjoyment of their inventions in Austria as the subjects of that empire enjoy in the United States. In this country the Austrian inventor may obtain a patent even if his invention has been exhibited and manufactured for two years prior to his application for a patent; and our courts will defend and protect him from infringement, the same as if he were one of our own citizens.

From the consideration of this branch of the subject, we desire to direct attention to subordinate though cogent reasons why legislative assistance should be denied. We consider that an inventor or manufacturer in sending his goods for exhibition to Vienna does so in accordance with the views expressed by President Barnard in a late oration: that it will be a grand advertisement and ensure him a large profit. Unless it is to his direct advantage to make such a display, no inducement in the shape of partial assistance will cause him to expend the necessary time and trouble. Surely, then, it is manifestly unjust to devote the national money to the ends of private gain. For the relief of needy inventors having meritorious products to exhibit and being without funds to forward their desires, just exception might be made and discriminating enactments, private or otherwise, passed. But to manufacturers of our own products and of long known and tried devices, who incur no danger of infringement, pecuniary assistance should be denied, and they ought to be ashamed to ask it. Such refusal will not militate against a fair display of American products, as the same are largely manufactured abroad and will in any event be contributed by foreign exhibitors.

We have yet to refer to the especial labor of the United States Commissioner. This gentleman some time since voluntarily accepted the office, well knowing, as he himself states, the duties pertaining thereto, and that it was merely honorary, no salary being attached. After working "zealously" alone for several months, he has suddenly, under what authority we know not, appointed an advisory committee of thirty, who in turn appoint a series of assistants, making the total number of officials one hundred and forty-three. Forgetting his voluntary acceptance and also that of his subordinates, the Commissioner now concludes that he and they will labor no longer at his or their private expense, and consequently devotes his entire energies in securing, or, to use a common phrase, the lobbying through Congress, an appropriation of *five hundred thousand dollars* from which he and his deputies are to be compensated.

To say that the personal ends of these gentry do not underlie their patriotic endeavors would be absurdity; the fact is evident, and indeed is admitted by some, though, at the same time, defended by specious arguments of scientific reports, etc. It is well known that living expenses in Vienna are extremely high, and therefore half a million dollars would barely cover a year's expenditure for the number of officials above mentioned, leaving either a very small sum or nothing for the benefit of the exhibitors. We hold that this body of office holders are totally unnecessary, and that for Congress to lavish public money upon them would be both unjust and impolitic. We have ample diplomatic representation in Austria, with paid employees to look after our interests. We need no one at home to point out to our citizens where their best interests do or do not lie. Our business men are sufficiently shrewd and amply capable of managing their own affairs without any assistance from General Van Buren or his staff.

In conclusion, and on the grounds above related, we strongly urge upon Congress the denial of all applications for this appropriation. If a considerable sum is necessary, let General Van Buren, his assistants, and others who are interested in the Exposition, subscribe to the extent of their abilities, and thus further their own profit with their own funds. The country cannot and should not lavish half a million dollars, which might be far more advantageously applied to the reduction of our national debt, to the support of our own Exposition., the Centennial of 1876, and to hundreds of other purposes, than to any enterprise to which there are such strong objections, and which, at the best, bids fair to be of so little national benefit as the Vienna Exposition.

REVIVAL OF AMERICAN SHIPBUILDING.

Two new and splendid steamships, for the Pacific Mail Steamship Company, have lately been launched at Wilmington, Del. They are the Colon and the Acapulco, both of same size. Three others, for the same company, are also being built at Chester, Pa. The following are the general dimensions of the Acapulco: Length, 300 feet; beam, 40 feet; depth of hold, 30 feet 6 inches. She is a four decker of 2,324 tuns measurement, with a carrying capacity of upward of 4,500 tuns. Her model is handsome, and combines speed stability, and large stowage capacity. She is to be brig rigged, like the other vessels of the line. Her interior will be supplied with all modern improvements. The machinery is first class, of the compound type, with cylinders 51 and 88 inches in diameter, and with 42 inches of stroke; she has four boilers, 9 feet 9 inches in length and 13 feet in diameter, connected to one smoke stack; each boiler is made of 13-16 inch boiler iron, double riveted, and capable of carrying a working pressure of 70 pounds of steam. The line shafting is 13½ inches in diameter, the propeller being 16 feet 3 inches, with a varying pitch of 22 to 26 feet.

We alluded the other day to the remarkable stupidity exhibited by certain prominent shipping merchants, in requesting the American Institute, of this city, to examine and report whether the compound marine engines, now so extensively used, were really meritorious; as if the success and economy of this form of machinery, now employed on all the finest foreign vessels trading to this port, had not settled the question. Among the signers was the Vice President of the Pacific Mail Steamship Company. The engineers of that corporation seem to understand the subject, whether the Vice President does or not, for they are putting in the compound engines; and their new fleet of steamers will doubtless be enabled to make the same speed on half the coal burned in their present vessels, besides carrying more cargo. It would not be a bad idea for shipping merchants, who pay for the building of steamers, to become readers of the SCIENTIFIC AMERICAN, and thus keep themselves posted in the mechanical and scientific progress of the day.

THE CALIFORNIA DIAMOND BUBBLE.

For several weeks past the papers have been filled with accounts of the discovery of diamonds, rubies, sapphires, and other precious stones, in Arizona and other parts of the Western wildernesses. The wonderful region, where the gems were to be found almost as thick as blackberries, was alleged to be quite circumscribed, and very inaccessible. The fortunate discoverers brought to San Francisco a large number of specimens, which excited the astonishment and interest of everybody. It was then announced that they had arranged, by purchase and preëmption, to secure the whole of the valuable area, which embraced these untold treasures. The aim of the proprietors, as they now allege, was to make arrangements for the supply of a large amount of funds, so that a body of workers might be sent to the grounds and subsisted for a length of time sufficient to collect all the jewels that were accessible. To effect this, they determined to form a joint stock company. A corporation, styled the San Francisco and New York Commercial and Mining Company, was accordingly organized, a large amount of the stock sold, and the money transferred to the pockets of the original projectors. The purchasers of the stock, in order to ascertain the approximate value of their astonishing possessions, decided to institute a careful survey of the diamond regions and, for this purpose, a scientific party, headed by the well known geologists, Clarence King, D. D. Colton, Mr. Bost, and Mr. Frey. These gentlemen, after a toilsome march, reached the alleged diamond regions, and found, surely enough, diamonds and rubies on the surface of the ground and in the crevices of the rocks. But, strange to say, in every instance of a "find," it was evident that the gems had been deposited there by the hand of man, and that none existed where, if their occurrence had been genuine, the inevitable laws of Nature would have placed them. The explorers were forced to the conclusion that the ground in certain places had been salted, or scattered over with the gems for the purpose of deceiving honest or unskilled searchers, and they denounced the whole thing as a swindle of the most barefaced description.

When the report of the surveyors reached San Francisco, the trustees of the corporation met and adopted a resolution to the effect that the fraud be at once and fully exposed, in order that the public might be protected; also that no more stock be issued or transferred, and that the corporation be dissolved as soon as practicable.

Thus ends the romance of the Arizona diamonds. It is to be hoped that the originators of this daring outrage upon innocent purchasers of the stock may be brought to justice.

OFFICIAL PUBLICATION OF THE AMERICAN PATENTS--A NEW AND IMPORTANT WORK.

No better evidence of the energy and ability which the present Commissioner of Patents, General M. D. Leggett, has brought to the discharge of his onerous duties, and no more satisfactory proof of the rapid improvements which are being effected in the department under his charge, can, we think, be asked than that afforded by the recently published volume which forms the first of a series hereafter to be issued by the Patent Office, entitled "Specifications and Drawings of Patents." It consists of a large quarto of 668 pages of letter press and 226 pages of plates, containing not the mere claims, but the entire specifications and reduced *fac similes* of the drawings of all patents issued for nearly one month. It is intended to publish this work monthly, so that the record of devices patented, instead of being obtainable only in the Patent Office, will be broadly disseminated throughout the country and made generally accessible.

The importance of this undertaking, both as an encouragement to the useful arts and as a valuable aid to the inventor, can hardly be over estimated. An immense amount of time is constantly wasted by people seeking to develop what to them are new ideas, which are in the end perfected only to be rejected, after official examination, as old and covered by previous patents, while the luckless inventor discovers too late that he might have saved all his toil and expense, had he posted himself in what others had done before

him. With the aid of the present work, which—for a small yearly sum, no more than sufficient to cover the actual cost—may be added to every one's library, the most accurate information may be obtained, not only regarding the latest improvements and discoveries, but also all that has hitherto been accomplished in any special branch of industry or mechanism. So that within a few years the accumulated volumes will form the most elaborate encyclopædia of the useful arts ever published.

Each monthly edition will contain at the least estimate one thousand patents, while the aggregate of the latter, published in the twelve volumes, will reach nearly fourteen thousand per annum. If we compare the above large total with that corresponding in other countries, we find that the sum of all the patents granted in the United States in a single year exceeds the entire number issued by many nations during the past century or since the establishment of their patent offices. This fact alone shows that the work will be of still wider value as furnishing, not only to Americans but to the world, a complete record of the majority of all the useful inventions produced.

Great Britain approaches us most nearly in the number of novel ideas yearly devised by its inhabitants and placed under the protection of its patent laws. The statistics of this nation show that 3,000 patents are annually granted, but little over one fifth of the average taken out in the United States. The English specifications and drawings have, however, been regularly published for a considerable period back, so that we are enabled to draw the contrast between the British and American modes of transmitting this valuable information to the public.

The specifications of the English patents are issued in volumes measuring 7½x10x2½ inches, each weighing some 4½ pounds. Each year's publication occupies about fifty books of specifications alone, the drawings being bound separately in fifty additional volumes—16x22x3 inches in dimensions, and weighing about fifteen pounds each. The aggregate dead weight of a year's issue reaches 975 pounds or *nearly half a tun* of printed matter, all of which, it seems, is required for the description of 3,000 patents in a manner not a whit clearer or fuller than our compact yet elaborate volumes. On the above English plan of publication, it would require about five hundred volumes a year, weighing in the aggregate over two hundred tuns, to produce the same number of patents as are yearly issued by this country, and which Commissioner Leggett expects to print in thirteen comparatively small volumes. As to the comparative expense of the two systems, no comment is necessary. As a matter of course the English publications might as well remain unprinted, for they are virtually out of almost every one's reach.

We can confidently predict a world-wide circulation for our new work. It will prove a trusty guide to the inventor and a useful and convenient means of reference for the Patent Office Examiners, as well as a valuable repository of knowledge for all interested in or desirous of obtaining information regarding our industrial progress. As an addition to our mechanical and scientific literature, it enures greatly to the credit of Commissioner Leggett, to whom its inception is due, while, as a monument of the national inventive genius, it is a production of which the country may justly be proud.

IMPROVED SHIP'S COMPASS.

The Earl of Caithness, at present visiting New York city, has recently exhibited to us a new form of gravitating ship's compass, invented by himself. Seamen are well aware that during heavy weather the rolling and pitching of a vessel cause the compass to oscillate, and that the consequent side movement of the points often renders proper steering a matter of difficulty, and at times results in throwing the ship far off her course. Lord Caithness' invention overcomes this difficulty by abolishing the gimballs in which the compass box is supported in the binnacle, and substituting therefor a ball and socket joint.

The arrangement of this device is simply a ball of metal fastened directly under and to the center of the bottom of the compass box, resting on a ring formed in the top of a hollow conical support, which is firmly attached to the binnacle. Just within the ring is a small metal point, and in the ball is a slot, fitting over it, so that sidewise rotary motion of the parts is prevented, and the compass, when adjusted to the ship, is held in proper position.

Attached to the ball, and counterbalancing the box and its contents, is a vertical rod, on which slides a weight. Within the binnacle, this pendulum has free play, and, by its gravity remaining always vertical, will necessarily retain the instrument in a horizontal position, no matter how deeply the ship may roll or pitch.

The variety of compass employed, whether liquid or ordinary card, is of course immaterial. In port, when it is desired to hold the compass steady, it is only necessary to slip the weight on the vibratory rod an inch or so down, so as to embrace the end and also the top of a small fixed upright at the bottom of the binnacle, securing it in place by a set screw.

His Lordship's invention is one of practical utility, and is both inexpensive and a decided simplification and improvement on devices now in use. We have before us many testimonials received from the British Admiralty, and officers of the navy and merchant service, giving records of its performances, all of which unite in its commendation. We note that in one instance a compass remained free from oscillation when the vessel was rolling to an angle of 30° and at times 35°. As Lord Caithness is desirous of introducing his device in the United States, we take pleasure in thus presenting an invention, evidently meritorious, efficient, and well worthy the careful attention of all seamen.

THE NOVEMBER ATMOSPHERIC WAVE.

Recent reports from the Signal Service Bureau indicated the discovery that the great meteorological phenomenon, known in Western Europe and the British Isles as the November atmospheric wave, has appeared on this continent. That this aerial billow has been hitherto believed to exist only within circumscribed limits, is shown by the following, written by Sir John Herschel in 1863, in which he speaks of "that great periodical phenomenon whose recurrence is beginning to be recognized as one of the features of our European weather table—a vast and considerably well defined disturbance, peculiar, it would seem, to this portion of the globe." The views of the distinguished astronomer are, however, now clearly shown to be erroneous. On November 12 last, says the report, a similar atmospheric wave began to break over the shores of Oregon and British Columbia, as shown by the weather telegrams. By the evening of the 13th, it had spread over nearly all the Pacific States and Territories, Utah and Nevada, and at midnight was pouring through the passes of the Rocky Mountains. On Thursday, the 14th, it descended upon Colorado, Nebraska, Kansas, and the Indian Territory. On Friday morning, it extended in unbroken magnitude and magnificence from Oregon and Washington Territory eastward through the great trough or depression of the Rocky Mountain back bone in Idaho and Montana, and stretched thence to the Lower Missouri and Lower Mississippi Valleys and over the western shores of the Mexican Gulf. Through this discovery the approach of winter may be accurately predicted, as it advances from the Pacific coast eastward in the great current of westerly winds. By showing that the warm air from the Pacific Ocean laden with vapor breaks over the icy summits of the Rocky Mountains, it explains the cause of the vast falls of snow which so effectually blocked the Central and Union Pacific Railroads last year. The air robbed of its vapor, and besides deflected upwards, is, it is believed, further chilled, and large quantities of latent heat are liberated. The warmer strata being then borne eastward explains the existence of the mild winter belt lying northeast of the mountains of Idaho and Montana and extending to the Athabasca and Saskatchewan rivers.

Whether or not this vast motion in the atmosphere has any connection beyond that of coincidence of time with the November meteoric belt, through which we have recently passed, is an open question. It undoubtedly has had some influence in the severe storms recently experienced. The telegraph informs us that, on the night of the 12th of November, the polar bands of cloud, said by Humboldt to presage tempests, appeared; while on the same evening a prediction of the Signal Bureau was verified by the rising of a heavy storm which visited the lakes with great severity and swept over the whole face of the country. The more immediate effects of the present wave are said to be drier and more wintry weather.

The Signal Bureau deserves the greatest credit for the valuable addition to scientific information elicited by its researches, and we trust that the Government will appropriate ample funds to promote the prosecution of such important labors.

DEATH OF HORACE GREELEY.

This distinguished editor, so widely known in connection with the New York *Tribune*, died on November 30, at the age of 61 years, at Chappaqua, N. Y. His demise has deprived the world of industry, progress, and science, of one of its stanchest and most zealous friends. The son of a New Hampshire farmer, he was apprenticed to a newspaper printer in Vermont, and came to New York in 1831, with very little money, and no friends. He obtained work as an ordinary type setter in a printing office, and soon showed his intelligence and ability. In partnership with a friend, he undertook the printing of a one cent daily paper, which soon failed; and Mr. Greeley then found another partner, with whom he started the *New Yorker*, a journal which had for seven years and a half a high reputation for its literary and critical ability. Mr. Greeley was subsequently the editor of *The Jeffersonian*, and then of the *Log Cabin;* but his great work was the establishment of the New York *Tribune*, the first number of which was issued in April, 1841. In this work he was ably assisted by Thomas McElrath, his partner, without whose business abilities it is not likely that the *Tribune* would ever have attained its present success.

Although Mr. Greeley's talents were chiefly literary and controversial, he had a most enlightened sympathy for all the branches of science and the progressive spirit of the age in which he lived. He was notably the friend of the industrious, the ingenious, and the intelligent among the people; and his journal owes much of its popularity to this trait in the character of its principal editor. His influence as a journalist has been acknowledged by all parties, and although much of his life had been passed in weathering political storms, he has left few personal enemies behind him. He was the recent candidate for the Presidency, of the Democratic party, and to over exertions made during the late campaign is due, it is believed, the illness which has so fatally resulted Horace Greeley was a remarkable man, and his name will occupy an eminent place in the annals of American history.

J. E. T. has tried a recipe published in our paper for a cement composed of glue and rubber in spirits of niter, and says the thing wont work. The rubber dissolves but the glue remains solid. In dissolving and combining many substances, it is oftentimes necessary to observe a certain order. In the present case, if our correspondent will dissolve the glue in a little water and then add it to the solution of rubber in spirits of niter, we think he will succeed.

[Reported for the Scientific American.]

ELECTRICITY AT THE STEVENS INSTITUTE.--NOVEL RESEARCHES BY PROFESSOR MORTON CONCERNING THE INDUCED CURRENT.

The first of a course of public lectures on electricity was recently delivered by Professor Morton, at the Stevens Institute of Technology, Hoboken, N. J., before a large and intelligent audience.

The lecturer introduced his subject with a few simple, but suggestive, experiments, showing the attraction and repulsion of pith balls and gold leaf very plainly, by throwing their magnified image on the screen. He mentioned that although glass was the substance generally used as an insulator, it was not by any means perfect for the purpose, and pointed to a series of Leyden jars which were entirely useless as a reservoir of electricity, owing to the poor insulating power of the glass.

Vacuum tubes were passed among the audience, each tube having sealed within it a smaller tube, with bulbs blown along each inch of its length; in the space between the smooth outside and the bulbed inside tube, was placed an ounce of mercury; on suddenly inverting the instrument, the mercury, in its descent, would strike against the bulbs of the inner tube, producing friction, and consequently electricity, of which the effect could be seen as a violet or purple colored light following the mercury.

