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THE PRALL AUTOMATIC STEAM VACUUM PUMP.

We have pleasure in laying before our readers some account of the above pump, the performance of which we have lately witnessed. It is ingeniously and yet simply constructed, and appears to be very effective in operation. It admits of various forms of construction without essential alterations of principle, and can thus be rendered applicable to raising or forcing water, or both, under a variety of conditions. Its capabilities will best be understood from a description of its mode of action, which we will now give from the pump in its simplest form.

Figs. 2 and 3 give views of the single cylinder pump, the latter being a vertical section which shows all its working parts. A is the cylinder or body of the pump, which is made of cast iron and has its sides lined with wood. B is the section or supply pipe, and C is the discharge pipe. Each of these pipes is furnished with a check valve, as shown, to prevent the backward flow of the water. At the top of the pump is shown the steam pipe, which is connected with a suitable boiler. The passage of the steam is regulated by the valve, D, which is connected by a rod with a rubber diaphragm, shown at E. This diaphragm, upon the action of which the movements of the valve, D, depend, is placed between two disks which are slightly hollowed out on their inner sides so as to allow between them an upward or downward movement of the center of the diaphragm equal to the extent of the movement required in the valve. The space below the diaphragm is connected, by the pipe shown, with the water supply pipe, B, and to the upper side of the diaphragm air is freely admitted through the upper disk. In the operation of the pump thus constructed, when the cylinder is filled with water, the pressure on the under side of the diaphragm causes it to rise in the middle, and, by means of the connecting rod, to raise the valve, D. The effect of this is to admit steam, which, on entering the cylinder, is diffused by coming in contact with the plate shown at F. The water contained in the cylinder is then driven out through the discharge pipe, C, with a force commensurate with the pressure of the steam. When the steam has descended low enough to come in contact with the cold iron bottom of the cylinder and to enter the mouths of the water pipe, a partial condensation ensues, which reduces the pressure sufficiently to cause the diaphragm to fall and thereby shut off the steam; at the same time, and by the same cause, the valve of the injection pipe, G, is raised, and sufficient water drawn from it into the cylinder to complete the condensation of the contained steam. The vacuum thus produced is immediately supplied by water entering through the supply pipe, B, and as soon as the cylinder is filled the diaphragm is again raised as before described, and the entire operation is repeated. This continues so long as steam is supplied from the boiler. A small pet cock, shown near the top of the cylinder in Fig. 2, admits sufficient air, while it is filling, to prevent the water rising above the plate, F; this allows of the diffusion of the steam over the water surface without agitation of the latter. The action of the check valves in the water pipes during the operation will readily be understood without explanation. It will be noticed that the chambers containing them are constructed with face plates which admit of easy removal, so that the valves may be inspected and repaired without difficulty. The action of the single cylinder pump is intermittent, but by using two cylinders, which force and condense alternately, the pump is made to throw a continuous stream. The double action pump is shown in operation in Fig. 1, together with a boiler of proportionate size for running it. In this form of the apparatus, the valve is made so as to admit steam to the cylinders alternately, and the sides of the diaphragm are connected, each with one of the cylinders, in such a way that it is moved upward by the pressure of water in one and downward by the pressure in the other. Thus a constant flow of water is kept up through the main discharge pipe.

THE PRALL AUTOMATIC STEAM VACUUM PUMP.

Fig. 2

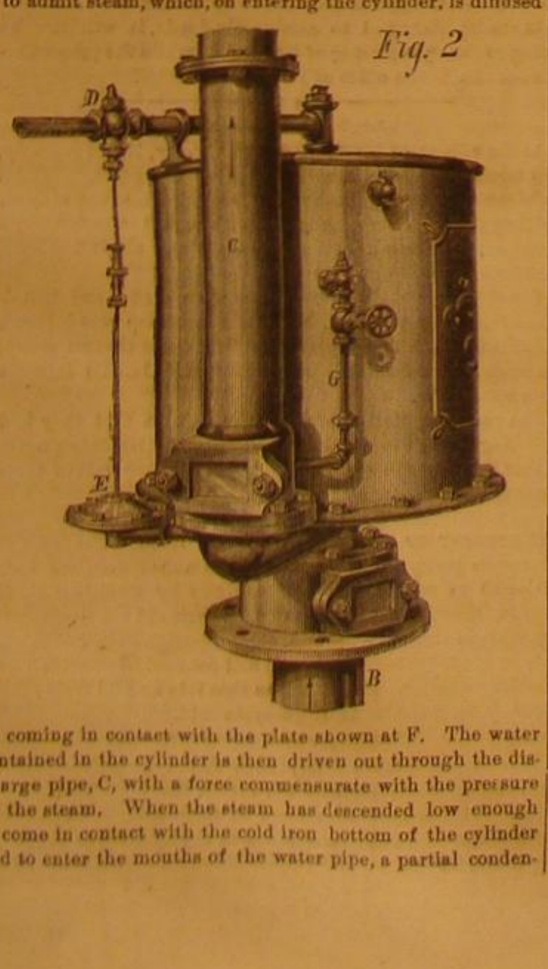
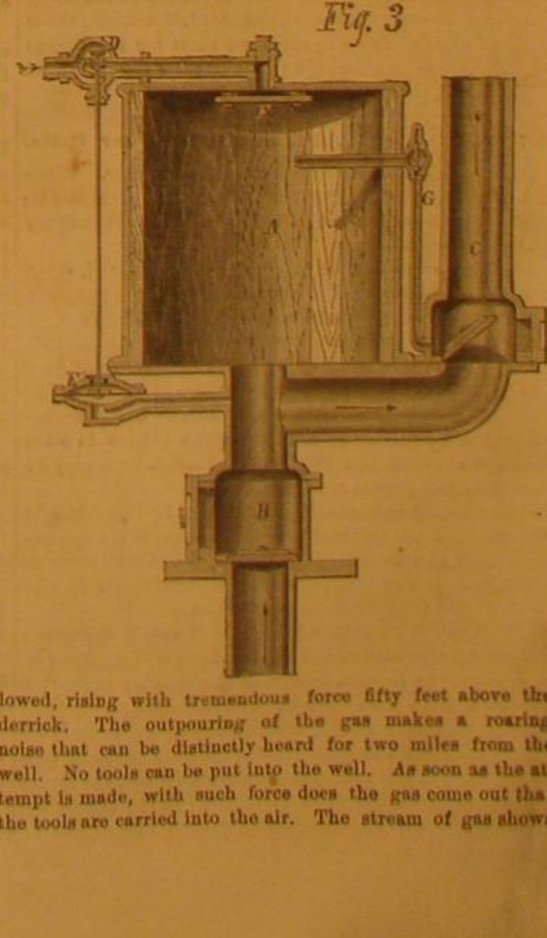


Fig. 3



The inventor claims that in this pump the steam is utilized to the fullest possible extent; it is made to perform a double duty—to expel the water by its pressure and to create a vacuum by its condensation. The absence of the working parts of ordinary pumps, such as pistons, levers, cams, cranks, etc., gives great advantages to this device, which he thus enumerates: 1st. Having no piston it is not affected by mud, sand, salt, or grit of any kind. 2d. Being frictionless, it requires no lubrication at any point. 3d. Having no moving parts but the valves, there is nothing (but them) to break down or require repair; the water flows easily and noiselessly in and out of the cylinder, and the pump may be run for years without special attention other than, perhaps, an occasional replacement of the check valves.

The single cylinder pump is adapted for service in filling railroad tanks, etc., where the water is to be lifted forty feet or more in large quantities. The double pump will perform the same duty, and is also adapted for use as a ship's pump, a fire engine, or for any purpose requiring water to be forced a long distance. The supply of water may be taken from a tank, river, well, or any other available reservoir by suitably connecting with it the supply pipe of the pump, and the inventor states that the vacuum formed is so perfect that the cylinder is filled when its top is placed twenty-five feet or more above the water level by the pressure of the atmosphere.

The pump may be operated by steam at a very low pressure where it is employed to raise water by atmospheric pressure alone. In this case the delivery pipe is placed below the cylinder, so that gravity may assist the discharge. Small pumps of this form are constructed specially for the use of farmers in raising water for their stock, and are also well adapted for purposes of irrigation.

The invention, which has been in practical use for the last ten months, was patented in this country July 4, 1871, and has been subsequently patented in Europe. Further information may be obtained by addressing the Prall Steam Pump Company, Indianapolis, Ind., where they are at present manufactured, or P. O. Box No. 3413 New York; or Messrs. Gray & Noyes, Washington, D. C., who manufacture for the Southern States.

A Great Flow of Gas.

A freak of an oil well near Titusville, Pa., is thus recorded in a recent number of the Titusville *Courier*: The well had been sunk for about twenty days, but continually poured forth such a volume of gas that it was found impossible to pump it, as the valves would not work. The tubing was pulled and the well was cased, in order to let the gas blow off, so that it might be pumped. After the casing was put in, the sand pump was lowered for the purpose of agitating the well, when the gas raised a column of water, throwing a solid stream into the air a hundred feet. The noise was terrific, and could be heard for a distance of more than two miles. The noise was something like the loud roar of thunder, and when the column burst at the top it threw the water each way for fifteen rods from the well. The water was exhausted in about twenty-five minutes, and then a column of gas followed, rising with tremendous force fifty feet above the derrick. The outpouring of the gas makes a roaring noise that can be distinctly heard for two miles from the well. No tools can be put into the well. As soon as the attempt is made, with such force does the gas come out that the tools are carried into the air. The stream of gas shows no sign of diminishing, and its loud and continuous roar can be heard for miles around.

Progress of the Great Tunnels under the East River at Hell Gate.

The work which is to culminate in the removal of the Hell Gate obstructions may now be considered as more than half accomplished. It is thought that about fifteen or eighteen months will yet be required to complete it, but this cannot be done unless Congress makes additional appropriations. The subject will be pressed at the opening of the next session, and it is not believed that a work of so much importance will be allowed to stop. The work is a wonderful piece of engineering.

Viewed from the head of the stairway, it reminds one of a railroad engine house, being semicircular in form, and having ten embrasures, with tracks leading back to the terminus of the tunnels. A turning table in the center of the shaft makes the simile all the more complete. Only ten tunnels are visible from the outside, but there are sixteen all told, six commencing in the interior of the work. Four galleries or intersecting tunnels are now completed, and the fifth has been commenced, thus leaving the rock above, which is about ten feet thick, resting on solid columns. Some of these columns have already been pierced for the reception of nitroglycerin. The main tunnels are numbered and named as follows: Farragut, Madison, Humphrey, Hoffman, Sherman, Jefferson, Grant, McClellan, Franklin and Jackson. As usual, General Grant is ahead, the tunnel bearing his name being 230 feet long. The aggregate length of these excavations exceeds 3,000 feet. The depth of the shaft is 34 feet.

Visitors to the works should by no means go in their best clothes. The leakage from above is so great that the pumps are kept constantly going, and even with the use of an umbrella the incautious investigator is likely to come out with his clothes considerably the worse for the journey. Supplied with a candle, the visitor gropes his way through the dark, sometimes descending at an angle of forty-five degrees until he reaches the dim light at the end of the tunnel. Here the workmen are found, some drilling and others shovelling up the loose stones. If he is fortunate enough to get into the gallery where the diamond drill is in operation, he will be well paid for his trouble, although it does deafen him with noise. There are two drills of this kind here, but one is now undergoing repair. The bore made by this machine is an inch and a half in diameter, and the cores, sometimes four feet in length, can be had of the miners. The drilling being over, the next thing in order is the blasting, which occurs three times a day, and is now done altogether with nitroglycerin. When powder is used, the stones are so large that the use of the hammer is necessary, whereas the glycerin breaks them into fine pieces.

When the charges are to be exploded, a gong is sounded, the workmen retreat to a place of safety previously indicated, and an electric battery does the work of explosion. The thundering, smothered sound of the successive charges forcibly reminds the visitor of a battery of forty pounders in full play. When the volumes of smoke have disappeared, the workmen return, and the operations of drilling and removing the *débris* are resumed. Specimens of stone can be procured from the miners, or from the piles of rock on the shore. Garnets, mica and quartz abound.

The apprehensions of danger when the general explosion takes place, are entirely groundless. So confident is Mr. Reitheimer, the general superintendent of the work, of this fact that he intends to remain in his office, about 300 feet from the shaft, when the final charge is exploded. On completion of the work of excavation, with the nitro glycerin ready, the coffer dam will be cut, and, as it is easier to raise a weight under water than above it, the shaft and mine will be flooded, and with the discharge of the electric spark the dangers of Hell Gate will no longer exist, But should the explosion by any accident not prove successful, or, indeed, if it should never take place, there will still be sufficient room for the largest ocean steamers to pass through the shaft after the coffer-dam shall have been cut.

Relative Merits of Rubber and Leather for Belts.

Rubber will not last one fourth as long as leather. When once it begins to give out, it is next to impossible to repair it; while wide bands cannot be used for or cut up into narrow ones, as leather ones can be.

Leather belts may be used over and over again, and, when of no further value for belts, can be sold for other purposes.

A rubber band, costing hundreds of dollars, may be spoiled in a few moments by the lacing giving out, and the band being run off into the gearing, or by being caught in any manner so as to damage the edge, or by stoppage of either the driving or driven pulley. A few moments of quick motion or friction will roll off the gum from the canvas in such quantities as to spoil the band, while leather belts may be torn or damaged, yet are easily repaired.

Should a rubber or gum belt begin to tear by being caught in the machinery, if the rent strikes the seam, it is most certain to follow it, even the entire length, if the machinery is not stopped. It would be impossible to tear leather in like manner.

Oil in contact with rubber belting will soften the gum; and rubber, gutta percha, and canvas belts will continue to stretch as long as in use, rendering it necessary to shorten them continually.

During freezing weather, if moisture or water finds its way into the seams, or between the different layers of canvas composing these bands, and becomes frozen, the layers are torn apart, and the band is spoiled; or if a pulley becomes frosty, the parts of bands in contact with it will be torn off from the canvas and left on the pulley. Also, gum belts will not answer for cross or half cross belts, for shifting belts, cone pulleys, or for any place where belts are liable to slip, as friction destroys them.

A well made leather band, if properly looked after—the width and pulley surface proportional to the amount of work to be done—will last twelve, fifteen, or twenty years, and yet be of value to work over into narrow belts.

THE HANDS OF THE NATION.

According to the returns of the census up to June 1st, 1870, the United States contain 12,505,923 working people. The number of inhabitants in the country is 38,558,371, so that the active workers constitute very nearly one third of the entire population, the ratio having considerably increased since the census of 1860, at which time it barely exceeded one quarter.

10,669,436 are males, and 1,836,487, females. Between the ages of ten and fifteen years, the males outnumber the females in a ratio of nearly three to one; between sixteen and fifty-nine years, the ratio increases to nearly six to one; while at ages above sixty years there are more than twelve times as many men at work as there are women. These figures apply to the men and women in actual outside employment. It will be noticed that as the women grow older, their numbers in proportion to the men decrease. This is accounted for by their marrying, abandoning their employments, and settling down to the drudgery of the household. Now, the population of the country may be estimated to be divided into 8,000,000 families, each of which has a woman for one of its heads. She is not considered as a worker in the foregoing calculations as given by the census, and here we consider a mistake has been made. The poor man's wife has far more labor to perform than her unmarried sister who works her ten hours a day. The cares of housekeeping and the rearing of children are the heaviest of burdens, and the woman that conscientiously fulfils her perpetual round of wifely duties ought surely to be classed first on the list of those who earn their bread by hard work. In at least seven million families, the lot of the wife and mother is no sinecure; so that in reality we find that the working women and the working men are not only nearly equal in point of numbers, but there is a balance on the side of the women in the shape of unending labor, the most monotonous and thankless in existence.

Out of the number of working people above mentioned, 9,802,038 were born in the United States; 949,164 in Ireland; 836,502 in Germany; 301,779 in England and Wales; 189,307 in British America; 109,681 in Sweden, Norway, and Denmark; 71,993 in Scotland; 58,197 in France, and 46,300 in China and Japan. There are therefore from three to four times more Americans engaged in useful labor than foreigners.

Regarding occupation, 5,992,471 are devoted to agriculture; 2,707,421 to manufactures, mining, and mechanical pursuits; 2,684,793 are rendering professional and personal services; and 119,238 are engaged in trade and transportation. Comparing the different callings of the inhabitants of foreign nativities, we find that of the Germans the largest numbers are engaged in manufactures and the least in domestic service. Of the Irish, the laborers and servants nearly equal numerically all the other occupations together. The English, Welsh, Scotch, and British Americans have a majority in manufacturing pursuits, and the least numbers in trade and transportation. Among the Swedes, Danes, and Norwegians, those devoted to agriculture constitute much the larger portion, while those following trades are considerably in the minority. The Japanese and Chinese are principally engaged in manufacture. Many of these nations enter domestic service, but a small portion devoting themselves to agriculture or trade.

The largest part of the population engaged in any single occupation are the planters and farmers, numbering 2,982,573. The farm laborers are nearly as numerous, reaching 2,880,045.

In manufacturing and mechanical occupations, the carpenters take the lead, numbering 344,596. Next in order come the boot and shoe makers, tailors, miners, and blacksmiths, ranging in numbers between 171,000 and 141,000. Then the milliners, brick and stone masons, and painters, each trade averaging between 92,000 and 85,000. Then follow the machinists, nearly 55,000, and next the saw mill hands, butchers, cabinet makers, carriage makers, coopers, and millers, each branch ranging in numbers between 50,000 and 40,000. The printers, harness makers, and tinners average between 40,000 and 30,000, and the tanners, cigar makers, bakers, fishmen, brick and tile makers, marble and stone cutters, plasterers, and wheelwrights between 30,000 and 20,000.

The number of manufacturers returned is 42,905. In the various factories throughout the country, there are 111,606 operatives in cotton mills, 81,000 in iron works, 58,836 in woolen mills, 41,619 in works not specified, 11,985 in tobacco factories, and 12,469 in paper mills. The aggregate number of clerks, salesmen, bookkeepers, and commercial travellers is 275,086, more than that of any trade except the carpenters. The railroads throughout the country furnish employment for 1,902 officials and 161,401 clerks and employees. The express companies require the services of 75 officials and 9,321 clerks and employees, and the various street car lines, 88 officials and 5,103 employees.

Of those gaining their living afloat there are 56,063 sailors, 7,338 canal men, and 7,975 steamboat employees. The hackmen, teamsters, and draymen number 120,975.

There are 62,383 physicians and surgeons or an average of one to look out for the health of every 618 people. The clergymen number 43,874, or one to take charge of the spiritual welfare of every 879 souls, and finally there are 40,736 lawyers, or one to adjust or foment quarrels among every 946 of the population. Education is instilled into the minds of youth by 136,570 teachers, and the washing of the entire nation is done by 60,906 launderers and laundresses. The laborers number 1,031,666, and the domestic servants 971,043. Our great hotels and restaurants furnish employment to 94,170 people, and the livery stables to 26,090 more. The office holders, national, state, and municipal, outnumber the members of any of the liberal professions, there being 67,912. It takes 23,935 barbers to shave the male portion of the population, and 15,667 nurses to attend the sick. 12,785 boardinghouse keepers offer the "comforts of refined homes" to the unsuspecting public. 6,519 musicians make up the total of the various orchestras and bands. The journalists number but 5,286, although there are 6,432 periodicals published. This discrepancy can only be explained under the supposition that the census takers did not consider the individuals who, while engaged in other callings, edit country newspapers by means of scissors and paste, as belonging to the profession. Finally, the officers of the army and navy are numerically the least, there being but 2,286 in both arms of the service.

Another Boiler Explosion.

Another instance of a large loss of property and the severe injury of several persons through gross carelessness and incompetence took place recently at the Lafayette Iron Works in Titusville, Pa. A boiler exploded, overturning walls, tearing out floors and windows, and scalding and burning, though providentially not killing, six or seven men. The boiler was a "twelve horse power Washington," resting on a brick foundation, and supposed to be capable of withstanding a pressure of 150 pounds.

The cause of the disaster is abundantly explained by the testimony of the engineer. He says that he never tested his steam gage, and had no means of knowing whether it was correct or not; that he did not know what the safety valve stood at, and had never tried to find out. He did not know whether the boiler contained any scale or sediment or not. He knew there was a leak under the fire box, but was not aware whether it would discharge two cocks in twenty minutes or not. Believed that one of his gage cocks was in a damaged condition; was certain that he had thirty-five pounds of steam in the boiler a short time before the explosion, but had not noticed whether the steam had risen in the interval or not.

Any one who can run a boiler even for a week and not know at what pressure his safety valve blows off, or whether his steam gage is in working order, is certainly utterly incompetent to fulfil the duties of an engineer. Whether the explosion, in the present instance, took place from the water escaping from the leak before mentioned, or whether, as was most probably the case, the steam pressure was allowed to get too high, it is plain that there was the most deliberate ignorance and negligence, not only on the part of the engineer, but also on that of his employers, who, by retaining him in his important position, jeopardized the lives of the entire establishment.

The New Erie Railroad President.

Peter H. Watson, formerly an examiner in the Patent Office, subsequently a patent lawyer, and who, for two years during the war, served as assistant Secretary of War with extraordinary ability and success, has just been elected President of the Erie Railroad.

Mr. Watson is a gentleman of strict integrity and possesses great energy and talent. We congratulate the Erie Railway on its fortunate selection of so capable an officer, and Mr. Watson on his appointment to so important a trust. If the Erie stockholders fail to receive dividends, it will not be owing to the squandering of its receipts while the present incumbent holds the office of President.

Lightning Freaks.

At the village of Marlboro, Ulster County, N. Y., recently, two terrific thunderstorms went over the place. Three bolts from the consolidated storm descended into the village, striking three houses occupying, with regard to each other's situation, the three angles of a triangle and about five hundred feet apart.

The chimneys of the three houses were struck and demolished from roof to cellar, but only one person was injured. This man, James Terwilliger, was struck and thrown down, his boots torn off and his body scorched. But his injuries were not serious.

The people of Marlboro are of the opinion that they had lightning enough for one day, and that, if "lightning never strikes twice in the same place," it sometimes strikes three times in places quite close to each other.

CHEMISTRY OF THE COTTON PLANT ROOT.—The root of the cotton plant, which is employed as a medicine, has been subjected to careful chemical analysis by Professor E. S. Wayne. He obtained from the root a dark red resinous mass, insoluble in alcohol, ammonia, chloroform, and ether, but soluble in caustic solutions of soda and potassa. It contains no alkaloid principle. He concludes that it is an acid resin, and suggests for it the name of gossypic acid.

Two diamonds have lately been found near Placerville, Cal., one weighing almost three carats, the other nearly one carat. It is supposed that more of them will yet be discovered. Diamonds have been found in nearly all gold producing countries

LIGHTNING RODS.

"Lightning Rods and How to Construct them" is the title of a convenient little handbook by Professor John Phin, issued by the Handicraft Publication Company, 37 Park Row, N. Y. Price 25 cents. It contains much sound and useful information upon the subject, and ought to have a very wide circulation. The following selections will give some idea of the excellent character of the book:

Are Lightning Rods Really a Protection?—There are many instances on record where buildings protected by rods have been struck and injured. But this is not to be wondered at when we reflect that fully one half—nay, perhaps three fourths—of all the rods now actually erected violate the fundamental principles upon which their efficiency depends. Besides serious errors in regard to arrangement and continuity, it will in general be found that it is only by the merest accident that a good ground connection is ever secured. This point will be more fully discussed in a subsequent paragraph. Meanwhile, the following facts prove irrefragably the great value of well constructed rods. The Cathedral of St. Peter, in Geneva, although so elevated as to be above all other buildings in the neighborhood, has for three centuries enjoyed perfect immunity from damage by lightning; while the tower of St. Gervaise, although much lower, has been frequently struck. This doubtless arises from the fact that all the towers of St. Peter are accidentally furnished with perfect conductors. The great column of London known as the Monument, erected in 1677 in commemoration of the great fire, although over two hundred feet in hight, has never been struck; while much lower buildings in the vicinity have not escaped. The Monument, however, is protected by a most perfect conductor, the upper end terminating in a vase from which proceed numerous metal plates designed to imitate the appearance of tongues of flame. The vase communicates by means of stout bars of iron with the metal staircase, which descends through the middle of the column and terminates in the ground. A still more striking instance of the value of lightning rods is a church on the estate of Count Orsini, in Carinthia. This building was placed upon an eminence, and had been so often struck by lightning that it was deemed no longer safe to celebrate Divine service within its walls. In 1730, a single stroke of lightning destroyed the entire steeple; after it had been rebuilt, it was struck on an average four or five times a year, without counting extraordinary storms, during which it was struck from five to ten times in a single day. In 1778, the building was reconstructed and furnished with a conductor; and, according to Lichtenberg, up to 1783—that is to say, during the space of five years—the steeple had been struck only once, and this stroke had fallen upon the metallic point without producing any damage. For two or three years after its erection, the church of St. Michael in Charleston had been frequently damaged by lightning; a conductor was attached to it, and during the following fourteen years it had not been injured. The steeple of St. Mark's, in Venice, has a hight of 340 feet, and was frequently struck by lightning until a proper lightning rod was applied to it, since which time it has not been injured. These facts leave no room for doubt in regard to the great value of lightning rods.