The subject of electrical induction was next introduced, with a simple instrument called the electrophorus, and a Holtz machine; then followed a series of experiments with induction coils. A Giessler tube was caused to revolve rapidly by means of a small magnetic engine. When the induced current was transmitted through the revolving tube, it produced the effect of a handsome piece of fireworks. A wire, with strips of paper fastened at one end, was connected with the inner coating of a Leyden jar. On charging the jar with the long sparks of induced electricity from the induction coil, the strips of paper would be repelled and stand out from each other, but on discharging the jar they would instantly drop. A chime of bells was rung on the same principle, and would continue to ring for twenty minutes with one charging of the jar.

Professor Morton mentioned that he believed he was the first to discover that the induced or secondary current of the Rhumkorff coil was capable of producing attraction and repulsion, similarly to frictional electricity.

An electrical orrery was set in motion by the induced current escaping from points, and reacting on the air; a lighted candle, held near one of the points, was almost blown out.

The speaker closed the lecture with some brilliant experiments with the large coil of the Institute. Wood was torn up, and gunpowder was only scattered with one electric flash, which lasted the six billionth of a second, but ignited by another of longer duration, about the six or eight hundredth of a second. The last experiment, that of causing the induced electricity to penetrate blocks of glass, was received with well deserved applause; the assistants brought in two heavy columns of glass, each having a metal rod running through its middle; thick varnish was poured on the top face of one column, and the block of glass to be penetrated placed on the varnish. More varnish was then poured on the block, and the other column placed on top. The principle was simply to bring two very well insulated electrodes together, with the block of glass between them; the object of the varnish was to render the path through the glass the easiest course for the electricity. The terminal wires of the secondary coil were connected with the rods in the columns of glass. It was very interesting to observe the effect of the strange force struggling through the glass; the electricity would penetrate perhaps an eighth of an inch, and then, as if the resistance were too great, it would dart back and run around the outside of the block, turning the corners and scattering the layers of varnish; then again the current would make a new attack, penetrate deeper and deeper, until at last the bright streams of light passing entirely through the glass announced the electrical success.

The Professor exhibited a block of glass three inches thick (penetrated in this manner), by throwing the light through it and on the screen; two plainly marked cleavage lines showed the electric path through three inches of solid glass.

L. D. D.

THE CHRISTIAN LEADER.

The *Christian Leader*, the organ of that body of religionists known as the Universalists, has just made its appearance in a new and improved form, to wit, the large quarto shape. Its readers are now presented with twenty pages of matter, handsomely printed. The new publisher is Mr. M. K. Pelletreau, and his name alone is a sufficient guarantee for the elegance of the typography. Office No. 8 Church street, New York; subscription $2.50 per annum, chromo included. The new editor is E. H. Chapin, D. D., who, as everybody knows, is not only an able and popular writer but he is also a most eloquent speaker. Under this new editorship and management, the *Leader* will undoubtedly take the place in the ranks of religious journalism which its name so appropriately implies. The editor in his address says: "In our day, the human mind is much engaged with problems that involve the highest interests of our being. It may be an age of religious doubt and dislocation, it is not an age of religious indifference. These things appear, not because men are apathetic, but because they are in earnest. Trained by the scientific culture of the times to face the facts of nature, they demand facts and not assertions in every department of human faith and teaching."

In education, science is invaluable as the sole means of training and invigorating the intellect.

NEW ICE HARVESTING INVENTION.

Mr. Louis Townsend, of Terre Haute, Indiana, has devised and patented a number of useful and ingenious inventions, destined to cause much saving of labor in the cutting, transporting and housing of ice. Not only this but an ice increasing machine is introduced by which the thickness of the ice in rivers, lakes, etc., can be materially augmented. This device consists in a number of sections made of two planks each, nailed together at right angles and braced by an end piece. As soon as the ice has acquired a sufficient thickness to bear the workmen, a sufficient number of these sections to enclose the desired space are placed end to end and secured to one another. The lower edges of the sections are wet so that they become frozen to the ice. Water is then pumped into the enclosed space to a shallow depth, which readily freezes. Another supply of water is added, and so on until ice of the desired thickness is formed. This invention was patented April 23, 1872.

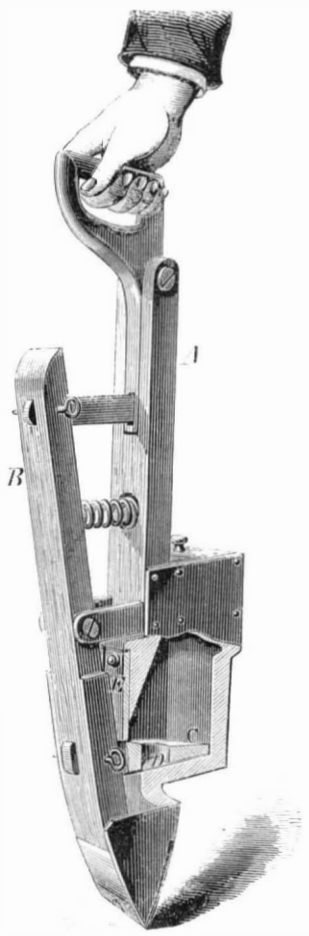
Having made his ice, Mr. Townsend invents an ice cutter which consists of a T shaped frame work carrying a set of circular saws which mark the ice similarly to an ice plow but do not cut through. Then driven by suitable mechanism are vertical saws destined to cut the blocks, power being transmitted by means of a horse walking on an endless belt. The power may move forward automatically as the saws cut their way through the ice, and may be placed at a considerable distance in advance so that being far from the edge of the ice there is no danger of its support breaking through. When it is desirable to have the saws work in advance of the power, they are reversed and the latter is mounted on a boat or raft. The date of this patent is Oct. 8, 1872.

The blocks being cut, in order to float them to the elevator or flume where they are to be stored, a device is presented formed in three sections hinged to each other. Each section consists of a top bar, bottom bar and a series of rounds, so that the apparatus resembles an ordinary ladder. It is placed around a block of ice, a rope is attached and the whole floated to the desired point. Patented April 23, 1872.

The blocks having been brought to the store house, Mr. Townsend supplies an invention for carrying or moving them about. It consists of a carrier the bottom of which is a metal plate made somewhat in the form of an earth scraper, but with its forward edge turned up. Metallic straps pass around the lower side of the plate and serve as runners, also as guides to hold the ice, and their ends fasten the plate to the long bars or handles. The carrier is made of such a width as to receive two blocks of ice placed side by side, and is designed to secure the ice as it falls from the chute, carry it to the place where the packing is going on, and there be easily slipped from under its load. This invention was patented April 23, 1872.

IMPROVED SEED PLANTER.

The accompanying illustration represents a convenient and ingenious form of hand planter which may be readily adapted to various kinds and different sizes of seeds.

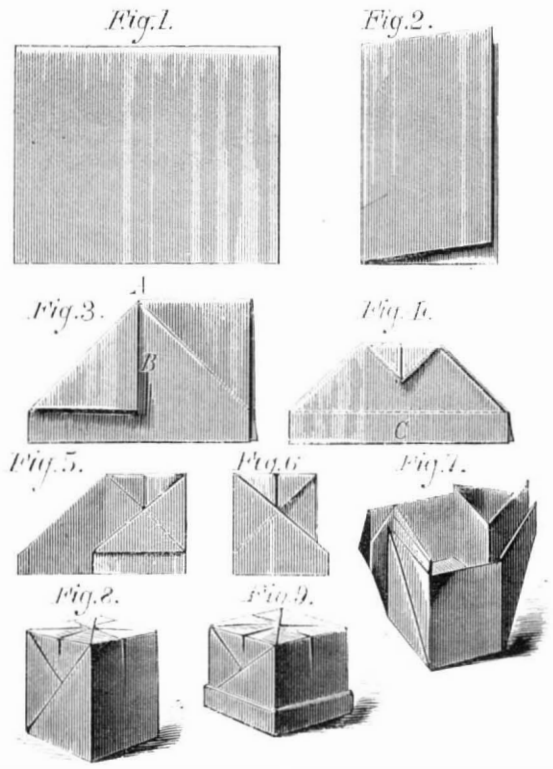


A and B are two blades meeting at their lower extremities and there protected by a metal sheath, as shown. Attached to the blade, A, is a seed receptacle, a part of which is exhibited as broken away in order to show the interior arrangements. At the bottom, and passing through an opening in the receiver, is a wedge-shaped valve, C, which is secured by being pinned in a slot in the blade, B. This valve has a circular orifice at D, and immediately above it, and resting upon its upper side, is a sliding piece, E, countersunk in the blade, A. The two blades are held apart by the spring, and are connected by the bearing, F, on which the moving blade, B, works, and also by the arm, G, to which is attached a hand lever, the fulcrum of which is at the upper extremity of the blade, A.

In operation, the receiver being filled with seed, the apparatus is thrust into the ground. A downward and backward motion of the hand lever, to the left in the engraving, causes the blades to separate at their lower extremities. The valve, C, is thus withdrawn through the opening in the receiver, as far as to permit the seeds which have settled in the orifice, D, to drop therefrom, fall down into the point of the planter, and thence pass through an opening into the ground. The slide, E, descends by its own weight as the beveled upper side of the valve is drawn under it, thus preventing the seeds, beyond what are contained in the orifice of the latter, from escaping, and then ascends as the valve is pushed back. Different valves, with various sized orifices, may be used to suit the varieties of seed employed. Patented June 11, 1872. For further particulars address Mr. Henrick Lage, glass box 1,055, Omaha city, Nebraska.

HOW TO MAKE PAPER CAPS.

It is a noticeable fact that, in workshops and factories where numbers of men are employed, a large percentage of the operatives will be found to be prematurely bald. If the cause of this affliction be sought, it will be traced to the pernicious habit of continually wearing the close cap or hat, thus keeping the scalp at an unnatural heat, and cutting off

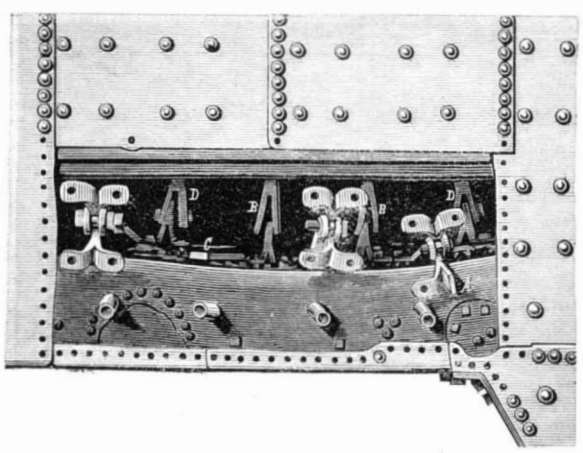


from it all ventilation. The hair under such treatment is, as a matter of course, weakened, and, decaying at the roots, falls out in large quantities. In defence of the practice, it is urged that the head and its covering must be protected from the dirt and dust that fills the air of the work rooms, and that an old hat is about as good as anything that can be used. We think that all will concede that a light paper cap that costs nothing, or at best a penny for a sheet of brown paper, will answer every requirement of protection, while at the same time being both light and cool. Besides, it is much more cleanly to renew one's head gear with a fresh sheet of paper every once in a while, than to continue wearing a grimy, greasy, thick piece of felt or cloth for months at a time. In order, therefore, that all may be able to make their own caps, we have prepared the accompanying engravings which, with the following few words of explanation, will show how they are folded:

First, provide a sheet of moderately thick brown paper, size from eighteen inches to two feet, shape as in Fig. 1. Smooth it out perfectly flat and double over as in Fig. 2. Turn it round with the fold from you, and mark the exact middle of the piece at A, Fig. 3. Then bring down both corners and measure off on the edge, B, from the point, A, Fig. 3, a distance equal to one quarter the circumference of your head. Mark the point. Now, turn the paper over so that the under side will be uppermost, and bend the apex of the triangle back from the point just marked, as in Fig. 4. Fold over the sides, Figs. 5 and 6, and with scissors cut off the lower portion, C, below the dotted line and also the points of the two lower corners of the pieces just bent over. Next unfold the paper; spread it out flat. You will find a square marked in the middle, and creases leading therefrom to the corners of the paper. Double up the material on these creases, so as to bring up the paper as sides of a box, of which the middle square is the bottom, as in Fig. 7. Smooth the folds flat, and your work will appear as in Fig. 8. Lastly, turn up the edges of the box all around, twice, folding the paper on itself. Your cap is then complete, and, if the measurement directed above was correctly made, it will exactly fit your head.

STEAM BOILER EXPLOSIONS.

It will be remembered that a series of experimental ex



plosions of steam boilers, at Sandy Hook, attracted much attention some months ago. The boiler tested were, before being submitted to excessive steam pressure, several times subjected to hydrostatic pressure until ruptured at their weakest points. After one of these boilers, No. 3,* had given way at the crown sheet under this treatment, Mr. F. B. Stevens, who planned and conducted the experiments, had a sheet cut away opposite the crown sheet, and the interior photographed. We now have the pleasure of presenting a copy of this photograph in the accompanying carefully made engraving.

The boiler was built by the well known firm of T. F. Secor & Co., in 1846, and was 25 years old at the time of its removal from the boat.

The excellent proportions of its bracing are shown by the fact that no one detail seems to have shown special liability to fracture. The ear of a crow-foot brace, at A, the pins at B B, and the body of a brace at C, have all given under about the same pressure. The crown sheet seems to have gone down considerably under B B, and is much distorted elsewhere. Far back, at D D, we can see, in spite of the lack of light, braces that still held. The picture is an interesting study.

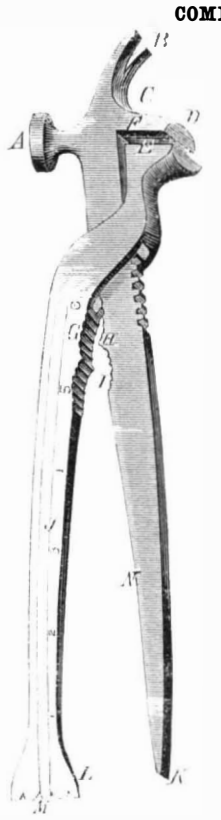
Brain Work.

One thing I would like to impress upon those who are exceptionally excitable. The very slightest stimulants, which others may use with impunity, are bad for them. I have known cases of chronic neuralgia, from which torture had been endured for years, cured by ceasing to drink tea and coffee regularly, or by leaving off smoking. The nerves are such delicate affairs that they often make us a great deal of trouble with very little cause, seemingly. Excessive brain work renders them much more susceptible. This susceptibility must be counteracted by the avoidance of those things which tend to excite. What a steady brain worker wants is to replace (not stimulate) his vitality as fast as he uses it up. To this end he wants everything that is nourishing and soothing. A stimulant crowds out some part of the requisite nourishment, since the system can only receive a certain proportion of matter into it at a time and appropriate it harmoniously. If you set it to work on a stimulant, or set a stimulant to work on it, the action is mutual. It will not assimilate fully the nourishment which may come immediately afterward.

All the diseases to which we are constitutionally liable are aggravated by the use of stimulants. They assist the development of chronic complaints, and make all sickness harder to cure. It is not necessary to speak of their bad effects on ailments of the brain. But most of these, I believe, are to be traced originally to their use. A healthy brain naturally seeks relief in sleep when it is tired. But one that is spurred and driven on by stimulants loses that inclination. From the inability to rest springs the whole train of nervous and cerebral diseases.

I believe that one, working the brain at proper hours and giving it the requisite rest, relaxation and nourishment, and never stimulating it into unhealthy action, might go on doing the very hardest mental work from youth to extreme old age and never suffer an atom from it—on the contrary, be benefitted.—*Howard Glyndon.*

COMBINED TOOL.



The ingenuity of some of our inventors has often been exercised upon the combination, in one instrument, of the tools in daily use by some classes of mechanics, and especially by housekeepers; and we here illustrate a successful arrangement of many of the useful implements most commonly needed. It is not necessary that we should give a lengthy description, as our engraving will show the numerous and varied uses for which the appliance is available; and its simplicity of form is such that it can be sold at an economical price.

The invention consists in combining the following named useful tools, in convenient form for general purposes, namely, hammer, A, tack and nail puller, B, stove cover lifter, C, scraper, D, pincers, E, adjustable wrench, F, gas burner tongs, G, nut cracker, H, cork presser, I, six inch rule, J, screwdriver, K, box opener, L, carpet stretcher, M, door fastener, N.

It was patented May 9, 1871, by Mr. J. Gorrick

THE school ship Mercury, owned by the city of New York and used as a reformatory for unruly boys, recently sailed on her third cruise. The vessel will proceed to the Volcano Islands, south of the equator, taking soundings and deep sea temperatures as often as may be practicable; thence to Rio and Barbadoes, and then back to New York. All necessary instruments for determining velocity of currents, sounding and collecting deep sea plants are provided. The information obtained will doubtless be of much scientific value, inasmuch as no correct charts of tropical ocean currents have as yet been published.

*Experimental Steam Boiler Explosions, by Professor R. H. Thurston: Van Nostrand, 1872.

[From Journal of the Franklin Institute.]

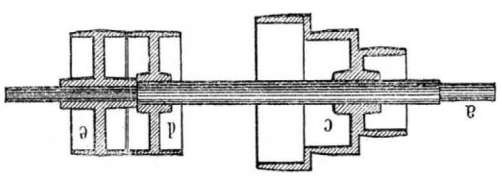
TRANSMISSION OF MOTION.

A Lecture delivered by Coleman Sellers, at the Stevens Institute of Technology, Hoboken, N. J., February 19th, 1872.

NUMBER V.