The Best Form for the Rod.—If we examine the rods ordinarily found in market, and puffed by those who have invented them, we shall find that, instead of being solid bars of a square, round, or merely flattened form, they are tubes, twisted ribbons, or bars whose cross section has the form of a star. And if we ask why these complicated and expensive forms have been adopted, we shall be told that it is for the purpose of obtaining the greatest amount of surface with the least amount of metal, and this is done because electricity always resides on the surface. Those who reason in this way, however, prove clearly that they have never studied the subject, else they would be aware of the fact that while static electricity, as it is called—that is, electricity at rest—always disposes itself on the surface of bodies charged with it, electricity in motion pervades the entire substance of the bar through which it passes, and consequently the power of such a bar to convey electricity is measured by the quantity of metal that it contains, and not by the extent of surface that it presents. Pouillet showed this in a very clear and decisive manner. He measured the conducting power of a fine wire of cylindrical form—the form that presents the least possible surface in proportion to its cubic contents—and then, having flattened and annealed it, he tested it again. Its surface was enormously increased, but its power to conduct electricity was lessened rather than otherwise; this diminution being probably due to the fact that the wire was increased in length, and, consequently, its cross section was somewhat diminished. An experiment, equally decisive and perhaps somewhat more easily performed, is at the command of every one who has access to a small electrical machine and a two quart Leyden jar. Take a fine gold wire, say one fiftieth of an inch in diameter. This wire will present nearly the same surface as a ribbon of metal 1-32 of an inch wide. The wire will carry off, without being injured, any charge that can be imparted to the jar. If, however, we pass the charge through a strip of gold leaf having several times the surface of the wire, it will be completely burned up and dissipated.

Arrangement of the Rod.—It is very obvious that the most perfect, though not the most economical, arrangement would be to cover the entire building with a sheet of metal. Then it would be impossible for the lightning to strike any point without falling upon a good conductor. But such an arrangement being obviously inadmissible, we must so arrange matters that the most exposed points shall be the conductor and its connections. The French Academy recommended the use of rods elevated nine to twelve feet above the building, and, after a good deal of experiment and observation, came to the conclusion that a rod was capable of protecting efficiently a space covered by a radius equal to twice the hight of the rod, above the most elevated part of the building. For ourselves, a very careful examination, of the conditions which arise during a thunderstorm, leads us to place no confidence whatever in elevated rods, and to depend wholly upon so arranging the conductor that every part of the building shall be protected.

It is obvious that the rod should be carried from the roof to the ground by the shortest possible way. Some have even recommended that it be carried down the chimney—a plan in which there is nothing objectionable, provided it happen to be the most convenient.

Attaching Lightning Rods to Buildings.—It is a very prevalent opinion that lightning rods should be carefully insulated from the buildings to which they are attached, and hence most rods are made to pass through glass tubes or insulators, the avowed object being to prevent the electricity from passing into the building. The extreme worthlessness of such arrangements ought to be obvious to any person who ever observed a flash of lightning. The discharge from a powerful Rhumkorff coil will pierce through five inches of solid glass, so that, if a lightning rod were entirely cased in a glass tube, an artificial flash of lightning can be produced which will pass through it as easily as a spark from one of the old machines would pierce a card! And if such a result can with safety be produced by artificial means, in a room filled with people, what would be the limit to the effects produced by natural means where thousands of acres of cloud surface are engaged? Insulators do very well to talk about, but as a security against Heaven's artillery they are powerless.

Lightning rods should be connected with all large masses of metal which may exist in or upon the house, such as metallic roofs, tin or iron gutters or pipes, iron railings, etc. In the second place, the rod should be attached to the house in the neatest and least obtrusive method possible. If the rod be flat, it may be pierced with small holes and tacked directly to the building; but a better way, both for round, square, and flat rods, is to employ properly shaped staples of stout wire. These staples may be driven into the studding of wooden houses or into the joints of brick walls, and, when properly painted, will not present an unsightly appearance.

Termination in the Ground.—Upon the perfection of the ground termination mainly depends the value of the lightning rod. If this be defective, no other good features can possibly make up for it. And yet, so little is it understood, that a careful examination of a very large number of rods leads us to believe that fully one half the lightning rods in existence are defective in this respect, and, consequently, furnish but an insufficient protection.

Iron conducts better than water, but water conducts better than dry earth. And just as we are able, by increasing its size, to make an iron rod conduct as freely as a copper one, so, by increasing the volume of water or soil employed to carry off the electricity, we can make it almost as efficient as the metallic conductor. These facts lead us to the following conclusions: 1. The end of the rod ought to be made to terminate in a layer of soil that is permanently wet; and 2. The end of the rod ought to expose to this soil as large a surface as possible.

Permanently moist earth is to be attained only at considerable depths—say at the level of the water in the wells in the vicinity. Unless we reach this point, we can never be sure that our rod does not terminate in dry or but slightly moist soil; consequently no effort should be spared in sinking the rod to a sufficient depth. This is most easily accomplished at the time when the foundations are laid; and we would advise all builders to sink the lightning rod termination when they sink the foundation. A short portion of the stem may be allowed to rise above the ground, and the conductor may be arranged and attached at a subsequent period.

It is a common practice among lightning rod men to form the earth termination by simply driving a crow bar into the earth, and inserting the end of the rod in the hole thus formed. No reliance can be placed on an earth connection made in this manner. The crow bar may have been driven into perfectly dry sand; and, in any event, the amount of surface exposed by the rod, and the consequent section of earth brought into action, is altogether too small.

How to Preserve to Prints the Beauty which they have in the Washing.

Every photographer must have observed how beautiful prints sometimes look in the washing water, and how much they lose of their vigor and beauty on drying. This is especially true of fully toned prints, which, although they show a warm tint of black in the water, dry sometimes of a cold inky tint, besides becoming mealy. It seems important, therefore, that prints which are intended to be framed for an exhibition, or which the artist desires to keep for himself as choice specimens and the best which the negatives will yield, should be so printed as to lose none of the beauty which they exhibit in the water—none of the rich warm tint, the transparency in the shadows, the clearness of the detail, the perfection of surface produced by the water acting as the varnish. But the only way to preserve all these excellencies is to substitute glass for water, and so to mount the print against the back of a glass plate as that when viewed through the glass it may appear exactly as it does under water, that is to say, exactly as it would if removed from the water and pressed while still wet against the glass plate. The problem, then, is to substitute for the water some kind of varnish which, when perfectly dry, will not produce any change in the appearance of the print. Imagine for an instant the problem solved and the thing done; what would be easier than to mount all such prints as we intended to be framed and glazed against the glass of the frame instead of upon a card board which is placed more or less loosely behind it? or to mount all such prints as an artist might desire to keep for his own use upon plate glasses, to be pressed in a plate box like negatives or glass transparencies?

The problem is a very old one, and it has been already solved by means of collodion and gelatin. M. Davanne has recently described the process at a meeting of the French Photographic Society. It is as follows:

Coat the glass plate to which the face of the print is to be applied with plain collodion, and immerse it immediately in a bath of cold water in order to wash out the ether and alcohol, as in the common wet process with the nitrate bath. Then pour over the film a solution of white gelatin, strength about eighty grains to the ounce of water. It must be sufficiently hot to flow freely, and care must be taken to avoid dust and air bubbles. Tilt the plate so as to let the excess of gelatin run off into another vessel, and then place it upon a horizontal support. The film of gelatin will thus be very thin. Before waiting until it is quite dry, lay the face of the print down upon it just as it comes wet from the washing water, and press it into close contact with the glass.

When viewed through the glass it will, of course, look just as it does in water, and this beautiful appearance it will not lose on becoming dry. With respect to the white background, or one of any other color, this may consist of a sheet of paper applied to the whole of the glass plate behind the print. Or if the negative be masked with black paper for a sufficient breadth round its edges, the print will have a white margin and need not then be trimmed. In subjects which are vignetted, this will, of course, be the plan to pursue.

As soon as the print has become dry against the glass, it may be put into a frame with a thin board behind it. Several prints may be mounted together upon the same glass. The only objection to the plan is that if the glass should be broken the print would be destroyed; but this objection is greatly outweighed by the increased beauty of the result. By using a rather thick plate of glass, the risk of breakage would become very small indeed. The perfect optical contact between the surface of a print and that of so splendid and smooth a varnish as a sheet of glass is an advantage not to be underrated or despised. There is no loss of detail, no change of color, none of the mealiness produced by drying, and none of the vulgarity of albumen. The result is not only technically but artistically finer than when any other method of enamelling and mounting is employed. If, when the print is dry, it be brushed over on the back with plain collodion, the pores of the paper would be so filled with air and water-proof material that greater permanency would, no doubt, be secured.

Pear Tree Blight.

Some interesting experiments are being prosecuted by Mr. William Saunders, superintendent of the Department of Agriculture grounds, at Washington, in relation to pear tree blight, particularly during the last two years. A pear tree which was badly blighted on its main trunk was made the subject of special experiment. Nearly all of the bark was blighted within three feet of the ground, only about an inch and a half in width being left to connect the upper part of the tree with the unblighted bark at the base. The affected part was removed and the sap wood left quite exposed to view; but to prevent injury from the air it was at once coated with a composition of carbolic acid, sulphur, and lime, largely diluted with water. After the lapse of two years, the tree has wholly recovered and the denuded part is again covered with new and healthy bark. The tree in all respects presents a healthy appearance. Many other trees much affected with blight were coated heavily with the sulphur compositions and have evinced marked signs of improvement. It is intended to continue these experiments on a larger scale, until sufficiently numerous and well established facts attest the best mode of treatment. The Department grounds consist of a heavy, compact, partially undrained soil, lying low; they are therefore unfavorable for the highest development of pear tree culture. It has been only by persistent effort that the fruit trees on the Department grounds have been brought to their present highly improved state.

Barry says that "blight has never been known to originate on the dry, sandy loam of Long Island, not even with heavy manuring, the drought of midsummer always ripening the shoots so completely that the leaves drop off long before frost commences." The true source of blight seems to have its origin principally in the action of frost on unripe wood, which may arise from a combination of causes.

Marvels of the Insect World.

The *Spectator*, in its notice of M. Touchet's work, "The Universe," says: "Man generally flatters himself that his anatomy is about the highest effort of Divine skill; yet that of the insect is far more complicated. No portion of our organism can compare with the proboscis of the common fly. Man can boast 270 muscles. Lyonet, who spent his whole life in watching a single species of caterpillar, discovered in it 4,000. The common fly has 8,000 eyes, and certain butterflies 25,000. M. Touchet treats it as an established fact that so fine are the sensory organs of ants that they converse by means of their antennæ. Consequently the strength and activity of insects far surpass ours in proportion. In the whole field of natural science there is nothing more astounding than the number of times a fly can flap its wings in a second; it must in that point of time vibrate its wings five or six hundred times. But in rapid flight we are required to believe that 3,600 is a moderate estimate."

NEW STEAM DREDGING BOATS.

Our illustration shows a novel type of dredger, constructed by Messrs Simons & Co., of Scotland, for the Government of Canada. Our engraving is from the *Engineer*. The dredger combines in herself the properties of a powerful dredger, a hopper barge, and a screw steamer. She is intended to be employed at the mouths of harbors and rivers in Canada, to keep them clear of silting and other obstructions, at a cost below what would be practicable under the old system of a fleet, including dredgers, barges, and tug steamers—the work of all which is managed under the new system in "one bottom."