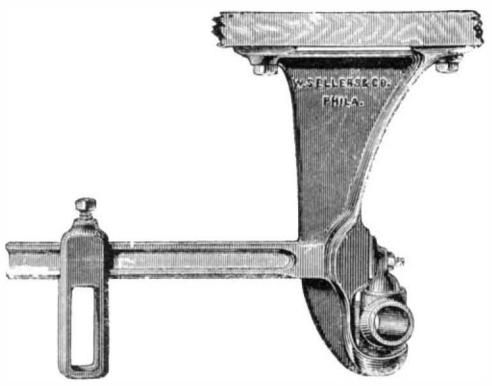
Pulleys are sometimes made loose on the shaft, and are used mainly on what are called countershafts, for the purpose of starting and stopping machines. Countershafts are usually short shafts placed over or under the machines to be driven, and, receiving the power from a main line, transmit it to the machine. Thus, I have here an example of a counter shaft for driving a lathe (see Fig. 19). You will observe that this shaft is necked down at its ends (a and b), to a smaller size; these smaller ends are the journals. It has upon it a cone pulley, c, corresponding with the cone pulley on the lathe head to be driven, the various sizes giving different belt speeds, and it has also a pair of fast and loose pulleys, d, e. Now this may be taken as an example of a countershaft; but all countershafts are not made in this manner. The term countershaft is applied to all shafts driven from the main line when placed at or near the machines to be driven, and sometimes in cotton and woolen factories some really long lines, driven from the main line in the same room, are called counters or counter lines. Such lines, differing in no respect from main lines except in name, need not be especially considered. Countershafts such as I here show you, Fig. 14, are peculiar in themselves, and must be considered by themselves. In this example there are fast and loose pulleys d, e. When the belt is on to the fast pulley, d, it will, in causing it to revolve, rotate the shaft also, and thus drive the machine connected with it; but when shifted on the loose pulley, e, that pulley can turn without turning the shaft. Now, you will observe that the shaft in the loose pulley is of the same size as the journal part, and the hub of the loose pulley is longer than its face is wide; this is an important feature, as it insures stability and durability. It makes the pulley run steady, and its extended bearing makes it wear well. It is advisable to so ar-

FIG. 19.



range countershafts of this character as to admit of the loose pulley being near the hanger, so as to admit of the shaft being turned down to the journal size where the loose pulley is. Thus, for a double purpose, the box of the hanger holds the pulley in place between it and the shoulder of the shaft, and the lubrication of the bearing helps to oil the loose pulley, as much of the oil will find its way along the shaft. The hangers for that counter need not be made with a vertical adjustment. They should be provided with the swivelling principle in the box, and as the boxes can be slid on from the end, they may with advantage be made solid, not in halves, as are the boxes of line hangers. I have here two examples of hangers to countershafts, called counter hangers. One of these (Fig. 15) is for use on a countershaft where there are fast and loose pulleys; the arm is to carry a belt shifting rod, which slides in the adjustable guide, and by suitable belt forks is used to push the belt from one pul-

FIG. 20.



ley to the other. As many counters are made without fast and loose pulleys, there are hangers made without the shifter arm, and this form of hanger is extensively used in factories for the counters of machines having the fast and loose pulley on the machine itself, as is the case with the looms.

I have already mentioned that there is a distinctive difference between the shafting system of this and other countries; let me explain this more fully, taking for example the practice that holds in England at the present day. Theoretically, motion can be transmitted more economically by means of gear wheels than by means of belt. Gear wheels transmit motion without loss by slipping, as might be the case with belts. Gear wheels are used in England to transmit the power of the engine to what is usually called the jack shaft; from this shaft, by means of bevel wheels and upright shafts, the power is conveyed to the various stories and thence by bevel wheels to the line shafts. This system insures the transmission without slip to the lines, but it is costly and very cumbersome, inasmuch as very high speeds are not possible with gearing. With a very rapid motion the teeth are broken by the back lash. Sometimes wooden teeth or cogs are inserted in the driving wheels, and the driven wheels are made of iron with the teeth carefully planed to proper shape. Wood and iron teethed wheels can run rather faster than iron on iron, but still not up to the speed now common in this country. Let us suppose, for instance, that it is found expedient to use no higher velocity to the geared shafts than 100 revolutions per minute, and the machine driven necessitates the use of pulleys 3 feet in diameter to drive them. The first cost of the line would certainly be less if the line could be run at 200 revolutions, and pulleys only 18 inches in diameter used to drive the machines. Well, the practice here is to obtain a speed of say 400 revolutions for lines in spinning rooms, and to use pulleys not more than 9 inches in diameter. These high speeds are not attainable with gearing, so belts from the engine to the line have come to take the place of gearing in all well constructed American mills, and this with a manifest gain in diminished first cost, in economical use and in steadiness and smoothness of motion.

Not very long ago, an enterprising firm imported from England some peculiar spinning machines, and some, to us, novel machines for preparing the wool with the intention of making fine yarns. They also brought out a boss spinner to put up the machines and organize the factory. They consulted me in relation to the shafting to drive the new machinery, and I asked for speeds of machines, etc., to enable me to arrange the proper speed of shafts, power, etc. They referred the matter to this spinner, who said that he did not know what speed the machines were to run, but if I would make the shafts 3 inches in diameter and run them at 100 revolutions per minute, the pulleys should be 36 inches in diameter. This was, of course, information enough to guide me, but, instead of making all the shafts 3 inches diameter, I made some only 2¼ inches and giving a speed of two hundred and forty. I could use pulleys only 15 inches in diameter. When the plan was shown to the spinner, he condemned it *in toto*. These machines could not be driven from any less pulleys than 36 inches; that he knew, and no argument could convince him that the same speed was being obtained at a less cost. The mill owner, a good business man, but not much of a mechanic, was in doubt as to what to do, but was convinced when he saw the estimate of the two systems, one at so much less cost than the other, and when he was shown that the pulleys on the machine were only 12 inches in diameter, hence would require no larger pulley on the line, so far as power was concerned. I could relate many other examples of converts to the American system of mill shafting, whose conversion was brought about through their pockets, but who are now enthusiastic in praise of the entire principle of light shafts, small pulleys and transmission by means of belts in place of gearing.

It is in America only that the production of all that pertains to mill gearing and shafting has been reduced to a systematic manufacture. To make a machine is one thing; to manufacture machines is quite another thing. Thus one sewing machine may be made by itself at a cost more or less in proportion to the labor expended upon it. But the same machine, by means of organized labor, can be produced in quantities for a tenth of the cost of one machine. Hence systematized manufacture is needed to insure cheap productions. The hanger which Mr. Bancroft showed to the New England machinists would indeed have been an expensive luxury if simply made one at a time, with no special tools fitted to its production; but with most special tools, thorough organization of the labor employed, and the production of immense numbers of them, with all parts made to gages and interchangeable, the cost is less now than what the commonest, rigid bearing hangers were made for formerly, and their adoption is now universal. Apart from systematized labor, an important item in first cost is weight of material. Not very many years ago all shafting, and all pulleys, and everything relating to the machine for transmitting motion, were made and sold by the pound. Purchasers were attracted to the makers who charged the least per pound, and no very great care was taken to see that too many pounds did not go into the various parts of the machine. Shafts of a given size could not be made to weigh more or less by different makers; but much needless weight might be put into hangers, into couplings, and into pulleys, so that the price per pound really came to have no meaning so far as total cost was concerned. Some dozen years or so ago, the house of William Sellers & Co., feeling that this system of selling hangers, pulleys, couplings, etc., by the pound was not the proper way to dispose of such things, determined on a radical change. They instituted an extensive series of experiments to demonstrate just how strong and consequently how heavy each article comprised under this head should be. They found that pulleys might be reduced in weight, and, by the employment of suitable machinery, be more perfectly made. So of hangers, and all that pertains to shafting, except the shafts. They then published a price list, offering to sell each item at some certain fixed price, dependent upon its own cost. This price list enabled the purchaser to know beforehand just how much money would be required to obtain what he wanted, and for strength and durability he took the guarantee of the makers. There was great opposition to this system from those who were still anxious to sell by the pound; but in time the manifest advantages of the plan caused its adoption by other makers.

Various establishments have been fitted up at great cost for the production of "shafting," and the same attention is now paid to its construction as is given to any other branch of the machine business. All conceivable wants of the trade are met by specially contrived devices, which can be made in quantities and kept in stock ready for sale. Hangers varying in size and "drop" (that is, in distance from center of shaft to the foot), are made from carefully designed patterns. Pulleys fitted for double or single belts, for wide or narrow belts, and made high or straight on the face, are all from patterns nicely adapted to the work each has to do. Last, but not least, all these things are made to standard gages, so as to have their parts interchangeable. A nomenclature, too, has come into use, and all the technical terms used are in a degree uniform through the trade. In regard to the sizes mentioned, in speaking of shafts, they are called always from the size of the bar iron from which they are made, and the term "shafting size" has come to have a significant meaning. All turned shafts are made from merchantable sizes of round bar iron, and in turning, one sixteenth is taken off in diameter, so that what is called a two inch shaft is really only one and fifteen sixteenths in diameter, and so of other sizes; they are all one sixteenth less than their names imply; and the couplings, hangers, etc., are made to conform to these sizes.

The adoption of high speeds for shafts has, as I have said, rendered it almost impossible to employ gearing for the purpose of transmission. Belts have become the recognized means of transmission, and mills formerly driven by gearing are now being altered so as to use belts only. When two shafts are placed parallel, the transmission by belts is a very simple matter; but sometimes shafts are required to be driven at right angles to the axis of the source of motion. This can be done by belts, provided the belts be carried over guide pulleys, so set in relation to the driving and receiving pulleys as will enable the band to lead properly from one to the other. Various devices have been arranged to effect this with readiness, and it is not an unusual thing to carry belts as wide as twenty inches over such guide pulleys, and in all imaginable positions. But this subject is one that would require more than the time allotted to one lecture to fully explain. I must therefore pass it by with this brief allusion to it, trusting that I may have an opportunity at some future time to explain it more fully to you.

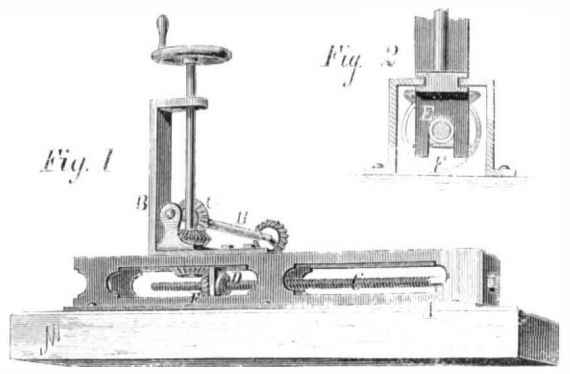
The subject of the transmission of motion from the motor to the machine, is, as I have shown, a very important one, and I cannot omit mentioning that I had an opportunity recently to note the comparative tests of power employed in driving two large manufacturing establishments. The amount of shafting, reduced to the same basis in each, showed in one case a consumption of ten horse power to run the empty shafting, and in the other thirty horse power only. The first was of the improved self-adjusting kind. The last was an example of shafts in rigid bearings. This will show you clearly how needful it is to study economy in transmission of power; and I trust what I have said to you this evening may at least furnish food for thought, and lead you to inquire into the subject further.

New Electrical Battery.

M. Lionel Weber has invented a new battery composed of a porous diaphragm filled with plumbago. This vessel is placed in a glass or porcelain vase containing a saturated solution of ammoniacal chlorhydrate. Into the plumbago is introduced a plate of charcoal which constitutes the positive pole; and into the solution which surrounds the diaphragm is plunged a plate of amalgamated zinc, forming the negative pole. This battery has been found to have great force, to be constant in the support of regular and continued work, to be economical and to need but little attention.

HEAD BLOCK FOR SAW MILLS.

The invention herewith illustrated is designed to facilitate the operation of setting logs to the saw in the process of sawing lumber, so that the thickness of the piece to be cut may be determined with accuracy. In Fig. 1, A is one of he head blocks of the carriage. B is the knee against whichl the log rests, and by which it is moved. C is a horizonta t



screw immovably affixed to the head block. D is a sleeve nut traversing said screw, and connected with the knee by means of the stirrup, E, as more clearly shown in the sectional view, Fig. 2. The same engraving represents how the edges of the horizontal portion of the knee, B, are grooved to slide in a slot in the upper portion of the head block.

Connected with the sleeve nut, D, is the bevel gear, F, which is actuated by the rod and hand wheel, as shown. By turning the latter, the sleeve nut on the screw, C, is caused to rotate, and consequently to move forward or back, carrying with it the stirrup, E, and also the knee. By this means the sawyer can reach the setting apparatus from the side of the log, and also set the latter with great precision. At G is shown another bevel gear which is also actuated by the hand wheel. This rotates the shaft, H, which ends in a miter wheel that forms the portion of a similar mechanical device on another head block, so that both blocks may be connected together and actuated by a single hand wheel or crank. By having three blocks, those on the ends communicating, as shown, with the one on the center of the log, it is claimed that the stiffness of the log will obviate the tension or twisting in the extension rod, a common defect in other devices.

Patented through the Scientific American Patent Agency, April 16, 1872. For further information address the inventor, Mr. H. C. McEwen, Oakdale Station, Alleghany Co., Pa.

Correspondence.

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

Self-Propelling Fire Engines.

To the Editor of the Scientific American:

The terrible fire in Boston and the world-wide horse disease, occurring so closely together, have naturally turned our thoughts to the subject of steam power *versus* horses.

The fire department of Cincinnati has had several self-propellers in use for many years, and has tested them very thoroughly for this special purpose; and I am informed by Mr. Fatta, one of their engineers, that the self-propellers have not as yet been sufficiently successful as to exclude horses. It requires several minutes to get steam up to a propelling point, and in that time horses can be hitched to the engine, and will often reach the point of action by the time the steam is up to the needed pressure. When the fire is at a considerable distance, however, and the steam gets to its working pressure before the engines arrive there, the surplus steam may be used very efficiently to assist the horses over difficult ground. As it does not add much to their cost or weight, or in the least impair the efficiency of the fire engines, it seems to me that the propelling device should be attached to every engine for use in cases of emergency.

One wheel is sufficient to propel an engine, and a steering device is not needed, the steering being performed by horses, or if necessary, by men. I saw a self-propeller in use at the late fire in Boston; one of the hind wheels was driven by an endless chain from a small chain pulley or "sprotchet" wheel on the end of the crank shaft of the engine, which could be released by a clutch when the propelling device was not in use. The ratio was about one turn of the traction wheel to six or eight of the crank shaft. The only extra parts used in this case are the chain, two simple chain wheels, one eccentric, and a reversing link.

Engine houses should be on high ground, for the reason that it is easier to hurry these heavy fire engines down hill than it is up, and everything possible should be done to facilitate their movement to the fire. F. G. WOODWARD.

Worcester, Mass.

Freezing Water in Bottles.

To the Editor of the Scientific American:

In the winter of 1865–66, I succeeded in freezing water solid in glass bottles, filled to the corks, without breaking them, by the following method: Several bottles were filled with water, and perforated corks were inserted into their necks, rather tightly. A glass tube, open at both ends, and drawn to a narrow conical point, was then inserted, point downwards, through the corks, to a little below the middle of each bottle. The tubes were of rather thick glass, having about a 3-16 inch bore, and projected about an inch above the corks. The bottles, thus prepared, were set in an exposed place, in extremely cold weather, and left over night. On the following morning they were found to be unbroken, yet each bottle was filled with solid ice. The covers and tubes, having been forced out, were lying beside them on the shelf. A portion of the water had frozen in the tubes, and this ice was forced up and partly projected out at their tops, to the hight of an inch or more, and was more or less bent to one side and downwards. This must have taken place before the tubes themselves began to be forced up, by the expansion consequent upon freezing. Thus the tube at first served as a vent, while the water was freezing at the top and bottom and all around its own circumference; but at length, the ice beginning to form about the conical point of the tube, this was gradually forced up, the space which was gradually relinquished in the center of the bottle being sufficient to compensate for the further expansion of the water. COE F. AUSTIN.

Gloster, N. S.

Juice vs. Cider.

To the Editor of the Scientific American:

I agree with the writers of two articles, lately published in the SCIENTIFIC AMERICAN, that there is a difference between cider and juice, but I prefer the juice: and I think any person who is very fond of apples would do the same.

Not long since I read that a physician—I have forgotten who—had never known a person who was very fond of fruit to become a drunkard. He regarded the two tastes as antagonistic. If this be so, we ought to cultivate a taste for fruit by drinking juice rather than cider. As sulphite of lime is used to keep cider sweet, I would like to inquire what the action of the drug is when taken into the stomach? As its office is to absorb oxygen and prevent the cider becoming oxidized, I do not see why it would not, like phosphorus, interfere with the oxidation of the blood by absorbing a part of the oxygen taken in by the lungs. If it would have such an effect, to drink it would be equivalent to breathing a poorer quality of air.

I presume if cider could be kept sweet as long as desired, and then exposed to the air until the sulphite was changed to sulphate, there could be no objection to its use.

Those who know will please inform us who make cider, so we shall know whether to use the drug or not.

Charlotte, Me. H. A. SPRAGUE.

Scientific School at Princeton.

To the Editor of the Scientific American:

Knowing that the readers of your journal feel interested in the establishment of scientific schools, I feel sure that they will be glad to hear of a new one.

Last June $200,000 was subscribed by Mr. John C. Green, for the purpose of founding a scientific school in connection with Princeton College, and already a large building is in course of erection. The building will probably be completed and the scientific school in operation by September next. This school will necessarily be of great advantage to the college, as students in the academic department can take advantage of the scientific school, and *vice versâ*.

The want of the age has been an ideal education, an education not exclusively scientific, not entirely classical; but an education embracing, with its practicality and science, a fair degree of literary culture.

We seem to be progressing toward this education. Already Harvard and Yale have declared in favor of it, and now Princeton comes to the front. The day is not far distant when all our larger colleges will have scientific schools, and science will enter largely into their courses. M.

Princeton, N. J.

Inventions Wanted.

To the Editor of the Scientific American:

I would respectfully call the attention of inventors to the fact that three articles need to be invented, either of which will be a fortune to the successful inventor:

A spring to close doors slowly, without slamming.

A detachable metal or other tip for children's shoes.

A sewing machine chair attachment, to be attached to any chair to support the back of the operator.

AN INVENTOR.

THE STURTEVANT BLOWER AND ITS USES.

The air blast, as many are aware, was but a short time ago applied to but few uses; indeed, its whole employment was confined to furnaces and forges for working metals and in connection with steam boilers. Coarse fans or, in cases where an especially strong blast was required, ordinary pumps constituted the mechanical device. To supply this manifest deficiency, Mr. B. F. Sturtevant, of Boston, invented what is now known as the Sturtevant blower, and in 1867 obtained his first patent, which was subsequently illustrated with engravings in these columns. Since this date thirty patents upon the original form have been granted, and so widely has the manufacture become extended that it is now stated that no less than nine thousand blowers are in use. We have obtained from the above gentleman the following facts, regarding the various operations, etc., to which the different styles of the Sturtevant blower may be advantageously applied, and we believe that the information thus for the first time collected will prove an excellent means of reference for manufacturers and others, besides exhibiting the many uses to which this ingenious machine may be adapted:

The pressure blower may be used for supplying blast for forges, all kinds of furnaces for smelting, melting, heating and converting all kinds of metals and ores, ranging from the jeweler's blowpipe through the long catalogue of silversmiths', coppersmiths', and blacksmiths' forges. For forges and furnaces for manufacturing agricultural implements, hardware and cutlery, from the plow to the penknife. For blowing the furnaces in railroad and steamship building and repair shops, iron and brass founderies, Bessemer steel works, cast steel works, rolling mills for the manufacture of iron and steel rails, sheet iron and boiler plate and merchant iron. For making blasts for steam forges for forging shafts for steamships, anchors, etc.; and also for affording a blast for furnaces for smelting and packing gold, silver, copper and lead ores.