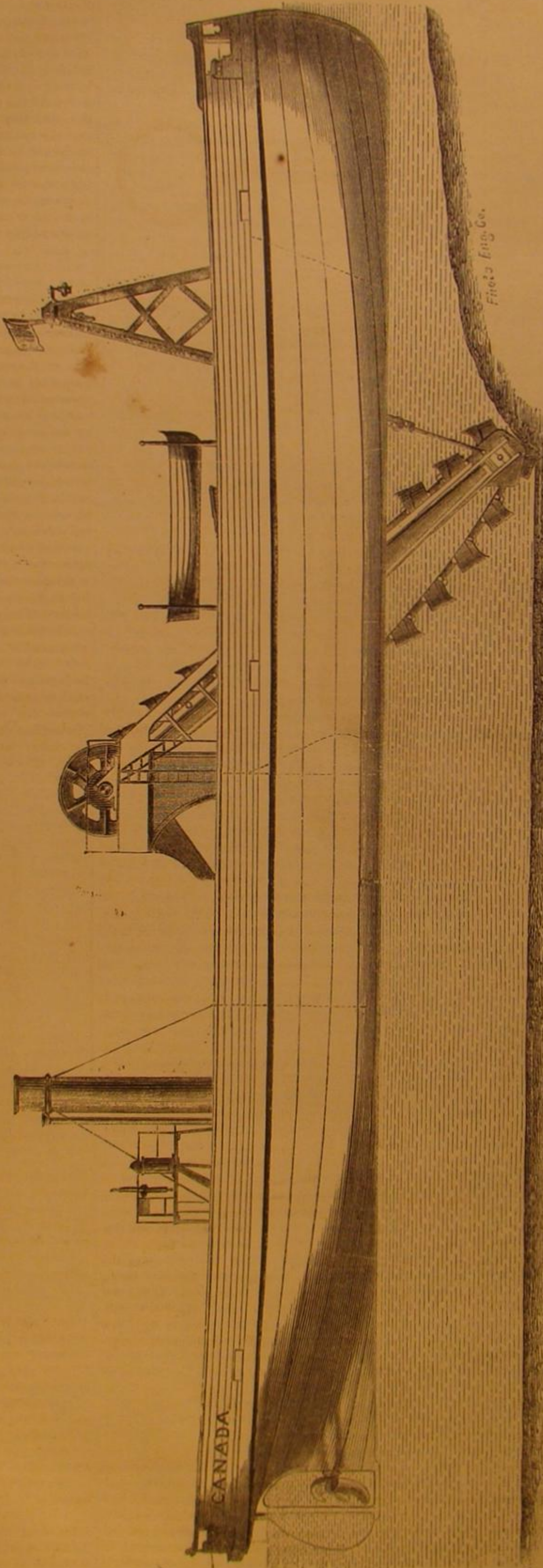
It will be seen that the novelty consists in the fact that barges are dispensed with, and we cannot better explain how than by stating what the dredger did a few weeks since on her first trial; the vessel was moored a little below Dalmuir, on the Clyde, at about 11 A. M., and the machinery started for operation in 18 feet water. In about two hours, the hopper cavity was filled with some 200 tuns of stuff—sand, gravel, mud, etc. dredged from the bottom of the channel. The dredging machinery was then disconnected, and the screw propeller put in motion; and the moorings having been loosened, the *Canada* proceeded down the river under easy steam, at the rate of about eight miles an hour, to the Kilcreggan shore, where the trapped bottom of her hopper cavity was opened, and the 200 tuns of dredged stuff above mentioned allowed to slide into the sea.

Her dimensions are: Length 131 feet, breadth 21 feet, depth 10½ feet; the hopper compartment is 20 feet in length, 16 feet wide, and 12 feet deep, containing when filled about 200 tuns spoil; the hopper doors are formed of hinged iron plates lined with elm, having strong hinges fixed to center keelson, the door chains being carried over side pulleys to the hopper crabs. The vessel is propelled and the dredging gearing driven by a pair of inverted cylinder direct acting condensing engines of 35 nominal horse power, having starting gear on deck and also in the engine room. Disconnecting clutches and levers are placed at the fore and aft ends of the crank shaft, arranged so that the dredging gearing or the propeller can be worked independently or together, as required. The engines make eighty revolutions per minute when propelling the vessel about eight miles per hour, and sixty revolutions when discharging about twenty buckets per minute. The inclined shaft that drives the upper tumbler is fitted with a friction wheel to slip and prevent accidents when an undue strain comes on the gearing. The boiler is of the multitubular kind, with two furnaces, working steam pressure 25 lbs. per square inch. A hand lever is placed on deck for controlling the dredging ladder and securing that the buckets shall cut to the proper depth when dredging. There are twenty-four buckets on the chain, each containing, when full, nearly four cubic feet; the cutting lips, pins, and eyes of the buckets are of steel. Triple geared steam crabs are fitted at bow and stern, each having three independent barrels, arranged to work and control the head and stern or the side lines, as required, and to work together or separately. When the vessel has filled her own hopper, the bucket ladder is raised by steam, the propeller is then at once put in gear and connected, the mooring chains unshackled and dropped with a buoy and line attached; the vessel then proceeds to the required place of deposit, drops her cargo, and returns; the buoys and lines are picked up, and the chains hove in by the crabs to bring the vessel up to the cutting face of the soil.

UNITED STATES GOVERNMENT DREDGER.

It may be of interest to state, in this connection, that a novel dredging boat, working on a very different principle from the foregoing, has lately been built at New York, for the United States Government, intended for operation at the mouth of the Mississippi river, in open water.

The length of this vessel is 151 feet 8 inches, depth of hold 20 feet, and about 28 feet beam. She has a screw at both ends—at the after end one with three blades, 12 feet diameter, and 14 feet pitch, for propelling exclusively; the forward end is provided with a screw also, but something a little different in its aspect. It has six blades instead of three, and looks like a big whirligig. The screw, like the one at the other end, is made of brass; its diameter is the same, and it alone weighs 23,900 pounds. The blades are made separate and the boat carries extra blades, so that, in the event that any one should break, it can be taken out and a new one substituted. The forward screw performs two offices, namely, that of impelling the vessel through the water by a drawing on process, and digging in the mud and sand. It is worked by two oscillating engines, 40 inch bore by four feet stroke, and will perform 65 to 90 revolutions per minute with thirty pounds of steam.



STEAM DREDGE FOR THE CANADIAN GOVERNMENT.

The three bladed propeller is driven by a single oscillating engine, the same size and power with the others. Besides the six-bladed screw for digging, there is also a large scoop or drag, in the shape of a half cylinder, made of three eighths inch boiler iron, with heavy wrought iron rims and pinions. It is 12 feet deep, 20 feet concave linear measure, and will drag away fifteen tuns of mud or sand at a load. The scoop is suspended from two strong davits overhanging the digging end of the boat, and is managed by means of a pair of powerful hoisting engines forward. The boat is first driven, light, as far up on the bar or bank as possible. Then the scoop or drag, which hangs suspended from the davits, is let go on the run. Its great weight carries it far into the mud. Then the big six-bladed screw is set in motion, and at the same time the propeller at the other end commences whirling, to pull the boat off. The six bladed propeller loosens up the mud, and adds greatly to the impelling power, which, when both are working, is tremendous, dragging the great scoop, with its freight of fifteen tuns of mud, out to sea. As the mud is worked away, the sinking tanks are gradually filled, the boat settles deeper in the water, and the digging apparatus works in deeper mud. The boat is built in the most stanch manner, and is perfectly seaworthy. She is brig-rigged. Her bottom is of solid oak, 18 inches thick, and will stand any strain to which it is liable to be subjected. When at sea she will work both propellers, one pulling and one pushing, and it is supposed that her speed will be 18 miles per hour.

Beet Sugar.

The problem of furnishing sugar to supply the large and constantly increasing demand for it throughout the civilized world is daily augmenting in importance. Sugar, in some of its forms, is widely distributed throughout the vegetable world, and though it is seldom found in chemical combination with other substances, yet it is generally so mixed with a number of other proximate principles that its separation in a crystallizable form is very difficult.

When it is ascertained that the juice of the sugar beet contains from 10 to 13 per cent of crystallizable sugar, and that the beet can be produced in unlimited quantities, most persons will suppose that the sugar problem is solved. But beet juice, in addition to sugar, holds in solution pectose, gum, albumen, asparagin, betain, oxalic acid, citric acid, phosphoric acid, sulphuric acid, chlorine, and silica. Besides these there are variable proportions of potassa, soda, lime, iron, magnesia, rubidium, and manganese, from all, or the greater portion of which, the sugar must be separated before it is fit for domestic purposes. Most of these substances, as compared with the sugar, are present in very minute proportions, yet these and their chemical derivations defeat all attempts to procure the sugar by evaporation merely. The efforts to manufacture sugar from beets or sorghum in this country have failed just at this point; and even in Europe, where the beet sugar enterprise has been most successful, this question of defecation is far from being satisfactorily settled.

In the most successful establishments in Europe, 75 per cent of the sugar actually contained in the beet is rarely obtained in a crystallizable form.

In the very interesting experiments of Professor Goessmann, of the Massachusetts Agricultural College, we have an attempt to obviate most of these difficulties on purely scientific principles; and, we are happy to say, with results which bid fair to lead to ultimate and complete success. Fifty pounds of the freshly expressed juice of the electoral beet was brought rapidly up to a temperature near the boiling point (80° C.,) when the source of heat was withdrawn and one half of 1 per cent (4 ounces) of caustic lime, reduced to the condition of milk of lime, was stirred into the juice. The heat was then raised fully to the boiling point, when it was again removed, and after standing fifteen minutes, the clear juice was drawn off by means of a siphon. Several advantages are gained by heating the juice before adding the lime; the chief of which are the more perfect coagulation of the albumen and the consequent separation of the organic substances which it carries with it: the more perfect neutralization of the citric, oxalic, and phosphoric acids, and the precipitation of the insoluble salts thus formed. The asparagin present in the juice is rapidly converted, by the action of caustic lime, into asparaganic acid and ammonia. The acid combines with the lime and is thus disposed of, and the ammonia escapes in the gaseous form, being insoluble in hot water. These are important advantages gained by hot defecation.

After this the clear juice was concentrated by evaporation to 30° Brinx, and when cooled to 125° F. (50° C.) it was treated with carbonic acid, which had the effect to liberate the lime from its combination with sugar, and precipitate it as calcic carbonate. The clear juice, heated to near the boiling point, was passed through a filter of bone black, and by careful evaporation was crystallized. By the use of carbonic acid the greater portion of the sugar which has entered into combination with lime, potassa, and soda may be recovered.

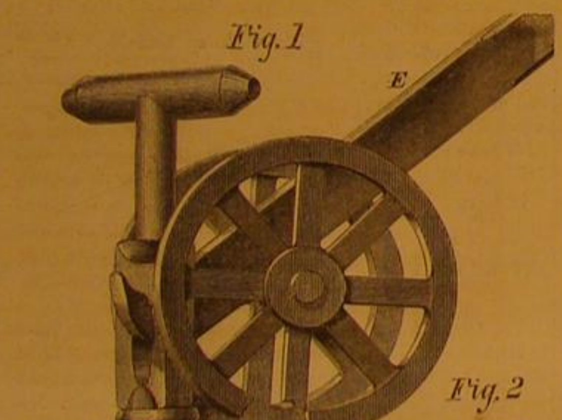
By this process from 8 to 9·4 per cent of crystallized sugar was obtained from juice holding in solution not exceeding 13 per cent. These results are certainly very encouraging.

These successful experiments are the first fruits of our system of agricultural colleges, and indicate very clearly an important feature in their mission.

IMPROVED BUNG.

Our engraving illustrates an improved bung which is so constructed as to be easily extracted from the cask by the operation of the lever and key, represented in connection therewith in Fig. 1. In this figure, the bung is shown in section in its place in the cask, and in Fig. 2 a perspective view is given.

The essential parts of the invention are a bung proper, made of wood or other suitable fibrous material, shown at A, and a cast metal plate, B, which has a shank which passes through A, and through the washer, C, beneath which it is fastened with a pin. The shank of the plate, B, is hollow for some depth, and is provided with internally projecting shoulders, in such a manner that the key, D, may be inserted between them and made to engage with them on turning it a quarter round. This locking of the key with the shoulders



of the plate, which will be readily understood from the cuts, enables a direct perpendicular pull to be made on the bung, by which it may be withdrawn from the cask. To facilitate the operation, the lever, E, is brought into play and hooked into the key, D, as shown. This lever is made of steel and is about 18 inches in length; the wheels, the axletree of which forms its fulcrum, are placed far enough apart to clear the bung while the fulcrum and key are brought very close together. Part of one wheel in the cut is broken away to show the bung. In this way, very powerful leverage is exerted and the bung easily extracted, without subjecting the cask to the liability of injury, which it always has to sustain when the bung is being hammered loose by the old method of extraction.