Exhaust fans are employed for removing shavings from planing and molding machines, sawdust and dust from sand wheels such as are used for polishing lasts, carriage spokes, shoe bottoms, felt hats, etc. and emery wheels for polishing all kinds of hardware, smoke and gas from smoky smith shops and manufacturing establishments and chemical works. Steam and vapor arising from paper machines and all drying cylinders and dry rooms; also sweat from millstones, offensive odors from try kettles and dyeing establishments, dust from rag and cotton pickers, flax and rope machinery, ventilation of coal mines and all underground apartments or cellars; also for exhausting impure air from public buildings of all kinds. Two of these fans are already in use in the United States Senate Chamber, and two in the House of Representatives, being driven by very powerful engines and capable of removing 1,800,000 cubic feet of foul air per hour.

Pneumatic despatch blowers are arranged for conveying and elevating packages and freight of all descriptions weighing from one pound up to two tuns.

Hot blast blowers are used for taking the hot volatile product of combustion from large boiler chimneys and forcing it into kilns for drying non-combustible materials such as fertilizers, brick, etc.

The hot blast machine (tubular steam heater and blower combined) is employed for heating the air with either live or exhaust steam and blowing it under beds of wet wool and cotton, and also cotton waste and wadding, into machines for drying wet cloth and hosiery, into kilns for drying lumber of all kinds such as are used in finishing. Also for doors, sash blind and carriage manufactories, piano and organ factories, staves for barrels, tubs, pails and clothes pins, brick, grain, tobacco, sliced fruit and vegetables of all kinds, chemicals, glue and gunpowder, and for drying leather and skins in tanneries. These machines not only supply the necessary heat for evaporating the water from the substance to be dried, but the great energy of the blast expels the moisture from the dry kilns, keeping them thoroughly ventilated and filled with dry hot air.

Erie Canal Navigation.

Navigation on the Erie Canal, New York, has closed for the season, and with it ceases the limit of competition for the State reward of one hundred thousand dollars, offered for the best form of canal boat motor, in lieu of horses. By the terms of the law passed in 1871, a reward of one hundred thousand dollars was offered for the device best suited, in the opinion of the Commissioners, as a substitute for horse towage. Competitors were to exhibit their improvements at their own expense, in working order, in boats carrying not less than 200 tuns of freight in addition to fuel and machinery; and they were allowed until the close of navigation of the present year to make their trials. Quite a number of boats have been tried upon the canal, some of which proved highly successful. The award of the Commissioners has not yet been made.

The closing of canal navigation compels about forty thousand men to seek employment during the winter at other occupations. Probably half a million more, who have worked on the rivers and lakes of the State, must soon look to something else for support, for the icy season is at hand.

In the aggregate, the canals of the State of New York are are eight hundred and thirty-four miles in length. The Erie extends from Buffalo to Albany, three hundred and fifty miles; the Chenango, from Binghamton to Utica, ninety-seven miles; the Genesee Valley from Olean to Rochester, ninety-five miles; a branch of the same, from Conesus to Danville, twenty miles; the Black River, from Rome to Carthage, including a distance of forty-two miles by river, seventy-seven miles; the Chemung, from Elmira to Montezuma, including a distance of thirty-five miles through Seneca Lake, eighty miles; the St. Paul's, a branch of the Erie, from Montezuma to Seneca Falls, thirty miles; and the Delaware and Hudson, from Honesdale, Pa., to a point on the Hudson River opposite Rhinebeck, about eighty-five miles of which are in the State of New York. These, in the season, are navigated by nearly 7,000 different boats, or an average of eight boats to each mile of canal. Of these boats the largest have each a carrying capacity for 225 tuns of assorted cargo, or 2,000 barrels of flour, or 9,000 bushels of grain. The smaller boats have a carrying capacity of 125 tuns, in proportion as indicated above. The average cost for the construction of the boats used is, for the larger, $5,000, and for the smaller, about $2,000. The average monthly cost of running, including tolls and towing, is about $800 per boat, which, it will be seen, involves a very large capital for simply the running expenses of a season. The men nearly all complain of the manner in which the canals have been managed by the State authorities, and express the hope, earnestly, that the next Legislature will inaugurate a reform. They charge the great falling off in the canal trade upon the failure to keep the canals in proper order, and the heavy tolls, by which, they declare, a vast business, which now seeks railway and other conveyances, has been driven away.

A London Fire.

On the day when Boston was burning down, a great fire was consuming the largest and what was supposed to be the most thoroughly fireproof building in London. This was the gigantic City Flour Mills, in Upper Thames street, near Blackfriars bridge.

From its extraordinary hight, it towered above all the other wharves and buildings in the neighborhood, and it had no less than 400 windows in and around it There were seven stories to it, each of them being divided into warehouses and machine rooms, and the quantity of grain that was continually kept in it was extremely large. The building was 65 feet wide and 250 feet long, one end fronting on the Thames and one side on a creek from the Thames, from which barges might be laden. The fire was discovered shortly before seven o'clock in the morning. Very soon thirty engines and upwards of 200 firemen, under the direction of four superintendents, were in attendance. The floating fire engines also appeared in due time and got as near to the burning premises as the condition of the tide at the time would allow. A capital supply of water was obtained, but the fire, in spite of every effort that the skill of the firemen enabled them to make, spread gradually through out the entire upper part of the building. The floors one by one gave way with a tremendous crash, throwing the entire weight of the contents on those beneath. Although, being daylight, no reflections of the flames were visible, yet as the fire became known the bridges and all the streets in the neighborhood were densely crowded. On the river also the floating engines were surrounded by skiffs and other small craft, all filled with spectators. The land engines played from every conceivable point round the building. Firemen stood on the roofs of high premises abutting upon the mills, and thence managed to pour, into the windows and apertures of the building, tuns upon tuns of water. Very little impression seemed, however, to be made, and the fire was likely to continue in that state for a day or two, owing to the immense bulk of the smouldering contents.

Preserving Charred Papers.

Mr. E. H. Hoskins, of Lowell, Mass., has suggested a very useful and practical way of preserving and giving toughness and flexibility to charred paper, which has proved to be of much importance in the identification and copying of valuable documents, charred by conflagrations such as the recent Boston and Chicago calamities. We have seen specimens of charred papers and bank notes, thus treated, that can be handled with impunity. The printing upon the charred bank notes can be readily discerned. The preserving process consists, we believe, in pouring collodion upon the surface of the charred paper. The collodion forms a thin transparent film, dries in a few minutes, when the process is complete.

PATENTS.

The present system of conferring patents upon inventions of public advantage, says Mr. W. R. Hooper, in *Appleton's Journal*, comes down to us from a transatlantic custom of very doubtful parentage. The English monarchs of the sixteenth and seventeenth centuries were wont to bestow on some royal favorite the privilege of the tanning of leather, the sale of salt, or other desirable monopoly. And when freedom, "slowly broadening down from precedent to precedent," had taken away this regal prestige, the same privilege might be acquired by him who could prove that his newly discovered invention would benefit the community. This wild graft of royal patronage, transplanted across the ocean, has burgeoned into one of the most beautiful branches of the tree of liberty. The Patent Office stands side by side with the common school as the ripened development of a distinctively American civilization. In literature, in commerce, in the arts of war, and in many such things, different nations may be our superiors; in a widely diffused education and in inventive genius for labor-saving machines, America leads the world.

As at present systematized, the grant of a patent is in the nature of a contract. Government says to every man of inventive skill that, if he will apply his mind and his capital to invention, and shall develop an improvement upon any existing "art, machine, manufacture, or composition of matter," he shall enjoy the benefit of his invention for the next seventeen years; at the expiration of that time the invention is to become the property of the public. So well is this contract appreciated that, short as has been our national existence, one hundred and ten thousand persons have already entered into it, and fifty thousand more applied and were rejected. The number of applications for patents steadily increases, as well as the objects of invention. These applications now arrive at the capital at the rate of twenty thousand a year.

It is the general opinion of those who study our patent system as a science that we are just on the verge of new discoveries that shall benefit the world more than any past invention. We have bridled the lightning and taught it to carry messages: but suppose the awful force of electricity, that can crush the hardest rock and bring a more tremendous power to bear instantaneously on a given point than any other known motor, should be as subject to our control as steam is! In that instant the motive power of the world is more than doubled. Within twenty years the burden of sewing has been taken off the mother and sister and put on the machine. Suppose the flying wind that hovers over our roofs should be imprisoned and so used that it should perform all our domestic labor before the airy captive should escape! There is no power on earth so great, so steady, so massive, as the tide. Twice each recurring day it lifts the whole body of sea water a number of feet into the air. It penetrates up every creek and stream and river, forcing the water to rise and overwhelm the solid land. Should this immense amount of tidal power, that envelops the whole world, become subject to the will of man and forced to do his bidding, we should have an instrumentality to bear the burdens of mankind infinitely more powerful and more general than anything now in use. We travel to-day on solid earth; should some of the numerous applicants for patents for the use of balloons or flying machines happen to succeed, and we should all take to travelling upon the wings of the wind, what would become of railroads and turnpikes and steamboats? Nor are these idle speculations. The employment of lightning, of wind, of tide, of air, will not seem so strange to our enlightened children as the telegraph, the sewing machine, the railroad, and the steamboat, seemed to their grandparents. The child may now be living who will yet see them all the willing slaves of man, joyous to do his bidding in the service of humanity.

The vast majority of patents contain no remarkable invention; they merely make some slight progress upon existing facts. Not in one great tide of invention does improvement come, but rather in small, gentle waves, each advancing almost imperceptibly further than its predecessor. And it is that slight difference that gives success to patents. The inventive mind is so constantly on the stretch that similar claims are constantly made by rival inventors. When petroleum first began to enlighten our darkness, there were twenty-five claimants at one time before the office, all asking for substantially the same mode of raising oil out of the solid earth. And when velocipedes so suddenly leaped into fashion a few years ago, four hundred and thirty-two applications for velocipede patents were filed within four months, and of these thirty-three were contemporary claims for the same idea. Every spring brings forth a crop of stove patents, each manufacturer preparing for the coming winter by striving to surpass his rivals in the prettiest pattern and the greatest warmth-giving power. Few persons think much of the form of the lamp they buy; yet lamp patents are renewed every year. At one time the student lamp, with an argand burner, yields its manufacturer a small fortune; the next year some fortunate genius notices that two wicks give an imperceptibly larger light than the argand; and the patent he obtains brings him prominence in all the lamp markets in the country. One of the most essential elements in patents is novelty; yet applications are continually made for patents based on ideas as old as the Christian era. Pliny, writing in the first century, describes harvesters for heading grain as then in existence on the plains of Gaul; and Paladius mentions them again in the fourth century; but both of these lacked some idea that would adapt them to general use. Tailors' machines were in smooth running order in Paris long before Hunt and Howe perfected the present invention. It remained for the Americans to lighten the domestic cares of the female sex throughout the world.

Most patent rights are limited in their application, and never attain a general circulation. But a patent of wide use, however small the royalty it pays, benefits the happy inventor with a large profit. Inventions for sewing machines, of which one company makes about three thousand a week, inventions for the use of India rubber, for agricultural implements, fire arms, and modifications of leather and paper, have accumulated fortunes. Nor is it possible to tell the extent of the ramifications of a patent. A few years since, all the dentists of the country combined to break an India rubbia patent; every one of them had to pay a royalty whenever he inserted a set of teeth in vulcanized rubber. Their combination failed, and the royalty still is paid. One of the most profitable patents ever issued in this country was for the manufacture of horseshoes. In England one of the most lucrative has been the Bessemer manufacture of steel. Most patents concern themselves with agricultural or domestic labor. In one year two hundred and twenty patents were granted for cultivators, two hundred and ten for plows, one hundred and eighty for churns, one hundred and seventy five for washing machines, one hundred and fifty-one for sewing machines, one hundred and forty for stoves, and another hundred and forty for gates. Nearly eighteen hundred patents have been issued for sewing machines and their attachments; and the applications for newer inventions come in daily.

For these applications for patent rights increase much faster than the population. In 1851 there were two thousand of them; in 1870 nineteen thousand one hundred and seventy-one, of which thirteen thousand three hundred and twenty-one were granted. Inventive skill does not depend upon education. Prussia is as well educated as this country; but in 1867 only one hundred and three patents were issued in Prussia, as against thirteen thousand in this country. Vermont has as good schools as Massachusetts; but the Bay State secures ten per cent of all the patents granted to the nation, while the Green Mountain State has less than one per cent. To quicken the inventive mind demands a large amount of capital engaged in manufacture, a skilled body of workmen, and a profit in the improvement of manufactures. Where these coexist, patents are in demand.

As a general rule, valuable inventions are the results of long years of close thought and much expenditure of time and money. Capital never offers itself to the inventor without the promise of an enlarged and speedy return. Nor do valuable ideas often enter the mind of the outsider on any subject. Abraham Lincoln was a very able lawyer of Illinois when in May, 1849, he obtained a patent for lifting steamboats over river bars; but it may be doubted if that patent has ever been used, or would have been applied for by a marine engineer.

Curiosities of Natural History.

We cull the following from a recent lecture in London by Mr. F. Buckland: He began by declaring that he was utterly opposed to the Darwinian theory of "development," and then explained the grounds on which his opposition rested. Man, he said, is unarmed, and his position of supremacy over all created beings taught him to invent what Nature had not given him, that is, weapons of offence and defence. The first instrument found by man is a common stone; this he cuts and adapts to his use till he makes knives, arrowheads, and hatchets, which afford him the means of securing his prey, making war on his enemies, and manufacturing other implements, such as wooden clubs, which could not be wrought without the aid of harder substances. He showed a massive club from New Zealand, which he recommended to the Chief of the Police as a preferable weapon to the "staff" used by the policemen: though he believed that such an unwieldly affair was used rather as a sign of authority—by the Lord Mayor of New Zealand perhaps—than as a weapon of warfare. In contrast to this large club, Mr. Buckland exhibited some small South American arrows, or puff darts, only a few inches long, and poisoned with some mysterious matter called wourali, which he believed might be snake poison. These arrows are blown through a small tube, and are so deadly that the moment anything is struck by the arrow it dies. The *virus*, however, is only fatal when mixed with the blood externally, and an animal thus killed has no ill effects on the person eating it. Thus from flints—a fine specimen of which, found among fossil elephant bones at Hoxne, in Suffolk, was exhibited—through clubs and arrows, man has gone on inventing weapons till he has now the deadly Snider, with which we civilized people are as ready to kill one another before we have ever seen each other, as the savages of Africa or of the South Seas with their less refined weapons.

Animals, on the other hand, have their arms found for them. Witness the lion, with his teeth and claws; the viper with its poison fangs; the elephant with his tusks; the torpedo with its electric battery. Man is not descended from a monkey. What monkey ever invented a weapon? Mr. Darwin has mistaken the law for the by law. It is true that from the sponge, the lowest in the scale of created organisms to man, there is a certain similarity of structure. Mr. Buckland showed by a simple diagram the ascending scale of creation, from a sponge—a simple stomach—upwards through the various classes to the head of all, man; but, he added, between man and beast, between man and monkey, there is a hard line drawn—a great gulf fixed. When a monkey walks as upright as he can, he is in a stooping position; his hands hang down, and he never raises his arms except to seize some support. When a man in the circus, or in the street, tries to imitate a monkey, he throws his arms up in the air—which a monkey never does. *Os homini sublime dedit.* The similarities in structure exist, but they exist through design, through a special adaptation of them to the various conditions of the animals possessing them, and are no more caused by "development" than a hungry man's appetite is satisfied by wishing for something to eat.

The cast of an immense hand of a gorilla was passed round, and Mr. Buckland asked if any young lady would like to honor her "poor relations" by accepting such a hand. It measures nearly six inches across and eleven inches long.

Speaking of poisoned arrows leads us to poisonous snakes. Mr. Buckland said he could not understand the antipathy that existed in man's mind against snakes. Some years ago he was entertaining some natives of New Zealand at his house—not that he could speak New Zealand to them, or they English—but, after conversing with them by means of roast beef and plum pudding, he produced a dead snake. Such things as snakes do not exist in New Zealand, and probably none of his guests had ever seen one before; but immediately it was produced they drew back, and raised a loud shout of fear, thinking that some harm would befall them. We might be allowed here to suggest that we have, in this dread that man has of snakes, another indirect proof of the truth of Holy Writ—that the "enmity between the seed of woman and the seed of the serpent" exists in reality, and will exist as long as the curse lasts.

But to return to the lecture. Mr. Buckland explained the controversy which has been raging, and which has been recorded in *Land and Water*, about "vipers swallowing their young," and showed a box containing a family of the father and mother and seven little vipers, which he excited great laughter by stating he was doing all in his power to induce to swallow, or be swallowed, though he doubted if they would do it to oblige him, any more than he would swallow his young to oblige any one else. He then exhibited casts of various species of venomous and non-venomous snakes, and a large skin of a boa constrictor, 16 feet long, showing the beautiful markings of the animal. He then passed round a preparation showing the poison glands and fangs of a viper *in situ*, explaining that when a snake attacks its prey it does not bite, but pricks it, allowing the *virus* to run down the fang or tooth, which is hollow, into the puncture. A short time since a rattlesnake died at the Zoological Gardens, and Mr. Buckland took the rare opportunity thus offered of making experiments to test the nature of the poison. The appearance presented by the *virus* when examined through the microscope was very peculiar, the liquid crystallizing very rapidly and throwing out *spiculæ* or radiating lines, similar to the coruscations of the aurora borealis and representing most probably the darting action of the poison when injected into a wound. The snake who was the object of this unique discovery was in its death a warning against greediness; it had had two guinea pigs given it one day for its dinner, and instead of eating one at a time, as a good rattlesnake would have done, it swallowed both at once and died, and so fell a victim to gluttony and guineapigism." Apropos of the food of snakes, the lecturer explained why they are fed with white mice instead of brown ones at the Zoo. He had often heard ladies exclaim: "How cruel to feed the horrid snakes on the pretty white mice," while the common brown mice in such a case would have received no pity. A brown mouse, if the snake does not eat him, will eat his way out of the cage, and thus show his gratitude to the snake for not devouring him by making an aperture through which Mr. Snake can also make his exit, while a white mouse will not attempt such a burglarious mode of escape. But why should the white mouse be pitied in such a death more than a brown mouse?