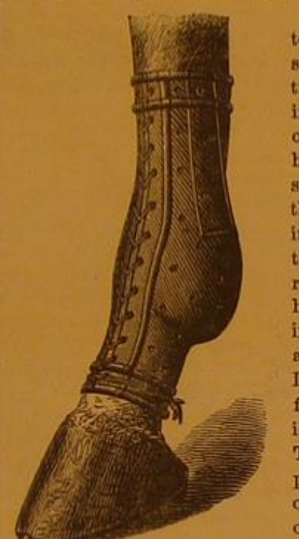
The invention, as described, was recently patented through the Scientific American Patent Agency, since which a further improvement has been made in the bung, which consists in the addition of a self acting valve which operates as a vent whenever liquid is drawn from the cask. The construction of this valve will be understood on reference to Fig. 1. A shallow groove is formed round the outside of the hollow shank, and a small hole is made connecting the interior with he groove. An india rubber ring is stretched round the groove and covers the hole air tight. Upon drawing off the liquid contents of the cask, the air raises, by its pressure, the rubber ring, and finds its way into the cask between the shank and the washer, which fit loosely.

Mr. Alfred Marsh, of 339 Fifth street, Detroit, Mich., is the inventor of the foregoing improvements, and further information can be obtained from him.

A BRIDLE BIT THAT IS SOMETHING MORE, AND AN IMPROVED STOCKING FOR HORSES.

Mr. Albert Van Auken, of Ludlowville, N. Y., has invented a bridle bit, which may be made the means of aiding in the cure of various diseases to which the throats and mouths of horses are liable.

He makes the bit hollow, with minute perforations along the side. Into the hollow bit he pours, while melted, a medicament prepared with some bland substance, like lard, oil of theobroma, or other substance which melts at a low temperature, simply as a vehicle or which may be itself of service as an emollient. The warmth of the horse's mouth, when the bit is applied, melts the medicament, which then exudes and mingles with the saliva which flows to and over the diseased parts, which are thus reached for treatment, even when the animal is at work. How efficient this will prove in practice, we leave for veterinary surgeons to decide. In any event, the effort to ameliorate the condition of the horse is a humane and commendable one, and will receive the approval of the horse's friend *par excellence*, Mr. Bergh.

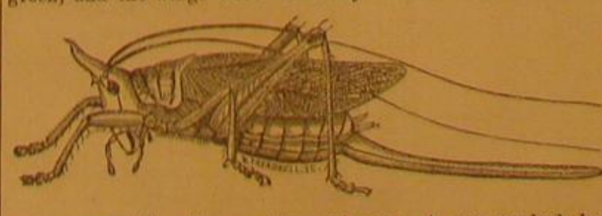


Mr. William Lewis, of Astoria, N. Y., has also been considering how he might contribute to the comfort, and, in one sense, to the support of horses, and to this end he has devised the improved stocking which figures in the accompanying engraving; it consists in a snug fitting elastic anklet of india rubber, molded to fit the horse's leg, and ribbed and reinforced to prevent sagging and slipping down at the top. It is also perforated to allow free exit for perspiration, and is laced in front as shown. The object of the invention is to provide a support, not always of the length shown, but longer or shorter as may be necessary for sustaining and protecting the tendons, ankles, knee joints, etc., of trotting and racing horses and horses in general, so as to prevent injuries from over bending or straining in stepping upon stones or rut holes, etc.

A New Grasshopper.

Mr. Townsend Glover, Entomologist of the Department of Agriculture at Washington, says that two full grown specimens, a male and a female, of a very singular and apparently new orthopterous insect, resembling *Conocephalus ensiger*, or conical sword bearer of Harris, were taken alive in the greenhouse of the Department of Agriculture, last season, by Mr. J. H. Brummel. A short time previous, two half grown larvæ were found, but died soon after being captured; and the remains of a fifth full grown imago were found, when cleaning out the flower pots in the winter.

These insects injured the leaves of the coffee plants, rose apples, and bananas, in the greenhouse, much in the same manner as is done by our native katydids, by eating holes in the leaves and gnawing away the edges. Their jaws were remarkably strong and sharp, and when the insects were incautiously handled they bit so severely as to draw blood. The male was about 1·75 inch in length, from the tip of the cone or horn on its forehead to the end of its wing covers when closed. The female measured 3·05 inches to the end of the ovipositor, which itself was at least 1·25 inch in length. The general color of both male and female was a light pea green, and the wings were delicately veined with distinct

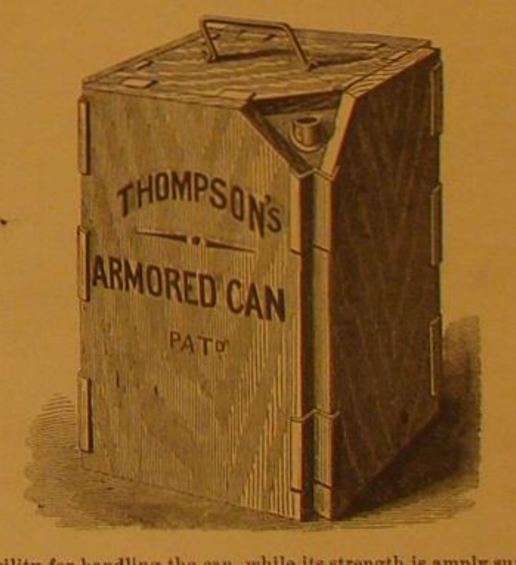


nerves, resembling the venation of leaves. A very marked feature in this insect, when alive, is that the labrum and clypeus are bright yellow, contrasting strongly with the jet black of the mandibles, which, together with the cone or horn on the top of its head, gives it a remarkable appearance. This cone or horn, which is placed obliquely upward on the top of the forehead, forming a line with the face, is yellow beneath, black at the tip, and ends in an acute point, which is somewhat bent downward at its summit. No insect resembling it having hitherto been found in this neighborhood, there is but little doubt but that it has lately been imported with or on some foreign plants sent from South America or the West Indies; and as many exotic plants have been received from Balize, British Honduras, it is probable that this grasshopper came in the egg state on some of the plants from that locality, and was hatched out last summer in the greenhouse. This fact alone admonishes us how careful we should be when importing new and valuable plants from abroad, for if a large insect, nearly two inches in length and fully the size of a katydid, can be so easily introduced, how much more readily the small and inconspicuous noxious insects hidden under the bark would be likely to escape notice until they had perpetuated their species, so as to become partially naturalized and injurious to our plants. There is no danger, however, that this grasshopper will spread, and, as it is apparently very tender and accustomed to a tropical climate, most probably it would not be able to withstand the rigors of our winters in the open air, and as all were killed or caught as soon as seen in the greenhouse, there is very little probability of any being left to perpetuate their race.

ARMORED CAN.

The sheet metal cans used to contain oils, varnishes and other liquids for transportation, have usually to be enclosed in a wooden box in order to afford them the requisite protection from accidental injury. It is the object of the invention we illustrate to economize in the cost of this wooden protection or armor, and at the same time to provide a covering of the needful strength. This is done by soldering small metal clamp plates to the angles of the metal can, and by fastening the armor, which consists of boards of the proper size, to the can by bending over it the projecting ends of the clamp plates. The entire arrangement will readily be understood from our cut, which represents the metal can enclosed in the improved armor. The boards for the top and bottom are first put on and clamped, and the four side boards are attached afterwards. In constructing the can, one top corner is sloped off and the nozzle inserted therein so that it does not rise above the top of the can, as shown in the cut. In this position, it is protected by the armoring of the top and adjacent sides and is conveniently placed for pouring out the liquid. It may be stopped in any manner required.

It is the design of the inventor to armor a five gallon can with wood of one fourth inch thickness at the sides, and one half inch at the top and bottom. The material, he says, can be furnished in shooks, cut to any size and ready for use, by eastern and western lumber merchants very cheaply. He claims that the expense of boxmaking is saved by this method and that less lumber is required, while the cost of the clamp plates is more than compensated by the saving in labor. The armor being lighter than the box affords greater



facility for handling the can, while its strength is amply sufficient for all practical purposes.

A patent was obtained for the inventor of the device, Mr. William F. Thompson, through the Scientific American Patent Agency, May 7, 1872.

Address for further information, Wm. F. Thompson or Edwin Jacoby, Toledo, O.

English Fast Train.

The Great Northern Railway Company is now running a fast train between London and Edinburgh, 395 miles, in $9\frac{1}{4}$ hours, which is at the rate of about 42 miles an hour. If we had good first class railways in this country, between our important cities, capable of the above speed, passengers might ride from New York to New Haven 74 miles, in $1\frac{3}{4}$ hours instead of three hours as at present required; to Boston 234 miles in $5\frac{1}{4}$ hours instead of 9 hours; to Washington 228 miles in $5\frac{1}{2}$ hours instead of 9 hours; to Chicago 835 miles in 20 hours instead of 34 hours; to St. Louis 1000 miles in 24 hours, instead of 48 hours.

TEA GROWING IN INDIA.—The experiment of growing tea in India is proving quite successful. In 1862 the crop was estimated at 1,000,000 pounds; in 1871, at something over 20,000,000. It is claimed that India can now compete with China in producing teas of the best quality.

Correspondence.

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

Artists with Bad Eyes.

To the Editor of the Scientific American:

The article under the above caption, reprinted from the *Chemist and Druggist* on page 392, Volume XXVI. of the SCIENTIFIC AMERICAN, treating on the effect of faulty vision in painting, conveys the impression that the artist with astigmatized eyes attaches the stigma to his picture when painting from Nature. This impression, I think, is erroneous.

Turner and all who seek to faithfully copy Nature try to make their pictures produce upon their own eyes the effect of Nature, and since like effects proceed from like causes, the effect of Nature can only be produced by the reproduction on the canvas or picture of the forms, proportions, and qualities of Nature. And this is true whether the artist's eye be correct or incorrect, since the same eye observes both Nature and the copy; and differences can be detected and remedied as readily by the incorrect, as by the correct, eye, and neither eye can be satisfied until such differences are eliminated. I am, therefore, compelled to deny that "astigmatism" tends to error in copying directly from nature; or to vitiate the criticism which is based upon observation of Nature made at the time of such criticism.

The writer of the article under consideration says: "Turner painted from Nature exactly as Nature appeared to him, but not as it appeared to him when his sight was truthful."

It is readily seen, if the above reasoning be sound, that the last clause of this statement cannot be true; and the first clause can only be correct on the supposition that Turner's eye was truthful. For if we suppose his eye to have been incorrect, he would still produce the forms and proportions of Nature in order that his eye might be satisfied. Thus he would see wrongly, but draw correctly.

Similarly, I am compelled to dissent from the opinion, expressed or inferred in the same article, that yellowness in the lens of the eye of Mulready led to untruthfulness of color in his paintings made directly from Nature; because the color in his eye was spread over Nature and picture alike, as he observed them. And I believe that if he, with colored lens, truly sought to make his picture appear to himself like the Nature he painted (not as he saw, but correctly) the stigma was not painted, but was, to him apparently but not really, added to the work by his diseased or incorrect eye. But a source of error in a representation of Nature might be found in the case of an artist who has observed Nature with correct eyes, and afterwards has become astigmatized, and in the latter state has painted or sought to record on canvas the knowledge gained by his previous observations. In this case, the error in the picture will be the opposite of the stigmatization. This accords with the case of Mulready as stated in the article considered.

C. STEBBINS.

How to Destroy Mosquitoes.

To the Editor of the Scientific American:

The process for destroying mosquitoes may be condensed into a few words. The strongest crystallized carbolic acid should be placed in a bottle, and covered with the same quantity of strong red-codliver oil; shake the bottle thoroughly until a whitish colored foam appears; if such foam does not arise, however, a small quantity of powdered lime should be added, with a little water. Pour the mixture into a dish or other convenient article, and place directly under the open window, as it is from this quarter the mosquito enters.

In my humble opinion, the effect should be explained in this manner: The moment the mosquito enters, it loses the scent of blood; for, as the combined odor of the oil and acid is much more powerful than that of blood, it follows, as a consequence, that the mosquito becomes suddenly perplexed. The consequence is, that after scrambling and skirmishing about in the dark, the mosquito is led, as it were, instinctively into the mixture, where it is either drowned in the oil or burned to death by the acid.

Formerly I was accustomed to smear my face, arms, and breast with the strong oil alone, but I frequently arose in the morning smelling so terribly that, though it protected me from mosquito bites, I was happy to lay it aside. I have slaughtered more mosquitoes with the article explained above than ever I could have done with my fists or any other dangerous weapons.

E. S. G.

Philadelphia, Pa.

A Machinist's Query.

To the Editor of the Scientific American:

On page 20 of your current volume, is an article from a young machinist which looks very young indeed. He says he has learned a trade; "jes' so." I'll guarantee he was one of those chaps who spend a good share of their time dogging bosses, and if he is getting $3.50, per day it is only because he is in a new country where workmen are scarce.

If he is such an encyclopedia of knowledge, he had better try to fill some poor wretch's position, as good men are always in demand. He will probably find some thorns in that bed of roses.

It is not necessary for me to enter into all the comparisons between the two occupations: but I will state some of the qualifications necessary before becoming a member of the brotherhood of locomotive engineers. He must be sober, moral, truthful, and inclined to deal justly with all men, ever ready and reliable, of good judgment (one of the most necessary qualifications) as he will have from two to three hundred thousand dollars worth of property day after day, besides hundreds of precious lives, entrusted to his care. Does a machinist ever have one tenth the responsibility? Is he in danger of his life by land slides, rocks, trees in storms on tracks, or wrong switches? Not that I know of. The majority of engineers are men who commenced young and fired for from 2 to seven years, from 12 to 20 hours a day, sleeping on boxes, tops of cabs, wood piles, soft sides of hemlock planks, etc., generally too tired to wash up and go to bed to sleep only three or four hours; while a machinist generally gets plenty of sleep. I intend nothing derogatory to the profession. These are a few of the nice attractions incident to the route to the position of a locomotive engineer. Lastly, the young machinist ought to know that we are getting but $4.00 per day.

Hornellsville, N. Y. S. E. STURDEVANT, ENGINEER.

The Young Machinist Again.

To the Editor of the Scientific American:

I find, on page 20 of the present volume, "A Machinist's Query," wherein the young machinist says he is sorry he has learned a trade; that it is hard to know that, after serving four years apprenticeship, he only gets $3.50 per day for building and repairing an engine; whereas the engineer, who is entirely ignorant of the working of the engine, gets $4.50 per day for running it.

Now I am personally acquainted with machinists who are first class workmen and command the highest wages, and who build and repair engines, but are not capable of taking charge as engineer, because they do not understand the principles upon which the engine works, and they are theoretically as ignorant as they can be. A man may be a practical machinist, good at a lathe, planer, or vise; but if he does not acquire the theory as well as the practice, but goes by a better man's drawings, he is nothing but a first class laborer.

Practice without theory and theory without practice are dead.

So I say, give me an engineer who can make his own calculations, in regard to the engine and boiler and the use of steam, rather than a man who is a practical machinist, who has served four years at the laboring part of the business, and knows nothing of the first principles of what he makes or repairs.

AN ENGINEER.

Philadelphia, Pa.

Laws of Electricity.

To the Editor of the Scientific American:

In your issue of June 22d last, a short article concerning electricity, its connection with the earth, and its probable obedience to the laws of gravitation, reminded me of some cogitations on the same subject which may, or may not, be sufficiently interesting to be worthy of notice. A year or two ago, your paper gave an interesting account of the generation of electricity by certain portions of swiftly revolving machinery in factories; it was an easy and natural transition of the mind to infer that the electricity with which the earth is charged is produced by virtue of its own swift revolutions; or, if not exactly produced, at least intensified. Each world, or star, would thus draw to itself its own share according to the speed of its revolution, from an unlimited ocean of attenuated electricity in which, they and we, all float. Electricity seems to be, humanly speaking, the source of vegetable and animal life, and indeed lies hid in all forms of organic or inorganic substances, only awaiting study to bring it to light.

Buffalo, N. Y. J. DEWALDEN CHURCHILL.

Extinguishing Fires.

To the Editor of the Scientific American:

Allow me to make a suggestion to parties who purpose building large warerooms or business blocks. In some part of the cellar, build a tank that will hold enough acid and marble dust to generate, when mixed, gas enough to fill the building. Let the stop-off arrangements extend to the outer part of the building; and when a fire occurs and gets beyond the control of the portable extinguisher, turn on the large one. In warerooms, the gas could ascend through hatchways; in other buildings, flues in the walls connecting with different floors would be necessary.

G. W. D.

Iron Shipbuilding in Pittsburgh.

To the Editor of the Scientific American:

In September, 1839, I was in Pittsburgh, and there saw the hull of the first iron steamer ever built, I believe, west of the Alleghanies. She was called the *Duquesne*, and was intended for a freight boat. The hull was on the ways and the mechanics at work on it. What became of her—whether successful or not—I do not know. I saw a notice in the Philadelphia papers of her departure from Pittsburgh on her first trip. As iron will probably replace wood on the Western rivers, I think this reminiscence might be interesting.

M.

Do Snakes Charm Birds?

To the Editor of the Scientific American:

H. L. Edis makes this enquiry in the June 22 issue of the SCIENTIFIC AMERICAN, and also relates a very interesting incident which he witnessed. Mr. Edis does not commit himself in any way to the belief that the snake has any power to charm, and the article would imply that he is not one of that superstitious class who believe that the serpent is more subtle than any beast of the field that the Lord God hath made. Many other beasts show far more cunning than the serpent; the fox, for example, the bear, or even the cat in her subtle manner of capturing her game, especially birds. Even the subtle spider, with her mechanical network trap for the capture of the fly, shows more subtlety than ever the serpent did. Some snakes are hostile enemies to birds when hatching or rearing their young. The hen, when sitting or rearing a brood of chickens, will fight an elephant or crocodile; so the small bird, with the same instinctive parental defensive nature, will fight anything so also the mother; possessed with the same rash parental instincts, will rush to the lion's jaws to save her infant child. I once heard a gentleman relate an experimental test he made in that direction.

The men in his field had killed a very large specimen of the black snake and dragged it to the house for exhibition. The gentleman had the curiosity to stretch it on the ground, with uplifted head and mouth wide open, directly under the eaves of his barn where the swallows are hatching and nestling their young; then he stood off and watched the result. Presently the monster was spied and the air filled with swallows, diving in the most frantic manner at the supposed enemy, until, in a few moments, as every plunge brought them nearer and nearer to the object of their fury, one struck the snake's head, knocked it over, and then, as he said, it would seem that every swallow would pour its fury upon the dead reptile, knocking it in every conceivable manner. Soon the excitement was over, the supposed adversary conquered, and one by one the swallows retired to their nests. No doubt the snake may make use of this means in order to capture the bird or other game.

J. E. E.

The Right Kind of Windmill.

To the Editor of the Scientific American:

I notice the remarks of your correspondent C. B., of Memphis, on page 261, volume XXVI., headed "The Right Kind of Windmill." Many of his ideas are undoubtedly correct; indeed, such is the importance of this power that any suggestions calculated to throw light on the subject are welcome. The style he speaks of would certainly do a great deal of work while it lasts; but is it not a question whether so very cheap an arrangement as he speaks of is the cheapest after all? The writer has known several large mills burned down by the friction of violent running, and the noise attending a very rapid motion would sometimes be very objectionable.

For example: Upon the building in which I write is a self regulating windmill, used to elevate the Croton water to the four or five stories whither its own pressure is not sufficient to carry it. Its maximum velocity is some fifty or sixty revolutions per minute; but if it should be allowed to run 200 or even 150, the clatter (of the pump rod) would be intolerable, the pump valves would not have time to close properly, and the wear and tear upon the pump or other machinery would soon be destructive. (In this connection, see page 340, volume XXIV. of the SCIENTIFIC AMERICAN).

It would seem impossible almost for any windmill to accomplish what "Novice" there describes, and I dare say only the Continental or some of the high priced self regulating windmills would accomplish it. A windmill, to meet the wants of the times, must be strong and ornamental, well made and self regulating, so as to set and furl its own sails in all weathers.

If your correspondent "C. B." will send me his full address, I will forward him the fullest mathematical calculations.

61 Park Place, New York city. A. P. BROWN.

[For the Scientific American.]

SAVING OF TIME.—A SERIOUS CHARGE AGAINST THE SCIENTIFIC AMERICAN.

The life of a man is at the very best too short. When it is all utilized, the ten thousand daily duties and obligations consume so large a share of it as to leave very little time for its main purposes. I assume that they are these: Mental culture; the development of our powers; the advance of civilization; the increase of the sum of human happiness; the solution of Nature's mysteries; and the exalting the spirit for its new sphere of exercise in the other life.

Of the three score years, to which men of good health live, twenty years are consumed in reaching manhood and getting ready for duty. Of the forty years remaining, about thirteen years are spent in sleep, and this is a total loss, necessary for recuperating from our physical and mental exhaustion. To this we must add two years for the time consumed in taking our food, and twelve years in earning food and clothing, and three years in ill health and its exactions. Of all things mentionable, Time is the most precious!

The writer has himself reached almost to the three score, and is a very miser of time; and he would gladly rival that proverbial thief, Procrastination, in stealing it from every source. I have robbed sleep of two years, and I think used most of it well, thank God, who (be it reverently spoken) will not be hard on my class of thieves.

I have flanked and evaded disease, and saved nearly my whole three years by avoiding tobacco, liquor, and dissipation in all their forms; and I am grateful in saying that this has enabled me to exalt my moral nature by devoting at least one of those years to the relief of others less fortunate or less prudent than myself.

In many ways I cannot name (and would not if I could), I have economized, utilized, saved and stolen moments and minutes to the amount of four years more; and I shall, I think, count twenty years, instead of ten, spent in a rational manner. But they are gone into the past, and I have done so little and have so much to do, that I am not at all ready to leave my work on this side the river.

My mania for saving time is paramount, and this brings me to the main object of this communication.

You, Mr. SCIENTIFIC AMERICAN, have consumed and are still consuming a portion of my time, enough for a miser to notice; and your brethren, or class, are still consuming it in a wanton, utterly useless and inexcusable manner; and just as remorselessly do you impoverish every one of your 50,000 subscribers.

It is not in spreading us an occasional article unworthy a perusal. This is not reckless, if at all chargeable; you do your best to send us the best and most instructive of reading matter, or I for one would not touch you. Life is too short. But *you do not cut your paper;* you compel us, the 50,000, each to cut his own! You have this day robbed me of five minutes precious time in cutting your paper, and the 50,000 each of five minutes! This would make about 520 days of the popular eight hour kind. Suppose it reached a year or half year of our most inestimable time; by machinery you could cut the whole edition for 25 dollars. Can you excuse yourself? Can all the slovenly publishers of books, periodicals, and newspapers furnish any sort of apology for this wasting of priceless time, amounting to some hundreds of times your own culpability? Why, *Harper's Monthly* has just cost me thirteen minutes, worth to me twice the price of the magazine!

What! 100 years or 500 years of human labor wasted weekly on cutting the leaves of your papers, when a few dollars worth of work by machinery would do it greatly better, and keep your papers and books neat, genteel, and durable! Shame on your whole fraternity!

* * * * * * *

I am not done. If you will give me room, after such a scolding, I wish you to help me to show in much shorter articles, how we can easily save time enough to build and maintain all our asylums and schools, and a large share of our railroads and telegraphs. A MISER OF TIME.

New Orleans, La.

SCIENTIFIC AND PRACTICAL INFORMATION.

SULPHURETTED HYDROGEN IN BLOWPIPE ANALYSIS.

If a metallic oxide or salt be mixed with hyposulphite of soda ($Na_2 S_2 O_3$), and the mixture dissolved in a borax bead in the inner blowpipe flame, the hyposulphite is decomposed and the sulphur combines with the metals to form the well-known sulphides, most of which are distinguished by their characteristic colors. To prevent volatilization of arsenic and mercury, however, the precaution should be taken to heat the mixture of the substance and hyposulphite in a glass tube.

SAFETY FULMINATE.

A constant correspondent, Mr. E. H. Hoskin, Lowell, Mass., writes as follows:

"In the course of my investigations, I have formed a new fulminate for charging shells for exploding nitro-glycerin, dynamite, and dualin; this preparation is equally effective for the purpose as that now in use, and has this important advantage: The shells will not explode with ordinary friction, nor even if struck with a hammer or by means of a bar of iron of 10 pounds weight, allowed to fall and so thoroughly to flatten them out. This being so, they become quite safe for a careless man to handle, and quite safe to transport as freight; they are entirely free from danger to life and limb till they come in contact with fire, when they will explode with terrific force."