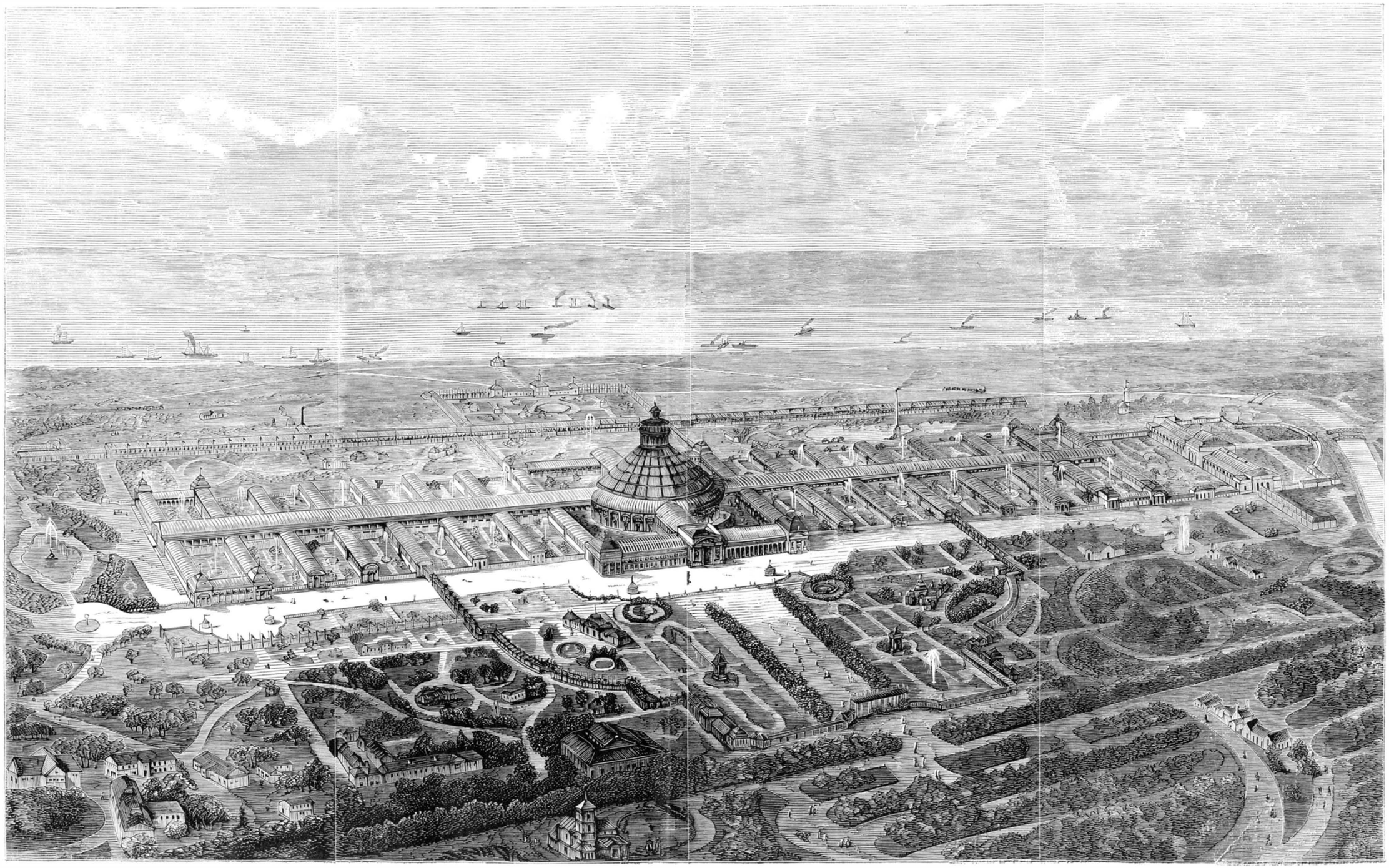
The Man of Long Life.

He has a proper and well proportioned stature, without, however, being too tall. He is rather of the middle size, and somewhat thick set. His complexion is not too florid; at any rate, too much ruddiness in youth is seldom a sign of longevity. His hair approaches rather to the fair than the black; his skin is strong, but not too rough. His head is not too big; he has large veins at the extremities, and his shoulders are rather round than flat. His neck is not too long; his abdomen does not project; and his hands are large, but not too deeply cleft. His foot is rather thick than long; and his legs are firm and round. He has also a broad, arched chest, a strong voice, and the faculty of retaining his breath for a long time without difficulty. In general, there is a complete harmony in all his parts. His senses are good, but not too delicate; his pulse is slow and regular.

His stomach is excellent, his appetite good, and his digestion easy. The joys of the table are to him of importance; they tune his mind to serenity, and his soul partakes in the pleasure which they communicate. He does not eat merely for the pleasure of eating, but each meal is an hour of daily festivity; a kind of delight, attended with this advantage, in regard to others, that it does not make him poorer, but richer. He eats slowly, and has not too much thirst. Too great thirst is always a sign of rapid self-consumption.

In general, he is serene, loquacious, active, susceptible of joy, love and hope; but insensible to the impressions of hatred, anger and avarice. His passions never become too violent or destructive. If he ever gives way to anger, he experiences rather a useful glow of warmth, an artificial and gentle fever without an overflow of the bile. He is fond also of employment, particularly calm meditation and agreeable speculations, is an optimist, a friend to Nature and domestic felicity, has no thirst after honors or riches, and banishes all thoughts of to-morrow.

AT the Zoological Gardens, London, a recent event of some interest is the birth of a hippopotamus. The babe is three feet six inches long, weighs one hundred pounds, and is of the color of a polished mahogany dining room table. It suckles continuously, and enjoys life very much



THE BUILDINGS OF THE VIENNA EXPOSITION.—(See page 376.)

IMPROVED HOT BLAST OVEN.

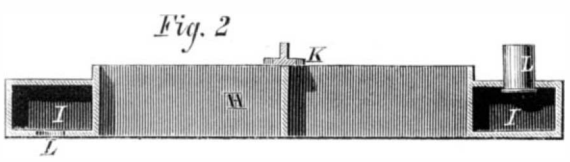
The invention herewith illustrated is an oven for heating the air supplied to blast furnaces. The various portions are constructed with a small weight of metal, and in such a manner as to provide against lateral and vertical deflection under a high degree of heat. By suitable means the gases which do not support combustion are allowed to escape, so that the oven may be heated by stone coal or similar fuel.

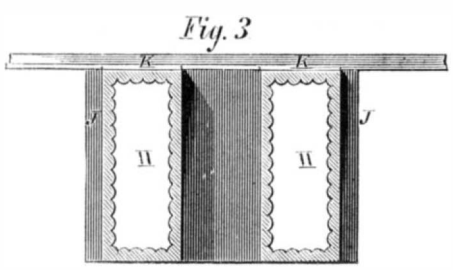
Fig. 1 shows the device, with parts broken away to exhibit the interior arrangements. Fig. 2 is a vertical, and Fig. 3 a horizontal section of a heating tube. The base of the oven is divided transversely by the partition, A, and longitudinally by the partition, B, into compartments. In the two chambers in front of partition A are the fire grates and ash pits, as shown through the broken away wall, immediately above which are perforated metal arches, one of which is represented at C. In the partition, A, are two openings, as at D, provided with dampers and regulated by a lever, E, outside of the side wall. The object of these orifices is to furnish a means of escape for the gases into the empty compartments in rear of the base.

The upper portion of the oven consists of four metal columns at the corners, which rest upon frame plates. On these columns are cleats, which support the ends of the bars or shelves, F, on which the heating pipes rest. The other extremities of the bars are held up by similar cleats on the middle column, G. Each heating pipe is divided into two narrow branches, which connect at the ends in single chambers, I. This arrangement is shown in the pipes lying beside the oven, Fig. 1, and also in the sectional views, Figs. 2 and 3. A vertical bar or stay is placed at the middle and between the two branches, so as to keep them firmly in position. The ribs, J, on adjoining tubes, fit closely together so that one pipe affords lateral support to the other. At K, on the upper side of the pipe, are fastened cleats which form a groove or recess running across the top of each tier of pipes when placed in position on the bars. In this groove is shoved a T shaped rail, the upper edge of which comes in contact with the lower sides of the next tier of pipes above, thus affording a firm support and preventing vertical deflection.

The inner surfaces of the pipes are corrugated, as in Fig. 3, thus giving a greater heating space and increasing the lateral strength. At the upper side of one end of each pipe is placed a vertical tube, L, which connects with the under side of the similar end of the pipe next above. The pipes in position are shown at H, Fig. 1, and are contained in the two chambers formed by the extension of the partition, A, to the top of the oven.

M and N are cast iron chests secured under the frame plate. The opening in M serves to admit the air which passes from the chest up through one set of heating pipes and thence to one of the metal boxes, O. Passing through the connecting tube, P, the blast descends through the other system of pipes, and thence into the box, N, through the opening, in which it

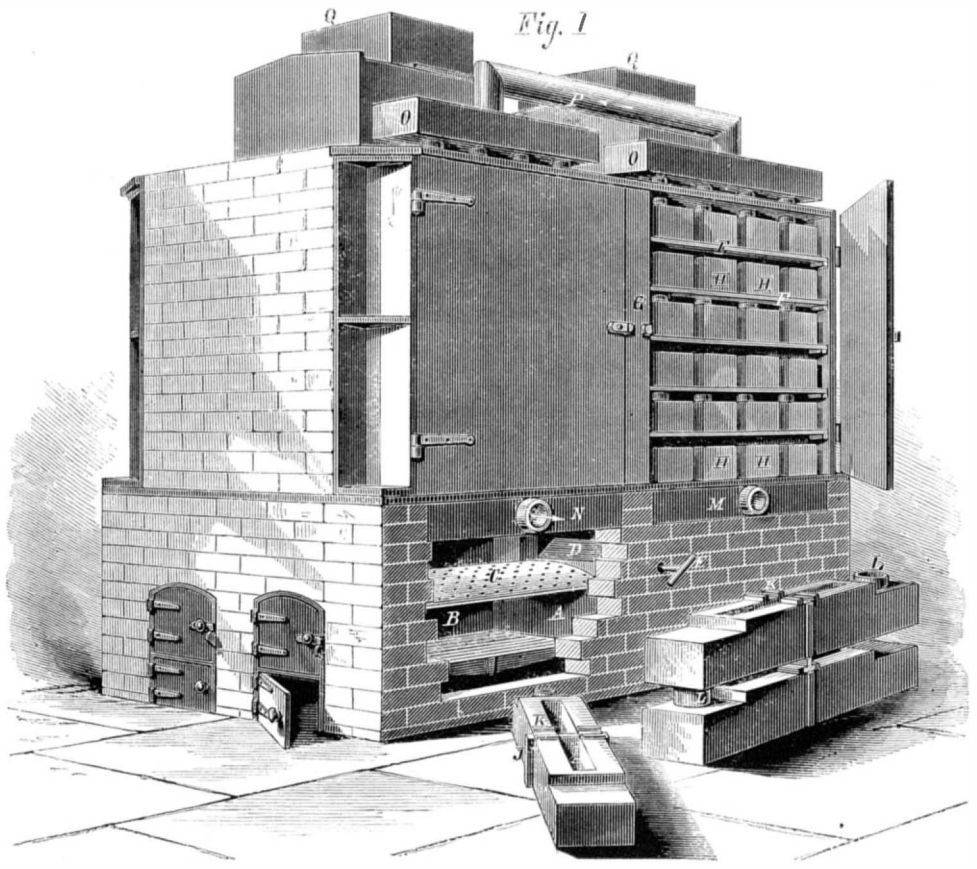




is discharged in a heated condition to the tweer. The arch of the oven is of fire brick with openings in the center, to allow the passage of smoke, etc., out of the chimney, Q Q.

The advantages claimed for this device may be briefly stated as follows: The peculiar shape of the heating metal which affords a large area of heating surface in proportion to the number of joints and weight of iron; the construction of the interior of the heating pipes so that some portion of every cubic inch of air within them is in contact with the heated metal; the facility with which a change of pipes may be effected without stopping the furnace and cooling down; the arrangement for carrying away impure gases and supplying the furnace with pure air, so that the latter can at all times be kept at regular work without change of burden; corrugating the surface of the heating metal, thereby increasing its facility for absorbing heat; the shape of the heating pipes as insuring durability at a high temperature.

Patented Sept. 3, 1872. For further information address the inventor, Mr. Jesse Young, Trigg Furnace, Trigg County, Ky.



YOUNG'S HOT BLAST OVEN.

Drawing as an Educator.

In a recent address before the Teacher's Institute, Connecticut Mr. Northrop gave many interesting particulars concerning the comparative progress and condition of education in Europe and this country. He considered that we surpassed Europeans in school architecture; no city in Europe, he said, equaling Hartford in this respect, and in arithmetic, in which our methods of computation are more quick and accurate. Yet they may be regarded as in advance of us in the following particulars: 1. More thorough supervision of schools; 2. Plan of gradation; 3. Culture of the expressive faculties (Americans have a few set words and phrases which are made to do duty on all occasions, without reference to propriety or congruity); 4. Independence of text books. They teach the subject rather than the book, the matter rather than a letter, and their teaching is more conversational; 5. More thorough teaching of history; 6. Mode of teaching modern languages; 7. Drawing. The swiss are in advance of all other countries in this art. To this their general prosperity was owing. Hemmed in among the mountains, they own their own houses and are more prosperous than many other countries with better advantages.

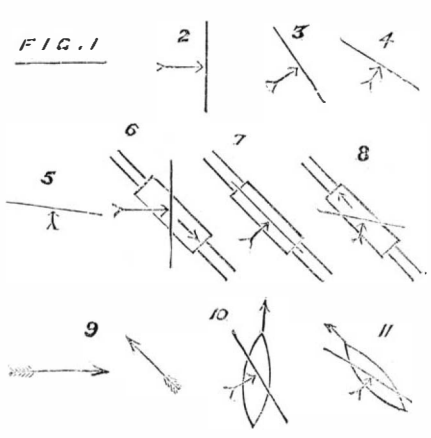
England pays five times as much for pauperism as for education, while Swizerland pays seven times as much for education as for crime. Drawing has chiefly made this difference. Mr. Northrop urgently counselled all the teachers to teach every one of his or her scholars drawing, even if they had to neglect other studies.

HOW A VESSEL SAILS AGAINST THE WIND.

We have been asked by a naval officer of high standing in her Majesty's service, who is well known as a sailor and a writer on seamanship, says *Naval Science*, to explain in a popular manner, and for the benefit of unscientific seamen, why it is that a ship is able to sail close to the wind and thus travel in a direction which is apparently opposed to the action of the force which is moving her. He says that, although most persons accustomed to the sea are aware of the fact, they are perfectly unable to comprehend it; and the scientific explanation by means of the resolution of forces does not help them out of their difficulty at all. This phenomenon is repeated many times in the day within the experience of numbers of seamen and people who live near the sea, and to some minds the observation of a constant repetition of this unaccountable circumstance becomes positively irritating. After such good reason being shown, we cannot refuse what little assistance we may be able to give towards clearing up this mystery, and shall proceed to give an illustration that we think may enable the action of the wind upon a ship when she is sailing to windward to be understood. In considering this subject in the simplest manner, let us separate the action of the wind upon the sail from the action of the sail upon the ship, and treat of each independently. Let us first consider the action of the wind upon the sail, and let us suppose that the wind always blows across the page from left to right, as in the direction of the horizontal arrow in Fig. 9. And let us, for the sake of simplicity, consider the case of a single sail upon a mast. Now, we shall take it for granted that every seafaring man will admit three things: 1st, that the wind, blowing steadily in one direction, will not press upon the sail at all if the sail is set with the edge to the wind; 2d, that if the sail is set in any other position, the wind will press more or less upon it; 3rd, that the wind will press most upon the sail when it is set across the wind, and that it will press less and less upon it as the sail is turned away from this position. For instance, with the wind blowing steadily as arranged (across the page from left to right); if we set the sail as in Fig. 1, the wind will not press on it at all; if we set it as in Fig. 2, the wind will press upon it with its full force: if we set the sail as in Fig. 3, the wind will still press upon it, but will press with very little force indeed. Let us draw thick arrows to represent the pressures of the wind on the sail in these different positions; that in Fig. 2 shall represent the full force of the wind on our little sail when set right across the wind, and the others shall get shorter and shorter as the sail is turned more and more away from the wind, and as the force consequently decreases. In Fig. 1 there is no arrow at all, because the wind does not press on the sail at all.

Now, let the reader carefully bear in mind that these little arrows represent the total effect of the wind upon the sail. There is no other effect upon it worth considering here. In Fig. 2, all the wind is effective upon the sail; in Fig 3, part of the wind's force is lost by slipping past the sail, so to speak; in Fig. 4, more of its force is lost in this way, but there is still a considerable pressure exerted against the sail; but in Fig. 5, nearly all the force, and in Fig. 1, quite all the force, is lost. But what we wish to impress is that the sail in Fig. 4, for example, is acted upon just as if a lighter wind than that actually blowing across the page were blowing in the direction of the arrow; and similarly in all cases, and under all circumstances, a wind blowing in one direction will act upon a sail which is inclined to it, just as a lighter wind blowing directly against it would act.

Let us now hoist our little sail upon a light railway truck, and place this truck upon a railway lying diagonally across the wind's path, as shown in Fig. 6. Here the sail is set in the same position as it is in Fig. 2, and the effect of the wind upon it will obviously be to propel the truck down the railway in the direction of the small arrow. It is also clear that if we set the sail in the truck in the position shown in Fig. 3, the effect of the wind would still be to drive the truck in the same direction (down the rails), but it would go more slowly, because, as we have seen, the force acting on the sail in Fig. 3 is less than that acting in Fig. 2. But supposing we now set the sail on the truck so that the sail stands along the truck, parallel to the line of rails, as in Fig. 7, we shall get no motion of the truck, because the pressure of the wind upon the sail will now be exactly across the railway, and the sail will be pressing the truck in that direction. The truck will not be forced either up the rails or down the rails, but across them only, and therefore no motion will ensue. Let us now turn the sail still more away from the wind, and set it upon the truck in the position shown in Fig. 5. The wind as we have seen, will press upon the sail, but with very reduced force. This case is represented in Fig. 8. Now we here see (Fig. 8) that although the wind is still blowing across the page, the effect of it is to press the sail almost directly up the page, and it is easy to see that the effect of the sail will be to propel the truck up the railway in the direction of the small arrow. Here, then, we have a railway truck literally sailing up to windward, because while the wind is blowing in the direction of the one arrow the truck is moving in the direction of the other; see Fig. 9.