FRENCH PUTTY.

Ruban, of Paris, has invented a putty made by boiling 4 lbs. of brown umber for two hours in 7 lbs. linseed oil, stirring in 62 grammes of finely chopped wax. It is then removed from the fire and 5¾ lbs. chalk paste and 11 lbs. white lead are incorporated in the mass.

CURCULIO.

A correspondent, Mr. J. H. Parsons, of Franklin, N. Y., denies the value of the method of preserving plum trees from the attacks of curculio, described on page 321 of our volume XXVI. He asserts that the bug will attack ripe fruit in preference to anything else; and that, as the curculio can fly, tarring the trunks of the trees is useless.

PARIS GREEN AND POTATO BUGS.

Mr. E. Wolff writes to point out that Paris green is a compound of two substances, arsenic and copper, both of which are poisonous in all their combinations. He disregards the often repeated argument that poisonous matter, strewn upon the plants or the soil, cannot enter into the roots or the fruit of the plant, and asserts that it is impossible to divest the potatoes from the substance which is spread over the whole soil. Mr. Wolff also states that repeated applications will render the soil so obnoxious that all vegetation will be injured. In commenting on this letter, we must say that it has not yet been observed, by any one of the thousands of farmers who have used Paris green as a bug destroyer, that any evil consequences to vegetation have followed the most liberal application of the mineral; and its poisonous effect on all the inhabitants of the soil is likely to be of the greatest service to the crops.

Mr. Wolff, however, sends us a suggestion which has the merit of novelty. He says: "Lay a piece of sheet iron, with the edges bent upwards, under the vines on each side of the row; and then, by beating the vines with a flat broom, shifting the iron pans along and emptying them occasionally into a pail of water, sufficient bugs and eggs may be destroyed." Mr. Wolff further asserts that the use of Paris green for painting purposes is to be deprecated. The color is inharmonious to the hue of foliage, the wood so painted will ultimately be burned, possibly in a baker's oven, and so the arsenical compound will get into the bread. We trust these warnings will be sufficient to deter our readers from the use of Paris green, for killing bugs or for painting, and that we may all be protected from eating bread baked in an oven heated with a fire lighted with a wood colored with a paint mixed with any arseniate of copper.

TO PRESERVE PENCIL AND INDIAN INK SKETCHES.

To a solution of collodion of the consistency used by photographers, add 2 per cent of stearin from a good stearin candle. The drawing to be protected is then spread on a board or plate of glass and the collodion poured over it as in photography. It dries in 10 to 20 minutes perfectly white, and so thoroughly protects the drawing that it may be washed without fear of injury.

HAIR DYES, HURTFUL AND HARMLESS.

Whatever we may think of the taste which leads people to desire their wrinkles and furrows to be surmounted by raven locks or auburn curls, the practice of using hair dyes seems steadily on the increase. Dr. Chandler's fearless exposure of the poisonous character of all the hair dyes in the market, and a knowledge that their long continued use will inevitably cause death, will not deter all the old fops and fools from using them. Perhaps we may rejoice it is so, for, like tight lacing, the use of poisons never removes from earth any sensible, well informed person whose life is really worth saving. Our duty seems to end when we have impressed upon their minds the dangers they incur, and we might leave them to choose for themselves between health and disease, between life and death. But we see too plainly every day that people are willing to take any risk for fashion's sake. We knew a lady recently who died from the effects of using Hall's *Vegetable* (?) Sicilian hair dye, and yet we have not known one of her friends to abandon the use of dyes equally dangerous. Since, then, people insist on obliterating the marks time bestows on their tresses, it is the best we can do to seek some substitute, less injurious than the salts of lead and silver now so generally used, in order that these people may choose the less of two evils. While we do not wish to assert that any dye is uninjurious, yet we should prefer a mild vegetable poison to an insidious, cumulative mineral like salt of lead. Among organic dyes which can be prepared by any one is that obtained from the green walnut burr, the epicarp of the fruit of the *juglans regia.* For this purpose the burrs are soaked in water and pressed. The liquid thus obtained is then evaporated and the dye precipitated as a black powder, which can be used in any convenient form of hair dressing. Dr. Kurtz says that large quantities are used in Greece, and are also exported thence for this purpose. The Greeks also make a dye by adding alum to the expressed juice, and use this to give a dark and marketable color to the cattle exported to Marseilles and other places where light colored stock is at a discount.

PRODUCTION OF GLYCERIN BY SYNTHESIS.

Another most interesting discovery in the compounding of organic matters has recently been made by Friedel and Silva. Propylen or tritylen is a gas eliminated from a compound of various gases evolved by decomposing the vapors of fusel oil in a red hot tube; and it can be more easily obtained by the action of biniodide of phosphorus (PI_2) upon glycerin. The new discovery is the production of glycerin from the chloride of propylen prepared by methods in which no glycerin is employed.

EMBALMING FLUID.

Busaline uses carbolic acid and camphor, dissolved in a sufficient quantity of petroleum, colored flesh color by vermilion.

PRESERVING MICROSCOPIC PREPARATIONS.

A nearly concentrated solution of acetate of potash is found to be the best means of preserving microscopic preparations.

The Hartford Steam Boiler Inspection and Insurance Company.

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

During the month, 1,150 visits of inspection were made and 2,188 boilers examined—2,071 externally and 516 internally—while 216 were tested by hydraulic pressure. The defects in all discovered were 828, of which 201 were regarded as dangerous. The defects in detail are as follows:

Furnaces out of shape, 49—7 dangerous; fractures, 85—39 dangerous; burned plates, 37—16 dangerous; blistered plates, 109—11 dangerous; cases of sediment and deposit, 142—21 dangerous; cases of incrustation and scale, 142—17 dangerous; cases of external corrosion, 72—11 dangerous; internal corrosion, 27—7 dangerous; internal grooving, 21—4 dangerous; water gages defective, 48—6 dangerous; blow out defective, 31—10 dangerous; safety valves overloaded and out of order, 19—14 dangerous; pressure gages defective, 123—20 dangerous; boilers without gages, 149; cases of deficiency of water, 10—3 dangerous; cases of broken braces and stays, 24—10 dangerous; boilers condemned, 14.

When a safety valve spindle becomes oxidized and moves with difficulty through the guides, it should be scraped or rubbed clean, and all oxide removed. But to pour oil on to a safety valve for the purpose of lubricating the spindle, seat, or guides, is pernicious. The more volatile portions of the oil evaporate almost immediately, and that which remains is a thick, gummy mass, accumulating dust, and ultimately becoming little better than glue. Where parts of machinery are moving one on the other or in bearings, oil is essential as a lubricator; but, for safety valves, it is not the thing. We call attention to this, because we have recently seen instances where this practice had rendered the valve nearly inoperative, and was a source of danger.

THE nineteenth annual exhibition of the Iowa State Agricultural Society will take place at Cedar Rapids on September 9, 1872.

Deterioration of Cotton and Sugar Cane.

BY THE COMMISSIONER OF AGRICULTURE.

The conclusion is inevitable that both cotton and sugar have diminished in the quantity of production, but that neither has depreciated to any extent in quality, and the cause of failure is most unerringly traceable to the planter himself.

The seed is promiscuously taken from the gin, carelessly thrown upon a heap, where it remains until planting time, and, without regard to any selection of good or indifferent, is again committed to the earth to make its bad or indifferent product.

Indifferent seed produces an infirm and sickly plant, and a consequent dimunition of cotton. Practice sanctions the use of from two to eight bushels of seed to plant an acre of ground, and the planter consoles himself with the idea that it is not lost; but this is only partially true, for this wasteful mode of converting seed into manure is not justified by the benefits derived. It would be far more profitable to subject the seed, as it accumulates at the gin, to an application of plaster of Paris and muck from a swamp, or pine shucks or leaves and earth from the woods, and thus convert the refuse cotton seeds into a compost which will tell with ten fold the effect upon the crop of cotton to which it is applied. One bushel of well and carefully selected seed will be quite sufficient to plant an acre of ground in hills, twenty inches apart and in rows four feet apart. But, after all, the planter must be convinced that a rotation of crop is absolutely indispensable to any operation for a series of years. If the plantation contains 200 acres let 50 of them be in cotton, 50 in corn, 50 in peas or beans, and 50 in grass, and let the crops alternate; and it cannot be doubted that if this process be pursued for a series of years, the 50 acres will have grown more cotton than 100 under other circumstances. The use lime, if it can be procured at any reasonable expense, will always insure the growth of grass.

With respect to the cultivation of the sugar cane, the same principles which it has been endeavored to enforce with regard to cotton planting are equally applicable.

Effect of Rum on Chickens.

A French doctor has recently been making some curious experiments as to the effect of alcohol on fowls. The birds took to dram drinking with evident delight, and many an old cock consumed his bottle of wine a day, so that it became necessary to limit the allowance. They all lost flesh rapidly, more especially those which drank absinthe. Two months of absinthe drinking was found sufficient to kill the strongest cock or hen. The fowls which indulged in brandy alone lasted, however, four months and a half; while the wine bibbers survived for ten months. Their crests also swelled to four times the original size, and became unnaturally red. The *Pall Mall Gazette,* doubts whether man is justified in trying experiments with the dumb creation with the view of ascertaining how far he may himself venture to get drunk with impunity; but having proceeded thus far, he may as well go a step further, and by the introduction of the teapot into the hen house find out whether there is any ground for the suspicion entertained in some quarters as to the innocent properties of tea. A few experiments in late hours might be made with advantage at the same time. A party of carefully selected cocks and hens might be allowed to mingle in the festivities of the London season, returning to their roosts at the hour when they usually commence to cackle and crow. It would possibly be found that one week of political reunions, concerts, balls, and crushes would be as disastrous in its effects as two months of absinthe drinking.

Plaster as a Protection from Fire.

After the conflagration in Paris, it was generally found that, with good plaster work over them, beams and columns of wood were entirely protected from the fire. In cases where limestone walls had been utterly ruined on the outside by the flames passing through the window openings, the same walls, internally, escaped almost unscathed, owing to their being coated with plaster.

On many such plastered walls the distemper decorations were still to be made out. The iron roofs rendered good service, and the party walls of each house were carried up right through the roof—a most important precaution, for otherwise nothing could have prevented the disastrous conflagration from being more extensive than it was. It was also found that good woodwork in beams and posts, good wood floors, well pugged, and good wooden staircases, were safer and more to be depended upon than cast iron columns and stone staircases, landings, and floors. Stone staircases well protected by plaster were fireproof, although not so safe as wood in case of heavy *débris* falling upon them.

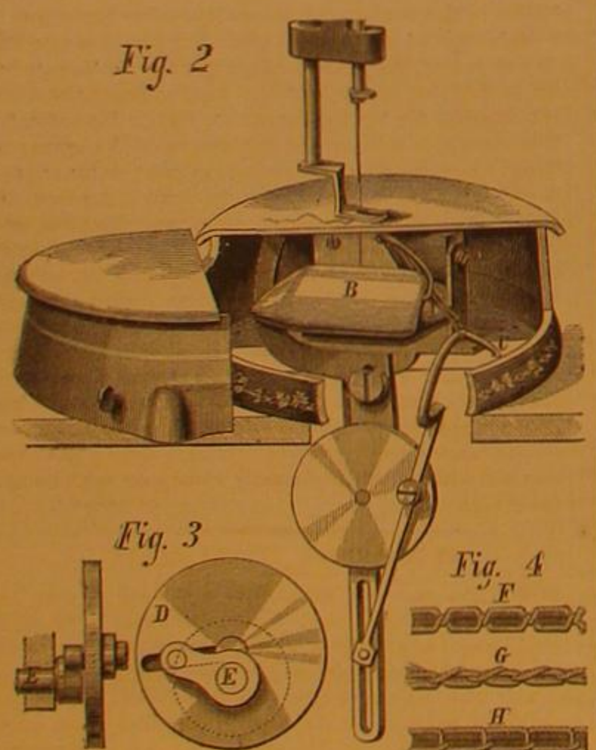
AN inclined railway is now in course of construction up the side of Mount Kohlenberg, near Vienna, Austria. It is to be completed by the time the Exposition opens next year. Mr. Francis Felbinger, late of the Pittsburgh, Fort Wayne, and Chicago Railroad, is the constructing engineer. The track is to be 6 feet wide. The cars are to carry 100 passengers each, and are to be drawn up by means of wire ropes, drums, and stationary engines, similar to the Pennsylvania coal railway inclines. Two engines each of 100 horse power will be employed.