Now this railway truck illustrates very fairly the case of a ship, with this exception, namely, that the truck can make no leeway; the rails prevent this. But a ship can and does make leeway, and therefore cannot sail so near to the wind as the truck. It is obvious, however, that the same general principles apply to the ship as to the truck. For example, let us take the case of the sail shown in Fig. 3, and set it upon a ship, as in Fig. 10; it is clear that the ship will sail away easily enough in the direction of the small arrow, which is at right angles, or square, to the direction of the wind, which we still suppose to blow across the page, but which takes effect upon the sail in the direction of the other arrow. Or, let us take the case of the sail set as in Fig. 4, and set it similarly upon our little ship, the wind taking effect as in Fig. 11. Is it not obvious that, just in the same way, and for the same reason, as the railway truck in Fig. 8 was driven up the line, so in the present case, Fig. 11, the ship will be driven in the direction of the small arrow, which is manifestly to windward? The only difference between this case and that of the railway truck is that, while the ship is

driven ahead, it will also be driven somewhat to leeward, which the truck was not; but this consideration only affects the amount of the ship's progress to windward.

THE BUILDINGS OF THE VIENNA EXPOSITION.

The bird's eye view herewith presented, of the vast building now in process of erection in Vienna, will convey as good an idea of the magnitude and splendor of the preparations for the World's Fair of 1873 as is possible in so small a space. The site chosen is the Imperial Park or Prater, along one side of which extends the new channel of the Danube, while on the other runs the Danube canal—a portion of which is seen at the right of our illustration—which separates the Park from the city, so that the Exhibition will lie in convenient propinquity. Great avenues, to permit of ample access and circulation, have been made, the principal of which, the Haupt-Allée, extends in front of the buildings, and through the Park from end to end. The grounds have been beautifully laid out, sheets of water added, buildings removed, and every resource of ornamental architecture and landscape gardening lavished in their decoration.

The central rotunda, with its conical roof, occupies the most prominent position in the view presented. This building will be filled with the choicest objects of the trophy character that the exhibiting nationalities can supply, and will doubtless present a *coup d'œil* of surpassing grandeur. It springs from the ground, a circular façade of piers of no less than 426½ feet in diameter, with Roman-Doric columns at either side, and connecting arches filled with glass. Within this is a gallery fifty feet wide, covered with its own roof, while above rises the great arcaded circuit. The large lantern seen above the roof is 105 feet in diameter, and is surmounted by a second lantern and cupola fully 300 feet above the ground. The rotunda stands in the middle of the grand quadrangle, which is 755 feet square. The vast central gallery or spine is 2,985 feet long, and the vista from end to end will probably be as much as even the condition of a Viennese summer atmosphere will enable the unassisted eye to discern objects clearly through. The width of this great hall is 82 feet, and its hight from floor to wall plate 52½ feet. The cross galleries are 250 feet in clear length by 49 feet in width; the open spaces between them will be laid out as gardens, in accordance with the taste and styles of the various nationalities to which they will appertain. The great picture gallery occupying a position to the southwest of the main building, and quite detached from it, with a length exceeding 700 feet, will probably, while it consists, be the most magnificent fine art collection in the world.

The machinery annexe is a substantial brick building, shown in our illustration to the rear of and parallel to the central gallery. It is intended to be permanent, and after the Exposition will be used for mercantile purposes in relation to the adjoining Danube quay. The extreme length is 2,614 feet, and the width nearly 155 feet in the clear. The side walls consist of brick piers, running up to the roof, with segment arching between, at a level to suit the side buildings. Ample means of lighting and ventilation are provided. Boiler houses are constructed at various points along the length of the building, and steam and water introduced from end to end. Down the gangways, at the sides of the central span, are to be laid lines of rails of the ordinary gage, so that exhibits can be brought right into the building on the railway trucks, lifted from the latter by traveling cranes, and deposited in their places. Altogether the arrangements of this portion of the Exposition are admirably planned, and the view which will be presented from the gallery—a range of machinery in motion extending for nearly half a mile—will be something which has never been previously witnessed.

Directly on the northeast side of the machinery building will come in the terminus of the North Austrian railway, and by proper sidings, etc., with a complete system of turntables, immediate connection will be obtained, not only with the rails within the building, but with nine other lines of way, each extending the whole length of the exhibition. Exhibitors will thus be enabled to bring their goods, without the risk of unloading, right up to the specified localities.

The thirty-two transverse galleries are destined for the reception of the lighter articles of industry, and the assignment of divisions to the different nations corresponds to their geographical situation, the extreme eastern division being given to India and that furthest west to America. Opposite the south end is a series of buildings for the use of the Sultan. West of this a large and fine building, in the Egyptian style of architecture, for the dwelling of the Viceroy, is in process of erection. In different places about the grounds are small buildings for fire apparatus, and barracks are being erected for the quarters of the troops stationed as guards.

The work on the buildings and grounds began last February, and has progressed as fast as the labor of six thousand hands could make it. The Austrian method of working is exceedingly slow and, from the description of the correspondent of the Boston *Globe*, according to our ideas, rather comical. It is stated, as an example, that a number of piles had to be driven, on account of the bad quality of the ground; instead of putting on an engine and driving the pile, a tripod is rigged with pulleys at the top, from which some thirty ropes radiate. These thirty ropes are grasped by thirty men, and the weight pulled up a little way; then all hands let go. The weight falls, and they begin again, so that thirty men take three hours to do what Yankees would do in ten minutes. Labor, however, in Austria is so cheap that money is actually saved by the adoption of this shiftless method.

Each gallery will have, on the outside, the arms of its nationality, and Austria's sections are already decorated. There still remains very much to be done in the interior, but in the eastern half of the Haupt gallery the flooring is already laid, and in the Austrian section the interior decoration is well under way, and is very pretty. Columns, a few feet apart, throughout the entire distance of the small galleries, extend from the bottom to the top. The base is square, of the color of oxidized silver, and upon this a round column, of a red color, with gilt figures terminating in a scroll work and capping of silver. Upon each of these columns is a staff bearing the Austrian Eagles all very heavily gilded, while in the center is a bronze wreath, in which are the letters W. A. (*Welt-Austellung*, the German for World's Fair). Most of the windows have been put in, and the east wing glazed, and several of the rotunda supports raised and fastened in position.

It is hoped to have the building quite finished and ready for the reception of articles by the middle of February, 1873, and it is expected that the outside staging will all be taken down before the cold weather sets in.

HOW TO MAKE MONEY BY PATENTS.

Charles Barlow, patent solicitor, London, England, has recently issued a pamphlet with the above title, designed to give patentees useful hints and suggestions how to render inventions profitable to the patentee and useful to the community. The writer commences with the following trite remark, which is as applicable to our inventors as to the English patentees to whom it is specially addressed:

To render patents profitable to their owners, it is requisite that the inventions for which they are taken should be new and useful, that the patent and specification should correctly describe and ascertain the nature of the discovery, and then that the patentee should judiciously put the invention into practical operation.

There may be said to be four ways of commonly dealing with a patent. The first mode is for the patentee himself to put the invention into practical operation; the second plan is to grant licenses for its use; the third is to dispose of the whole right; and the fourth is to divide the right into shares, and dispose of part of them; but the powers and privileges of the grant permit of a variety of dealings, including mortgages. Unquestionably, the preferable mode is for the patentee himself, if possible, to initiate the practical introduction of the invention into the market. If he possesses the requisite capital and knowledge of the trade, he can introduce it more advantageously to public notice than any other person, because he can best combat the difficulties which are likely to spring up, and soften down the asperities which generally are excited by the appearance of a new competitor for public favor. Fortunate is the patentee who is able to manufacture his patented articles without extraneous assistance,—who can appeal to the public at large, who, in the long run, adopt whatever is practically useful. Not a few novices in patents fall into the error of demanding exorbitant prices for their merchandise: they assert that there would be little advantage in a patent did it not enable the owner to gain high profits. Certainly a higher profit than is usually made in trade is due to the patentee who is taxed for his privilege, and who has to incur heavy expenses in experiments, models, and trials. But sound policy will dictate moderation, and the patentee will find it to his real interest to cultivate an extensive trade at fair and reasonable prices. The effect of placing too high a price upon the articles is to prevent trial of them, and it should be the object of the patentee to promote by all means in his power a speedy demand.

NOVEL MODE OF EXCITING A DEMAND.

In general it will be necessary for the patentee to stimulate demand. When Day and Martin first introduced liquid blacking, they hired a number of men, and equipped them in the garb of livery servants. These men were continually asking the apathetic shopkeepers for the celebrated liquid blacking, and would purchase no substitute. When tradesmen found, as they thought, that the nobility and gentry required the article, they gave orders for it, and when they kept it in stock, they recommended its use, and so the compound came at last into general use.

The more feasible, and certainly more commendable plan now, is to gain publicity by advertising. At the time when Day & Martin commenced, advertising was considered disreputable: tradesmen were not then accustomed to expend two or three thousand pounds in placards, or five or six thousand per annum in advertising in newspapers; neither did billstickers keep their carriages as they do now.

ADVERTISING.

In these times advertising is all powerful, and the patentee must not fail in this respect.

In addition to direct advertising, which, to be permanently beneficial, must be systematically and constantly adopted, the author then proceeds to name the different journals devoted to mechanics, mining, engineering, building, etc., published in London, in which he recommends patentees to advertise and have their inventions illustrated, selecting such papers as relate most intimately to his invention.

PUBLIC EXHIBITION.

A favorable opportunity of obtaining wide publicity occurs when a patentee is enabled to inaugurate the commencement of his operations by a public exhibition or experimental trial, to which he invites the reporters of the press. After showing them over his works, and exhibiting to them specimens of his new manufacture, he should supply the reporters with a printed statement of the nature of the matter, and then conduct them to a suitable entertainment. He will be assuredly repaid by the notices which will follow.

LICENSES.

There is a large class, however, who cannot themselves bring out their inventions, and who, consequently, sell the whole or a portion of their rights, or seek for purchasers of licences. In most of the staple manufactures, such as iron smelting, steel making, sugar refining, cotton, wool, and flax spinning and weaving, larger returns will be obtained by granting licenses than by a sale to any one firm. Licenses under letters patent may be exclusive, perpetual, limited, and general. An exclusive license amounts almost to a cession of the patent, and ought only to be granted under terms nearly equivalent to its purchase. Where a royalty is covenanted to be paid, a stipulation should be made for a fixed minimum amount per annum, otherwise the licensee can only be held liable to pay on the actual manufacture, and he may think proper to cease manufacturing. Probably all license deeds reserving royalties should contain a stipulation as to net amount of royalty to be paid annually, and in default of payment of that sum that the license should revert to the patentee.

STOCK COMPANIES.

As a means of obtaining capital for the development of inventions, it is a good plan to divide the patent into shares of, say, eight, sixteen, or thirty-two; the owner retains a quarter or half share and finds less difficulty in raising capital from a few persons in small sums, than a large amount from one or two. These shareholders, or joint proprietors, acquire no right to work the patent; they simply receive their share of any profit which may arise from its being worked by the patentee, or from licenses, or from the sale of the privilege. In this manner those much envied and sought for individuals, called capitalists, are induced to invest their spare funds in aid of poor inventors, to mutual advantage.

SEARCH FOR CAPITAL.

Capital will not in general go in search of the inventor; he must therefore go in search of capital.

Whatever is good, or valuable, or excellent, must be sought for early and late, in season and out of season, and the inventor who seeks capital must gird up his loins and vigorously set out on his search. Before doing so, he should provide himself with the best made model or specimen which his means will allow. Inventors often fall into error in this respect. They content themselves with an ill constructed, clumsy, defective model, of the most crude and paltry order, or exhibit imperfect samples which show defects rather than advantages. If to this be added a dirty drawing and a written prospectus, the picture of the equipment of many inventors for their journey in search of capital will be complete. With this drawing under the arm, and a unique model or specimen in the pocket, they journey on sometimes for months, and sometimes for years, and seldom without accomplishing their object in the long run, although by better management they might considerably shorten the term of their pilgrimage. They seem to have but one idea, and that is to benefit the world by the introduction of their invention, until which event occurs mankind, in their opinion, will remain in a state of semi-barbarism. They would, however, greatly facilitate the acquisition of their desires by devoting more attention to the preparation of whatever may be necessary to induce men to form a favorable opinion of the invention.

A pleasing model, correct in detail, made to scale, and well finished, serves to persuade and to silence objection; and if drawings are shown, they should be neat, and the prospectus or description always printed. When it is sought to interest some person with capital at command to take a share with a view to putting the invention into operation, or to enable a patent to be procured, the search may be made in any direction. Perhaps the least likely to aid are those connected in any way with the trade affected by the subject matter of the invention.

GETTING IN THE FIRST WEDGE.

The first object should be to induce some one, on payment of a nominal royalty, to commence manufacturing, and if the results are satisfactory, the area of operations may be readily extended. The trade should be addressed and canvassed personally if possible, or by a fitting representative; and this time after time, until some tangible result follows.

The patentee who is intent upon and determines to carry out his invention will not fail to visit personally the largest manufacturing houses, and in general will not visit them in vain. Although he may be a stranger and unacquainted with the details of the trade, if he possesses a clear head and a practical invention, he will meet with courteous attention, and carry his point.

HOW AMERICANS DO IT.

The author has frequently witnessed the successful manner in which American patentees dispose of their inventions in this country. They literally come, and see, and conquer all difficulties. They usually come well primed. They bring with them machines that will work, or a dozen rifles which will shoot with accuracy. They proceed to visit the center of the trade they wish to deal with, and by perseverance, energy, and tact, they succeed in accomplishing their object. Cannot Englishmen follow their example? How few do!

PHILANTHROPIC ASSOCIATIONS.

At any time within the last twenty years there has been in existence some society or association professing to be animatmated by the most philanthropic sentiments towards inventors. It is true such societies have sprung up like mushrooms, and have generally as quickly withered; but, generally speaking, some such affair is before the public, making a great parade of its efforts to aid inventors and to amelior-

ate their hardships. Under the guise of philanthropy, the object of most of these associations has been to carry on the business of patent agency with a view to their own individual benefit. Of fair competition no one has a right to complain; but that species of hypocrisy which masks itself under the name of philanthropy, while it seeks only self-aggrandizement, ought to be denounced and exposed; and inventors may rest assured that no society ever existed, or does exist, which was or is capable of benefitting them in the slightest degree. And inventors will best consult their interests by avoiding dealings with philanthropic patriots who would fain use inventors in the same manner that the monkey used the cat.

The author discusses in his pamphlet the English system of granting patents, and thinks that all patents should be granted for a longer period.

Lastly: All patents should in future be granted for the term of 17 years. This is the term which Congress a few years ago enacted that United States patents should enjoy. However good and valuable an invention may be, there is, and generally speaking almost always must be, considerable difficulty in introducing it. Its initiatory stage is seldom profitable; and in the remaining years of the 14, there is oftentimes not time enough to permit the owner to recoup his expenses, to say nothing of remunerating himself for years of labor and anxiety. One of the first patents taken in this country for sewing machines remained dormant for seven years, because there was no demand for the article; it was in advance of the times, and numberless instances might be quoted where similar delay has occurred. The copyright of a book or a play or a piece of music extends during the lifetime of the author, and for some years after his decease; does it seem too much to ask for 17 years copyright of a new locomotive, or loom, or propeller, or electric telegraph? If any country in the world can afford to be generous as well as just to inventors, it surely is this, which enjoys unparalleled prosperity, due in a great measure to the efforts of inventive genius.

NEW FIREPROOF CONSTRUCTION.

The *Building News* publishes the following description of an invention in which iron or steel, hollow earthenware and concrete or cement are the materials employed in combination. The walls, partitions, floors and roofs are constructed of cells of metal in which are placed earthenware pipes, the sides of which are splayed outward at the base to form a skewback. The pipes and iron flitches are bolted together so as to constitute composite girders. Between each skewback, an earthenware hollow pipe with oval shaped head and flat soffit, channeled and indented to receive the plaster of ceiling, is placed, with sufficient room left between the composite girders to receive a charge of cement concrete. The upper surface of the floor is leveled and covered with strong cement grout. Holes are left in the soffits of the hollow pipes for ventilation, and the pipes themselves may be utilized to convey warm air through the building. In walls and partitions, the iron and steel lengths are placed in a vertical, in floors, in a horizontal, and in roofs in an angular position.

In partitions, wire is used instead of lath to receive the concrete and plaster. The proportions of the concrete are six parts of broken brick, slag and sand, and one of cement, well mixed. The floors are made in one body and not in layers. This method is said to be cheap, to require no skilled labor to construct, to furnish thorough ventilation, and to require comparatively no repairs.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of September, 1872:

During the month, there were 988 visits of inspection, by which 1,990 boilers were inspected—1,929 externally, and 500 internally—157 were tested by hydraulic pressure. The defects in all discovered were 1,020, of which 292 were regarded as dangerous. These defects were as follows:

Furnaces out of shape, 42—9 dangerous; fractures in all, 110—53 dangerous; burned plates, 61—25 dangerous; blistered plates, 103—15 dangerous; cases of sediment and deposit, 196—9 dangerous; incrustation and scale, 191—10 dangerous; external corrosion, 70—29 dangerous; internal corrosion, 25—6 dangerous; internal grooving, 7—3 dangerous; water gages defective, 60—18 dangerous; blow-out defective, 26—24 dangerous; safety valves overloaded, 34—19 dangerous; pressure gages defective, 119—22 dangerous, varying from —5, to+20. Boilers without gages, 13—all dangerous, as they were being used at high pressure; deficiency of water, 3—2 dangerous; broken braces and stays, 40—29 of these cases left the boilers in unsafe condition; boilers condemned, 12.

The Force of Nitro-Glycerin.

The torpedoes of Roberts & Co., used in the oil regions for enlarging and opening the bottoms of oil wells, are charged with nitro-glycerin, and the works for the manufacture of the explosive are at Scrub Grass, Pa., on the Allegheny Valley Railroad. The works were recently destroyed by an explosion, resulting in the instant death of H. F. Wolf, a telegraph operator, and D. V. Wright, the torpedo agent. The explosion was fearful, shaking the earth in the neighborhood like an earthquake, and hurling stones and pieces of timber in all directions. The works were shattered as if they had been a target for artillery exercise. The ground on which the building stood was excavated to an astonishing depth. This excavation is directly underneath where the magazine was located. Not a piece of flesh bigger than a visiting card could be found of either of the unfortunate men, and limbs of trees in the vicinity held shreds of clothing and little bits of flesh. They were actually blown to atoms, and not a piece of flesh an inch long could be discovered. On the hillside a watch belonging to Mr. Wright was found battered up and red with blood.

An almost similar occurrence took place on November 25, near Yonkers, N. Y., in which two young men, it is not too much to say, wantonly destroyed themselves. With two companions, they were out walking and came upon a fenced inclosure, inscribed "Danger," "Nitro-Glycerin," etc. They scaled the fence, leaving the other two behind, and threw large stones at the cans, the necks of which stood out from the lids of the boxes in which they were enclosed. The inevitable explosion blew the two perpetrators of the mischief to atoms, the two other boys, who got behind trees, being severely injured. Some of the inhabitants of Yonkers are said to have loudly condemned the owner for leaving the dangerous substance in a place where a catastrophe could possibly occur!

The Origin of Man.

Dr. Ludwig Buechner, the German naturalist, lately delivered a lecture in this city on the Origin of Man, in connection with the theory of the origin and development of life. After explaining the Darwinian theory of the origin of life, the lecturer characterized the hypothesis that man is a descendant of the monkey and the ape as absurd. The higher classes of monkeydom—the gorilla, the chimpanzee and orang-outang—were, he said, only our cousins, and there was some satisfaction that these ugly animals were not our ancestors. But there was no doubt that they descended from the same ancestor who was the forefather of man. The origin of man must be looked for in a tropical region, probably Southern Asia or Africa, during the tertiary period. There is a theory that between Southern Asia and Africa there existed a now sunken continent, called Lamuria, of which there are traces in the numerous islands, where, according to some authors, the origin of man was placed. The ancestor of man was described as a hairy, long headed animal, with long arms and short legs, which, by the development of the brain and its moral attributes, resulted in the development of man. If the origin of man is placed in the tertiary period, the time of the origin of man must be traced back hundreds of thousands of years.

PATENT OFFICE DECISIONS.

The Cigar Ship Patent Extended.

In the matter of the application of Ross and Thomas Winans for extension of patent No. 21,917, for improvement in hulls of steam vessels, granted October 26, 1868, the Acting Commissioner Thacher has granted the extension. The Examiner gives the following interesting particulars:

This application relates to a novelty in ship building, the announcement of which was a sensation, and the development of which has excited a widely-extended public interest. It has been generally known as the "cigar ship," and the experiments testing its practicability, which have been made from time to time in this country and Europe, have been attentively watched by great numbers on both continents.

The report of the Examiner in the case is as follows:

This invention consists in a hull for vessels complete in itself, whose cross-section at any point shall be a perfect circle, and whose longitudinal section is formed of segments of a circle, making the form of the hull that of an elongated spindle, for the purpose of diminishing the usual variation of resistance common to vessels of irregular configuration, by which the same are caused to roll, and also to diminish the resistance of a vessel of given tonnage in passing or being propelled through the water, while at the same time increased strength is obtained.

The invention appears upon careful examination to have been new at the time the patent was granted, and the testimony of eminent experts indicates that it is valuable and important to the public.

In any case the applicants have shown their own faith in the ultimate success of their attempt to promote the efficiency of ocean steam navigation by continuous and persistent efforts extending through the life of their patent, and by an expenditure during that time of over a million dollars in money.

The importance and value to the public—although the amount in money is not calculated or approximately estimated—may, without doubt, be considered established, to what extent, however, is left entirely to conjecture; but the enormous outlay and uniform testimony of the experts as to the results obtained indicate that the value is very great, and will be commensurate with the difficulties and expenses already incurred.

The applicants show an expenditure of more than a million of dollars without any returns whatever. They, therefore, have not been adequately remunerated notwithstanding they have been unusually diligent, having been almost constantly engaged in the construction of vessels upon their plan during the past fourteen years.

The granting of this application will doubtless have a beneficial effect upon the public interests, as no existing interest whatever can, by any possibility, be prejudiced, as, if the averments of the applicants and the testimony of their experts can be relied on, the success of the invention is assured, and its general adoption by the public is only a matter of time.

If, however, the plan shall hereafter prove a failure, the applicants will be the only losers, while the public interests will have been subserved by the demonstration that more than a million dollars in money will have afforded.

DECISIONS OF THE COURTS.

United States Circuit Court, District of Connecticut.

MORRISON *et al. vs.* CASE *et al.*

A suit in equity under section 77 of the act of Congress of July 8, 1870, relating to patents, trade marks, and copyrights, brought by Thomas A. Morrison and others against Julius A. Case and others, to restrain defendants from the alleged infringement of complainants' trade mark.

SHIPMAN, Judge:

This is a bill in equity, praying for an injunction to restrain the defendants from using a certain trade mark upon men's and boys' shirts. The parties are both of them shirt manufacturers, selling their goods in the general market. The plaintiffs and their immediate predecessors have been engaged in the manufacture and sale of this class of goods for many years, during which the business has grown to considerable magnitude. For twenty years they have used the trade mark in question, by stamping or labeling the same upon the shirts manufactured and sold by them, and upon their packages and advertisements. In March, 1871, the plaintiffs caused this trade mark to be registered in the Patent Office at Washington, under the act of Congress approved July 8, 1870 (16 U. S. Statutes at Large, 210, &c., section 77, &c).

The trade mark in question, as appears by the certificate of the Commissioner of Patents, and the facsimiles filed in his office in conformity to the act of Congress, consists of the words "The Star Shirt;" also, the words "The Star Shirt" with the device of a six pointed star used in connection therewith; and, also, the device and words "The * Shirt"—either one or all being used as convenience requires.

Though this device or mark is in part arbitrary, and, to that extent, would have no natural or necessary significance in connection with the article manufactured, apart from its use in that connection, yet, by such use of the plaintiffs, in connection with their manufacture and sale of these articles, it has become well known to the trade, and has come to be taken by dealers as a peculiar designation by which the plaintiffs' goods are distinguished in the market. It is, therefore, both in its character and use, when taken together, a lawful trade mark. It has long been employed by the plaintiffs, and well understood by dealers and the public, as designating such articles of their manufacture. They have complied with the requirements of the act of Congress, and are entitled to protection. Their exclusive right to the use of this trade mark is coextensive with the limits of the United States.

The defendants have clearly infringed this right by using the words and device of the plaintiffs, both in the exact form, and in such near resemblance as is calculated to deceive. They have done this by so marking the shirts made by them, and by the labels used on their packages and packing boxes.

A perpetual injunction must, therefore, issue, restraining them from any use of this trade mark, either in the identical form in which it is registered in the Patent Office, or in any form in which it may be calculated to deceive by confounding the goods manufactured and sold by the plaintiffs with shirts made and sold by the defendants.

C. G. Child, for complainants.
C. E. Perkins, for defendants.

United States Circuit Court, Southern District of New York.

MEISSNER *et al. vs.* THE DEFOE MANUFACTURING COMPANY.

This was a suit in equity on the patent granted to Albin Warth, April 17, 1870, for an improvement in stop valves for petroleum packages. The complainants were Frederick and Charles F. L. Meissner and Charles F. Ackermann, constituting the firm of Meissner, Ackermann & Co., and Albin Warth, the inventor; and the defendant was the Devoe Manufacturing Company.

The claims of the patent were as follows:

1. The cup-shaped disk suspended within the package A, receiving the screw *b*, and forming a valve seat in combination with the valve *g* suspended from the screw between guides *h*, substantially as and for the purpose described.

2. The vent hole *c* and discharge opening *d*, in the cup-shaped disk, in combination with the central screw and with the valve and the guide arms, all constructed and operating substantially as described.

I deem it highly probable that the stop valve made by the defendant, when considered in reference to its construction and its office and function of a mere stop valve, is substantially like that described in complainants' patent, and that if the latter had been described and claimed by the patentee independently of the precise form and location of the parts and of the material office or function which such precise form and location performs in the combination described, the stop valve of the defendant must have been declared an infringement.

But the patentee has seen fit by his specification and claim to confine the right secured to him within much narrower limits. He does not in his specification claim that either part used in the construction of his stop valve is new, nor that any number of the parts, not including a cup-shaped disk by means of which the whole apparatus is sunk below the outer surface of the oil can, are new in their combination with each other.

The defendant does not use the parts in the same form or in an equivalent form, and does not produce the same result. The change he has made in the form of the disk constituting the valve seat is such as necessarily defeats the purpose for which the complainants' device was intended and which it accomplishes. The defendant's disk is, therefore, not an equivalent to that used by the plaintiffs—it has not the same effective operation. Instead of suspending the stop valve below the surface of the can or vessel by its convex form, it rises, necessarily, above that surface, and carries still higher the parts with which it is connected, thus doing the very thing which the complainants, by the peculiar form of their disk or valve seat, profess to avoid and do avoid. The conclusion cannot be escaped by saying that the difference is not in the material or essential characteristics of the device, but only in the degree of utility, that the defendant's device is the same in principle and in substantial structure, but by a change in the form of the valve seat, by inverting it, the device is rendered less perfect and less useful.

Under a specification and claim which might readily be suggested, this reasoning might be entirely just and true, and might render it necessary to pronounce the defendants' device an infringement. But the actual claim cannot be rejected. The complainants must stand or fall by the claim as made; and that, not only in terms, but when read and construed with reference to the whole specification, makes the form of the disk a part of the complainants' structure, material to its location in connection with the can, and especially material to the function or effect designed to be produced, and, in fact, produced thereby. I think, therefore, that under this patent, the complainants cannot reject the form of the valve seat and the location of the structure within the can, and allege that any form of valve seat and any location of the stop valve, however projecting above the surface of the can, is an infringement of their claim, provided in other respects it is substantially like theirs.

I think that in all other respects the defendant's stop valve does include the complainants' and all of its parts, in substantially the same form and manner of combination, and operating in substantially the same way and producing the same result. The differences in the nut and screw, in the guide, and in the contrivance for preventing the turning of the

valve are not changes in the principle or in the manner of operation which would relieve their stop valve from condemnation as an infringement; they are a mere substitution of equivalents. For this reason it seems not improbable that the conclusion to which I am compelled is not because the actual invention of the complainants has not been infringed or copied by the defendant, but because the specification and claim upon which the patent is granted has so narrowed the ground on which they stand that they fail to realize all the monopoly to which, in virtue of the actual invention, the patentee may have been entitled. If this be so, the Court is nevertheless unable to relieve them. We can only deal with the rights of the complainants as they are defined in and secured by the letters patent; and, as thus defined, my conclusion is that the defendant's stop valve is not an infringement.

The bill of complaint must, therefore be dismissed with costs.

J. Van Santvoord, for complainants.
G. Gifford, for defendants.

THE NOVEMBER METEORS.—Between seven and eight hundred meteors were observed in the course of five hours, on the evening of November 27, at the Observatory of Vassar College, Poughkeepsie, N. Y.

Business and Personal.

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

Notes & Queries

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

1.—Is there any good fastening for rubber belts? All the iron fastenings that I have tried are only failures; and in common lacings, the oil used in dressing the leather spoils the belts.—J. E. S.

2.—Will some one inform me of a good and quick method of hardening hydraulic cement pipes, or concrete, which will not kill the natural petrifying process?—A. H. B.

3,—I have noticed that trees, struck by lightning, were never split if the bark was torn off, but have found them to subsequently split. Why are lightning rods twisted when struck? Why does lightning that coils round an object never do any damage?—J. C. S.

4.—Have there ever been scales constructed which will weigh correctly, pounds and ounces, at any temperature, through other means than the changeable weight at a fixed point, or the sliding weight and beam? If so, how are they constructed and what is the reason they are not in general use? Scales with springs seem to be unreliable; besides they answer the purpose only to a certain extent, as they do not weigh more than thirty or forty pounds.—A. B.

5.—H. A. S., of Hiogo, Japan, says:—I am an habitual smoker, and have often noticed, when enjoying a pipe or a cigar, that the smoke which tobacco produces changes its color during inhalation, that which escapes from the bowl of the pipe or end of cigar being of a bluer color than that which is puffed out of the mouth. I attribute this to the condensation of some one of the component parts of the smoke. I should be much obliged if some one would kindly inform me if I am correct, and if so, what is it that is condensed, and what condenses it?

6.—How can I get the hardest edge on a plate of cast iron or steel, or even wrought iron? What I want is a plate of strong metal, say half an inch thick, with one side say 1-16 deep, of the hardest metal to be got for an edge, to work in the ground or gravel, and still strong enough to stand some concussion. Will case hardening do? Can cast steel be case hardened to it? Also, can you tell me who is the original inventor of the vacuum steam pump?—H. B.

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.

E. T. N., of Pa.—The mineral you send is iron pyrites—sulphur and iron.

B. J. K., of Ga., will find methods for curing his gun of its propensity to scatter fully described on pp. 42, 58, 74, 107 of our volume XXVI.

F. H. J. asks for practical directions for making bibulous paper for drying crystals, and for making salts of copper, cobalt, and silver. The paper can only be made in a paper mill, and common blotting paper will answer the purpose. The salts of metals can be purchased for very much less than they can be made. Consult any good chemistry for the processes.

C. Y. asks:—Will you please tell me through your paper what the difference is between a salinometer and a hydrometer? Answer: In principle, none. The salinometer is a glass tube graded specially for salt water, to indicate different degrees of saltness. A hydrometer is a similar instrument graded to indicate the specific gravity of any liquid in which it is placed.

J. A. S., of Ohio, says:—Will you please inform me how brass fitters obtain the beautiful finish for brass work usually seen on gas fixtures? I believe it is called dip lacquer finish. Please give the ingredients and proportion, and, if possible, the mixture of brass which produces the best results. Answer: The finish is obtained by dipping the article in nitric acid, a special quality called dipping acid being sold for the purpose. After dipping, the article is varnished. As to the metal, any brass founder willgive you that. It varies with the intended use of the casting. Fine yellow brass is composed of 66 parts of copper and 34 parts of zinc.

F. R. says:—Will you please tell me whether the diamonds used in the diamond drill are a manufactured article? A friend tells me they are so, but I think they are the true black diamond. Answer: The diamonds used in drills and stone saws are not manufactured. By no process at present known can the qualities of the diamond be imitated. The diamonds used in drills are known here as black diamonds, and have the appearance of close grained coal. This substance is termed by dealers *carbonado,* and appears to occupy a place between anthracite coal and the real diamond, having the hardness of the latter. The carbonado is found in Siberia and Brazil.

J. M. says:—I saw a reply to a correspondent concerning the old wheel question, and send this to say that, if you have no objection, after having expressed an unwillingness to admit discussion on that subject at this time, I will say to D. W. S., not only what I think, but exactly how it can be proved that, as per construction of the question, the wheel makes only one revolution; and this I will do with an article no longer than your reply to D. W. S., on page 330 in your last issue, with a few rings for a diagram. Please therefore to say to J. M. how you like my proposition. Should a discussion follow you are not required, you know, to take sides, if not so disposed. Answer: We should be very glad to re-open the wheel discussion if we were not fully satisfied that it could lead to no good result. The very same diagrams by which our correspondent thinks he can conclusively prove the one revolution, can be used by the two revolution people to establish the correctness of their ideas. In the course of the former discussion, we frequently received similar models and similar diagrams from opponents for the purpose of proving their views.

C. C., of Michigan, says:—I want to know if an air pump will take suction from the exhaust of a steam engine and force the steam into a rotary boiler for paper manufacture, creating a pressure of one hundred pounds to the square inch? Also, would such a pressure have the ordinary heat that one hundred pounds pressure has in an ordinary steam generator? Answer: An air pump would accomplish the object intended, but, to condense by compression to the extent indicated, would require it to be made very strong, would absorb very great power, and we should be inclined to expect it to prove an unprofitable experiment. Were the experiment made and the full pressure attained, the temperature of th steam would be the same as in the steam boiler at the same pressure, viz 337·8° Fahrenheit, with steam per gage at one hundred pounds per square inch. We should anticipate that it would be found far less expensive to take prime steam from the boiler at the desired pressure and temperature than to compress the exhaust steam as proposed.

In reply to H. E. C., query 2, page 345, I would say that faded writing can be restored by rubbing over with tincture of galls.—F. H. J., of N. Y.

To W. G. Blish, page 340.—A belt can be shifted with the loose pulley on the driving shaft if the driven shaft has a momentum that will keep it in motion until the belt is completely shifted, not otherwise. Also, crossed belts never run so well as straight ones. Better obtain more pulley surface by increasing the size of both pulleys, giving greater belt speed—a double gain. It is difficult to make a belt leave a tight for a loose pulley if the latter is much the smaller, but a slight difference is good practice.—J. E. S.

To B.S.P., query 3, page 345.—Make a solution of gutta percha in bisulphide of carbon, apply a coat or two around the leak in your gas bag; put also a coat or two on a thin piece of leather. Now warm the two coated surfaces, and at once press firmly together.—E. H. H., of Mass.

To H. E. C., query 2, page 345.—Faded ink can usually be restored. Try brushing over the writing a dilute solution of sulphuric acid to which a few drops of nitric acid have been added. When dry, brush over a dilute solution of prussiate of potash; the faded writing will exhibit a blue color, which will deepen on exposure. Or brush over the writing some solution of hydrosulphuret of ammonium, which by age and exposure has become yellow, and the writing will become black. Don't be astonished at the pleasant smell of this last plan.—E. H. H., of Mass.

To B. S.. query 3, page 345.—Air slaked lime will not do for making lime cylinders. Take lumps of nice soft chalk, and cut out or turn your cylinders; place in a crucible together with some powdered chalk, submit to a bright red heat for an hour or two, and you will have as nice lime as you can wish.—E. H. H., of Mass.

To I. W. C., query 4, page 345.—To a solution of nitrate of silver, add solution of cyanide of potassium until no further precipitate is formed; allow it to settle and pour off the clear liquor. Dissolve the sediment in enough solution of cyanide of potassium and form into a paste with prepared chalk. Rub some of this paste on your brass. or copper, or German silver, etc., and you will have a nice thin deposit of silver, of course not so thick or durable as if deposited by a battery. Be careful of the cyanide, as it is deadly poison, and do not let it get near a scratch.—E. H. H., 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.

ROTARY STOOL.—George H. Spencer, Fitchburg, Mass.—This invention has for its object to improve the construction of rotary office stools, chairs, etc., and it consists in the cylindrical nut or spider made with radial arms, having longitudinal sockets formed in their outer ends, and in the legs or posts with their upper ends bent inward to enter the longitudinal sockets of the spider.

SLEEPING CAR.—William E. Gowdy, Waldron, N. Y.—This invention has for its object to improve the construction of sleeping cars in such a way that each berth may be closed as securely as a state room. When the panels are turned down upon the bottoms of the seats, and the cushions replaced upon said seats, the panels will be entirely out of the way. By this construction, also, all the parts that require to be detached and removed are certain partitions. This construction makes the berths or compartments of a sleeping car become as secure as a state room, and the occupant, when he has bolted the panels upon the inside, can sleep in safety,

DUMPING CAR.—John R. Dubois, Virginia City, Nevada.—This invention relates to improvements in the class of dumping cars in which the box is hinged and pivoted so as to be turned horizontally and also be tilted toward either side or end of the track; and it consists in the peculiar arrangement of locking devices for preventing the box from swinging around on the turn table at the same time that it is held from tilting.

FIREPROOF FLOOR AND CEILING.—George H. Johnson and Edwin R. Hall, Chicago, Ill.—The invention relates to a mode of forming a fireproof floor and ceiling by means of slabs and hollow tiles of burnt clay, plaster of Paris, or other incombustible material, applied to the upper and under side, respectively, of timber joists, the slab being of rectangular form and secured by the same devices as the floor boards which are laid thereon, and the tiles being of prismoidal shape and provided with flanges to adapt them to cover and also be supported by strips attached to the sides of the joists.

CAR COUPLING.—Perry Brown, Louisville, Ky.—The invention is an improvement on that recently patented to same party. The link acts, as in that case, on a pivoted support for the coupling pin, so that the latter drops into its place as the cars come together. In this instance, the coupling pin is extended vertically to the top of the car, and is provided with a curved arm to act on a radial arm or projection of a similar extension of the shaft of the valve or said pivoted support, so that, the coupling pin being first raised, the support may be caused to move under it and thus place the coupling in readiness for automatic action without necessity for the operator to enter between the cars or descend from them for that purpose.

MEANS OF PROPULSION.—Seth R. Foster, St. John, Canada.—This invention relates to a new paddle attachment to steam engines for propelling vessels of various sizes, and consists in suspending the paddles directly from the ends of the walking beams of the propeller. The inventor proposes to impart the requisite vibratory motion to the beam by a jointed rod connection with a crank shaft, and to rotate the crank shaft by the pistons of two steam cylinders. The vibrations of the beam on its pivot serve to impart up and down motion to the dashes and paddles; but the horizontal sweep is imparted to the same by means of rods which connect them respectively with the cranks of the shaft. The invention can also be used for canal boats, in which case the propeller is placed on the bow or stern by a little alteration in its construction, namely, by having two walking beams instead of one, the sweeps attached to one end instead of both, and propelling machinery attached to the other end of each beam.

MILK COOLER.—Irving Wheeler, of Massena, N. Y.—This invention relates to an improved milk cooler by which a small quantity of water can be made to absorb nearly all the animal heat of the milk for the purpose of preparing it for market or for churning. The invention consists in the arrangement of a spiral water chamber beneath the milk pan for obtaining a large circulating channel, and, consequently, fully utilizing the heat absorbing qualities of the water.

INSOLE FOR BOOTS AND SHOES.—Garett H. Whittaker, Pittsfield, Mass., assignor to himself and Jacob Stewart, of same place.—This invention relates to a new insole for boots and shoes, with the object of keeping the feet warm by its use and of curing and preventing chilblains and other unpleasant and injurious diseases caused by cold feet. The invention consists in making the sole of three thicknesses of material, of which the lower is rubber cloth, the middle, palm leaf steeped in sulphur solution, and the upper, carpet.

SEED PLANTER.—John H. Dancy, of Dancyville, Tenn.—This invention relates to the class of seed planters in which the amount of seed required for a hill is elevated within the seed hopper and discharged through a hole in the upper part of the hopper into the drop tube. The object of the invention is to insure the planting of the requisite amount of seed at proper intervals and without injury to the seed. The invention consists in the use and new arrangement, with the vertical slide which elevates the seed to be dropped to the hole in the upper part of the hopper, of a cut-off, and other appurtenances which are necessary in order to make the slide effective.

SASH HOLDER.—William Wilson Amos, of Olathe, Kansas.—This invention has for its object to improve the construction of the sash holder and lock, for which letters patent No. 125,161 were issued April 2, 1872. The invention consists in a hinged box made inclined or tapering, and in it is placed loosely a small box, in which is placed a tapering rubber block. The box and its contents are held out against the casing by the spring. With this construction, when the sash is being lowered, the friction of the window casing upon the rubber block forces the said rubber block and its sliding box or case upward into the shallower part of the tapering box so that the rubber block will hug the casing and thus support the sash by friction.

STEAM EXHAUST FOR LOCOMOTIVES.—Thomas Davies, of Cleveland, Ohio.—This invention relates to an improvement in the means for supporting the ring jet pipes through which the steam is exhausted in certain marine boilers. An upright pipe, which is tapered and open at each end, forms a support for the ring exhaust pipe at any point in its hight, according to the predetermined size of the said ring and the point of its insertion in the smoke box.

SAWING MACHINE.—William C. Daniel, of Point Pleasant, Mo.—This invention relates to a new reciprocating buck saw, in which the saw frame and carriage are vertically adjustable and suspended from a windlass which unwinds automatically by means of an escapement attachment, so that the downward feed of the saw will be regular and gradual.

FORM FOR LAYING BRICK PAVEMENTS.—Samuel C. Brewer, of Water Valley, Miss.—This invention is embodied in a device for gaging the bricks for laying "herring-bone" pavement, calculated to insure regularity in the work. It consists of a brick paving gage, having right angled notches in one edge as deep as the longest bricks, and whose sides are arranged on angles of forty-five degrees with the long axis.

ELEVATED WIRE WAY.—George Killam, of Fort Dodge, Iowa.—This invention has for its object to furnish an improved construction for elevated railroads. The track is supported by two rows of posts, at a distance apart equal to the width of the track. The upper ends of the posts are fitted into and secured to castings which are made heavy and strong, and grooved transversely in the middle part of their upper sides with a deep and wide groove. The upper sides of the castings have grooves formed in them, of such a depth and breadth as to receive the flanges of the wheels of the car. The tops of the ribs between the longitudinal grooves of the castings are grooved sufficiently to bed the wires which form the track and are secured to the castings. The axles pass beneath the bottom of the car up along its sides, and project to receive the wheels at such a point that the center of gravity of the car may be considerably below the point of support. Directly beneath the upper wires are placed a second set of wires, the ends of which pass through the body of the castings. The shoulder upon the inner side of the castings, through which the inner wire passes, is made wide and is grooved longitudinally to receive the flange of the lower wheel. The lower wheels revolve upon the journals of arms which are formed upon the axles and project into such a position that the wheels may roll along the lower side of the inner wire and thus effectually prevent the upper wheels from leaving the wires.

ORE CLEANER AND SEPARATOR.—John H. Hillman, of Trigg Furnace, Ky.—This invention has for its object to furnish an improved machine for separating or cleaning ore by a current or blast of air. The ore after being crushed to the desired fineness is delivered into the hopper by any suitable means, and is fed into a cylinder which, by its motion, keeps the ore rolling and sliding about, causing it to pass down to the lower end of said cylinder. This movement of the ore rubs off the dirt and dust, which is carried out through the cylinder, pipes, and fan by and with the current of air. The smaller particles of ore will pass through the holes of the cylinder while the larger particles will be carried down to the ore receiving box. When the ore has sufficiently accumulated in the box, it will be discharged into any suitable receptacle provided for that purpose. A jacket is made to fit the cylinder at its ends and at its side edges, to prevent a current of air from passing in through the holes in the upper part of the said cylinder, thus making the current of air strong in the lower part of the cylinder where the small particles of ore must pass through.

ADJUSTABLE SCAFFOLD.—William A. Jester, of Holliday's Cove, W. Va.—The object of this invention is to furnish safe and convenient means for supporting house builders and painters with their materials and implements by the sides of buildings. It consists of a scaffold made of two uprights on which slides a triangular bracket. The platform upon which the workmen stand is supported by the bracket. In the top of the upright is a pulley. A clamp consisting of two or more jaws is attached to a horizontal bar. This bar is confined to the upright, so that it can slide up and down. One jaw (or pair of jaws) is rigidly fastened to the bar. The other jaw (or pair of jaws) operates as a lever, and the two are pivoted together and act much like a pair of pinchers. A rope is connected with the lower end of the jaw. This clamp, it will be seen, can be raised or lowered so as to be grappled on to roofs or projections of different hights from the ground. Two or more of the uprights with bracket and clamp attached are employed in supporting the platform.

LAST.—Joseph Anzer, of Ashtabula, Ohio.—The invention consists in providing means for locking the two parts of a last against lateral as well as vertical displacement.

PACKING BOARD FOR PENCILS.—Orestes Cleveland, of Jersey City, N. J.—This invention has for its object to produce a compact and symmetrical package of lead pencils, pen holders, crayons, or similar articles. A piece of wood or other material is inserted between the pencils that constitute a package, the inserted piece being grooved for each pencil to hold it firm independent of the other pencils. The inserted piece also serves to enlarge the package so as to produce a large surface for the admission of a showy label. This device is so constructed that it enables the retailer to withdraw several pencils from a package without losing the use of the label, the package still retaining its shape.

MACHINE FOR TURNING LOGS IN SAW MILLS.—George W. Baker, Elizabeth City, N. C.—This invention consists in the provision of a sliding carriage moving horizontally in ways or guides beneath the log deck and carrying a vertically reciprocating toothed turning bar, so as to enable the same to be horizontally adjusted for action upon logs of various lengths. The invention further consists in the combination with the movable carriage of a sliding self-adjusting weighted block for exerting a constant pressure upon the turning bar to hold the same in contact with the log.

MANUFACTURE OF SALT.—John McGrew, Ravenswood, W. Va.—The invention consists in providing the inside of a furnace with an air jacket and discharging the heated air into the bottom of a vessel of brine or salt water; in passing the unconsumed products of combustion through vessels of brine or salt water, thereby abstracting the heat and utilizing it for the general purpose of the apparatus; and finally, in a drying apparatus of such construction and so connected with the furnace that the salt is conveniently as well as effectually dried before it leaves the apparatus.

MEDICAL COMPOUND FOR THE CURE OF DIARRHŒA.—Mrs. A. B. Dorman, Cape Girardeau, Mo.—The invention consists in red oak bark, cinnamon, cloves, dandelion root, and brandy mixed in certain proportions with boiling water. This compound has been applied to the most obstinate cases with a prompt and marked effect, the diarrhœa yielding to the treatment in a very short time.

CAR COUPLING.—Darius Sutherland, Milo, Ill.—The invention relates to that special class of car couplings which are made to couple the cars automatically or by impact, and it consists in attaching the pin to a lever and weighted lift bar, arranged outside of the draw head and above the platform of car; whereby a projection from the top of one car is made to strike the lift-bar, whose weight turns the lever on its fulcrum and carries down the pin into the link.

WHIFFLETREE FOR DETACHING HORSES FROM VEHICLES.—Albert H. McAllister, Cotton Plant, Miss.—This invention has for its object to furnish an improved whiffletree, which shall be so constructed that should the horse or horses become frightened or otherwise unmanageable, or should other cause or causes render it advisable, they may be readily detached from the carriage and allowed to go free.

TUBING TONGS.—George A. Holden, Ruggville, Pa., assignor to himself and J. R. Holden, of same place.—This invention has for its object to furnish an improved tubing tongs or pipe wrench, designed especially for taking tubing out of and putting it into wells, and which shall be so constructed as to take a prompt and firm hold upon the pipe, and so as to enable two men to operate with the same tongs, thus avoiding the necessity of using two ordinary tongs, and the consequent risk of injury to the tubing.

ADDRESS PLATE FOR TRUNKS.—James E. Kirk, Marlborough, Mass.—This invention relates to a new construction of address plates for trunks, boxes, etc., in which the paper, slate, or other substance upon which the address is written is held beneath a small pane of glass by a hinged frame, said frame being locked by notched disks, to be unlocked and swung open whenever the address is to be changed. The plate in which the hinged frame and the notched disks are arranged is rigidly fastened to the trunk or box, and may further serve as a support for a handle.

CHECK PUNCH.—José R. Mesa, Brooklyn, N. Y.—This invention has for its object to produce an instrument for punching the number or amount to which checks or similar documents of value are drawn through the same and feeding the same forward to obtain the necessary spaces between the figures punched. It consists in a rotary cylinder with a series of vertical punches that represent the several figures and characters to be punched through the paper. The cylinder can be turned so as to bring any one of the punches under a knob or button, which, when struck by hand, forces the punch under it against the paper to perforate the same in the desired manner. Each punch is provided with a pendant by which, in its descent, it will work a pawl and ratchet, and thereby turn one of the rollers between which the paper is held to feed the paper in the requisite ratio.

BOTTLE RINSER.—James Roue, St. John, Canada.—The object of this invention is to provide convenient and efficient means for rinsing soda water and other bottles, tumblers, and similar vessels. It consists in the valve chamber or shell, consisting of a vertical tube with one or more branches, for attaching a supply pipe from the water fountain. The rinser is supported in any suitable manner in a sink. The lower end of the valve rod is connected with a paddle, by means of which the valve is lowered, The valve is held in position (or closed) by the spiral springs which surround the valve rod, with one end bearing against the valve and the other on the bottom of the valve chamber. With the water supply pipe connected with either of the branches and with a sufficient head of water, when the valve is pressed down the water will rush into the tube and be discharged from a rose head with a force proportioned to the hight of the head of water. This will effectually rinse the insides of bottles, tumblers and all similar vessels, when the tube is inserted therein.

TOOL REST FOR LATHES.—Charles F. Hadley, Chicopee, Mass.—The invention consists in the combination of a horizontal screw and nut with an inclined lever, which supports the tool rest, and which determines the hight of the same by its greater or less inclination. By this means the rest can be adjusted with great ease, and will set the tool to suitable hight without disturbing it otherwise. Heretofore the tools had usually to be loosened in their holders before they could be vertically adjusted, and were thereby often disturbed after their positions otherwise had been ascertained with care, thus causing much loss of time and labor. This invention may be found illustrated on page 274, present volume SCIENTIFIC AMERICAN.

TONGUEING AND GROOVING KNIFE.—William B. McClain, Sandusky, Ohio.—This invention has for its object to make tongueing and grooving knives adjustable, so as to enable their use for larger or smaller tongues, deeper or shallower grooves, without requiring their removal from the cutter head. This invention consists in making each cutter in three parts, the middle projecting or receding part being lengthwise adjustable between the others.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted.

FOR THE WEEK ENDING NOVEMBER 12, 1872, AND EACH BEARING THAT DATE.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
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On application for Extension of Patent	$50
On granting the Extension	$50
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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:

22,941.—RAILROAD CAR SPRING.—A. B. Davis. January 29, 1873.
22,947.—WRENCH.—D. P. Foster. January 29, 1873.
23,060.—ELECTRO MAGNETIC ALARM.—M. G. Farmer. February 5, 1873.
23,085.—LAMP.—E. J. Hale, C. H. Chandler. February 12, 1873.
23,875.—LAMP SHADE.—C. and A. C. Wilhelm. April 16, 1873.

EXTENSIONS GRANTED.

22,048.—LOCK.—S. N. Brooks.
22,071.—ELECTRO MAGNETIC ALARM.—M. G. Farmer.
22,104.—REFRIGERATOR.—A. H. Bartlett.

DESIGNS PATENTED.

6,244.—THREAD HOLDER.—T. W. Carter, West Meriden, Conn.
6,245.—OIL CLOTH.—H. Kagy, Philadelphia, Pa.
6,246.—OIL CLOTH.—C. T. and V. E. Meyer, Lyon's Farms, N. J.
6,247.—HUB BANDS FOR WHEELS.—O. S. Stevens, Belvidere, N. J.
6,248.—PRESERVE DISH.—H. C. Wilcox, West Meriden, Conn.

TRADE MARKS REGISTERED.

1,053.—FANCY GOODS.—Cochran, McLean & Co., New York city.
1,054.—MEDICINE.—V. Delaney, Santa Fe, Ill.
1,055.—COFFEES, SPICES, ETC.—J. M. Earle, New York city.
1,056.—NEEDLES.—Excelsior Needle Company, Wolcottville, Conn.
,057.—WHISKY.—P. Fegan, Washington, D. C.
1,058.—SOAP.—S. W. McBride & Co., Chicago, Ill.
1,059.—SUGAR CURED HAMS.—A. Schoeffel, Louisville, Ky.
1,060.—SOAP.—J. W. Swalley, Erie, Pa.
1,061.—EMERY WHEELS OR BLOCKS.—J. Tyzick, St. John, Canada.

Value of Patents,

AND HOW TO OBTAIN THEM.

Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe, and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer canonly be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

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A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

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Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

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Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

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Foreign designers and manufacturers, who send goods to this country may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Canadian Patents.

On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

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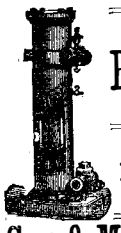

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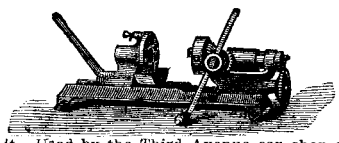

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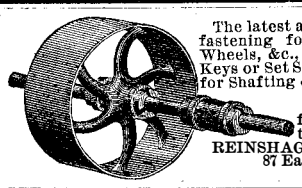

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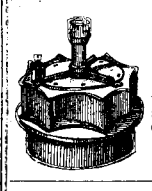

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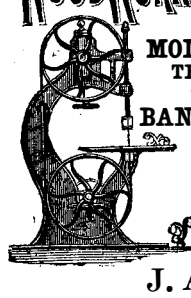

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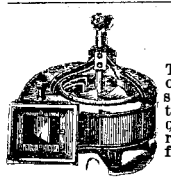

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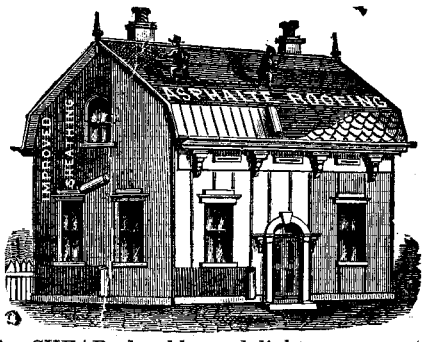

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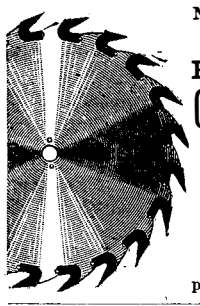

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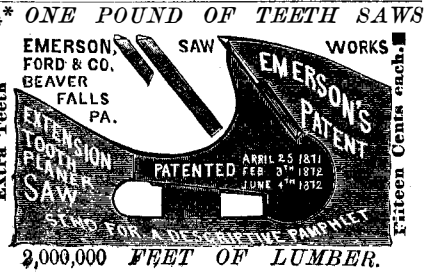

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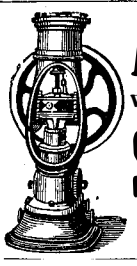

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