MAGNETIC sand is found in immense quantities on the sides of the volcano of Mount Ætna. The specific gravity of this sand is 2·813. Acids have little effect upon it. Analysis gives silica 52·71, magnetic oxide of iron 19·44, alumina 19·09, lime 6·61, magnesia 1·85.

SEWING MACHINE.

In the invention which we here illustrate, a wide step appears to have been made towards perfecting the construction of the sewing machine. Mr. G. L. Du Laney, the inventor, has devoted the past fifteen years to the study of this branch of mechanics, and during that time has made many valuable improvements, the net results of which he has embodied in the present machine. Some of these results we will now proceed to lay before our readers, and a mention of one of the most prominent will at once take us into the heart of our subject.

In lieu of shuttle or bobbin, on which the lower thread is ordinarily wound, Mr. Du Laney takes the spool of thread, just as it comes from the manufacturer's hands, and incloses it in a case of hard rubber, through a hole in the upper side of which the end of the thread is drawn. The hard rubber case is partially of cylindrical form, and is somewhat pointed at its front end and rounded at its rear. It is confined, loosely, in the machine in a sort of holder which consists of side barriers, in such a manner that a loop formed by the upper thread may be easily drawn over its smooth exterior within the barriers. It is by the passage of such a loop over the spool case, and by afterwards drawing it up tight, that the upper thread is made to loop with the lower one and the stitch formed. The mechanism, employed to effect this, is shown in detail in Fig 2, which gives an enlarged view, while open, of the box seen closed in Fig. 1. The pointed end of the spool case is shown at A, and at B is one of the side barriers before alluded to, which form the holder for the same. C is a rotating hook of novel construction to which motion is imparted by the pin and revolving disk shown in the figure. The needle, with its operating mechanism, we shall speak of more particularly hereafter. The operation is as follows: The upper thread, the end of which is held by the operator, is carried down through the fabric by the needle, which on its return stroke causes the slack thread to form a loop. This loop is immediately caught up, pulled out, and carried along by the revolving hook (which has, at the same time, been moving upward and across from left to right) until it reaches the position shown in the figure. It is here opened out by the point of the spool case, and is afterwards, by the continued motion of the hook, made to glide along the smooth surface of the case until it has passed completely over it, when the hook releases the loop. It now lies loosely



on the top of the spool case and incloses within it the lower thread. The hook returns in time to catch up a second loop which has been formed by a second passage of the needle, and carries it along as it did the first. As the second loop is enlarged by the movement of the hook and by its passage over the spool case, the necessary additional length of thread is supplied by the slack of the first, and the whole of this slack is thus taken up. The effect of pulling the first loop tight is the formation of a double loop where it engages with the lower inclosed thread, and, also, the carrying up into the center of the fabric of this double loop. By these means the well known lock stitch is produced. The friction caused by its unwinding of the spool in its case is sufficient to produce the requisite tension in the lower thread. In its passage from left to right, the hook carries the loop as shown in the figure, but when passing under, from right to left, a barb, seen at the end of the hook, engages with the loop and holds it upward until its upward motion releases it.

The needle, which has the advantages of being straight and very short, is secured in its place by a small cam devised for the purpose, and its speed, during the upward and downward strokes, is regulated by a novel and very ingenious contrivance for producing variable motion, which is shown in Fig. 3. Here D represents a slotted disk which is attached to the driving shaft. E is a shaft through which motion is imparted to the needle, and which has its center placed lower than the center of the disk, D, it is connected with the disk by means of a crank and a crank pin, which engages with the slot. When the disk is rotated, the path described by the crank pin is as indicated by the dotted lines, and it is obvious, therefrom, that the nearer the crank pin approaches the periphery of the disk, D, the higher must be the speed of the shaft, E, which will decrease as the pin draws nearer the center. By the employment of two devices of this nature, the needle is withdrawn by an accelerated motion from the fabric before the loop is pulled tight, and the motion of the rotating hook is, at the same time, retarded so as to allow of the withdrawal of the needle before it catches up the loop. In this way the chafing of the thread against the needle, which would otherwise occur, is entirely prevented.

Another improvement in this machine consists in providing the pitman with ball and socket joints, by which means it and the treadle are rendered adjustable.

We have hitherto spoken of the lock stitch only, but two other stitches can be made by the machine. An ornamental cable stitch is made by removing a shield wire, which may be seen in Fig. 2; this allows of the loop being caught in a nick (instead of being passed directly over the spool case) and held while the needle passes through it. The result is the formation of a loop in the upper thread in addition to the locked loop; both loops are pulled tight at once by the hook. The ordinary chain stitch is produced by the action of the hook on the upper thread alone, after the lower thread has been cut off, or the spool and its case removed from the machine.

The three forms of stitches are shown in Fig. 4, where F is the lock stitch, G the cable, and H the chain stitch. A surface view of the cable stitch is given; the other two are shown in section.

The machine works easily and noiselessly, and the motion is rapid. The general neatness of the design can be seen from our engraving.

Patented July 3, 1866, and May 2, 1871. Further information may be obtained of Mr. G. L. Du Laney, 89 John street, Brooklyn (Blees' sewing machine factory).

DU LANEY'S IMPROVED SEWING MACHINE.

The Cattle Business in Texas.

Among the noticeable changes made in the cattle business, since the close of the late civil war, is its concentration in fewer hands. The smaller owners found their stocks decreasing, and hence their profits did not meet their expenses. They have generally sold out, either to the larger proprietors or to the tallow and hide dealers. But few men now in the business have less than 1,000, branding about 250 calves. The herds range as high as 50,000, the numbers of calves branded being from 20 to 25 per cent of that number. On these larger ranches are maintained from 2,000 to 3,000 horses, in order to supply the army of *vaqueros* with remounts. Large numbers of the cattle are killed for their hides and tallow. Some of these dealers sell to purchasers on the spot, while others ship direct to New Orleans or drive to Kansas. Several leading stock raisers are mentioned as wintering from 2,000 to 3,000 each on the line of the Kansas Pacific Railroad.

The term stock cattle, in Texas, includes cows, calves, yearlings, and two year olds. A party selling 1,000 stock cattle would furnish 250 of each of the above classes, and charge a uniform price for the whole. The present price is $5 per head in specie. Three year old steers or four year olds generally bring from $10 to $12 per head. This class furnishes the staple of the Kansas trade. Four year olds, in good condition for shipment to New Orleans, bring $15 per head. The term beeves is applied only to animals four years old and upward. In good condition, they will net 500 pounds of beef per head.

HOSE COUPLING.

The improved coupling represented in our engraving is the invention of Mr. L. J. Roberts, of Meadville, Pa. It was designed by him with the view of securing quickness and ease in coupling or uncoupling hose pipes, and of protecting the screw threads of the couplings from injury; which objects he has attained in a simple and effective manner.

The coupling, which is shown in perspective in Fig. 1, and in section in Fig 2, consists essentially of three parts—the hose end, A, the nut, B, and the hose end, C. The nut, B, screws on the end of the hose end, A, and is kept in working position by a screw pin shown in the engraving. On each side of this nut is a projection and slot, shown at D, and on each side of the loose collar of the hose end, C, is a pin, shown at E. These pins and slots are made to engage by bringing the collar of the hose end, C, and the nut, B, together, face to face, and turning the collar round until the pins fall into the slots. The nut, B, is then screwed round until it brings the end of A, which is provided with a washer, tight up against the end of C. The button, F, is put on for the purpose of keeping the pins in the slots in case the nut should be jarred loose. It is provided with a rubber spring, which causes it to fall into a cleft in the nut, B, when the pins are made to engage with the slots. Attaching B and C in the manner described effects the coupling; the uncoupling is accomplished by unscrewing the nut, B, and pressing back the button, F, when a slight circular motion given to C causes the pins to fall out of the slots.

The hose end, A, is similar to that used with the old coupling, and the old hose end may, therefore, be used in conjunction with the parts, B and C, alone, to form a coupling on the improved principle.

On locomotive engines, also, the same two parts only are needed to make up a complete coupling.

The invention was patented through the Scientific American Patent Agency, Oct. 8, 1867.

Fig. 1

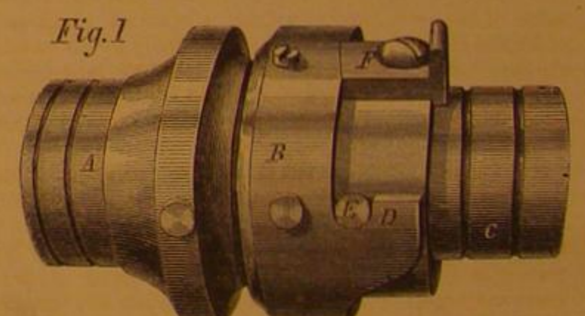
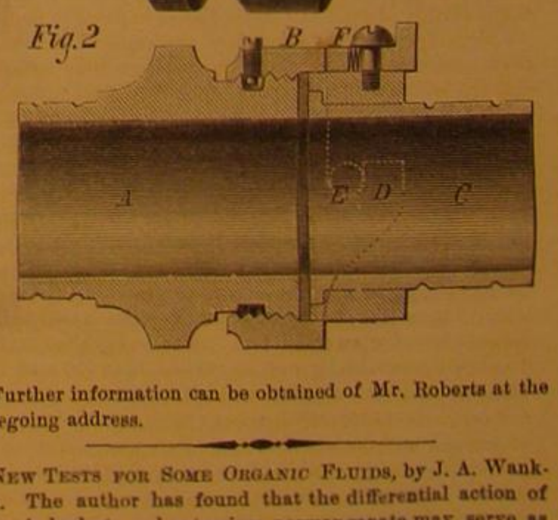


Fig. 2



Further information can be obtained of Mr. Roberts at the foregoing address.

New Tests for Some Organic Fluids, by J. A. Wanklyn. The author has found that the differential action of potassic hydrate and potassium permanganate may serve as a method to distinguish between various animal fluids. When these are evaporated down with excess of potassa solution, and then maintained for some time at 150°, a certain fixed proportion of ammonia is evolved, and if the residue be now boiled with an alkaline solution of potassium permanganate, a further definite quantity of ammonia is given off; the relative amount of ammonia evolved by these two actions being constant for the same animal fluid. The author has examined by this method wine, milk, blood, white of eggs, and gelatin, the latter of which gives but a mere trace of ammonia by treatment with caustic potash, the quantitative results being given in a table. It would be possible by this process to distinguish between a spot of milk and one of white of egg on a cambric handkerchief.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE TWO OCEANS.

Our solid earth's crust is surrounded by two oceans; one the fluid ocean, filling up the deepest hollows, and of which the surface is considered as giving the true measure of our earth's size; the other a gaseous ocean covering the former and those parts of the earth's crust not covered by the fluid ocean.

The first, or ocean properly so called, is usually considered to consist of water and common salt; the second ocean, commonly called the atmosphere, is considered to consist of fixed proportions of nitrogen, oxygen, and carbonic acid, with a variable quantity of watery vapors. Both these conceptions however, are very defective, and by no means the ones required for the true knowledge of the constituents of the sea and of the air.

The sea contains, besides common salt, the chlorides of magnesium, calcium and potassium, the sulphates of soda, magnesia and lime, the carbonates of alumina, lime, iron and manganese, phosphate of lime, bromide of magnesium, and iodide of magnesium and of sodium; also several compounds of fluorine and the salts of most of the ordinary metals, in minute quantities; even the presence of silver has been proved in such quantity that, when the amount in the whole ocean is computed, it exceeds in value a hundred thousand million dollars.

It is comparatively easy to analyze the constituents of the liquid ocean, but when we have to do with the gaseous ocean or atmosphere, we meet with the great difficulties inherent to the analysis of gases. It has been only during the last few years that we have been able to trace the presence of many gases and vapors in the atmosphere, and their condensation on the surface of solid and liquid bodies exposed to the same. We know now that the substances contained in our atmosphere, additional to those mentioned before, vary greatly in different localities; so in regions surrounding manufacturing towns, we find carbonic oxide, hydrocarbon vapors, and even often solid carbon, very finely divided, floating in the atmosphere. In the neighborhood of the ocean, common salt and hydrochloric acid are found, while Chatin found iodine in the air of France, Switzerland, Northern Italy, Germany, Holland, etc. After every thunderstorm, large quantities of ammonia compounds and nitrates are found in the air. They are formed by the electric discharges, causing the nitrogen to combine with the hydrogen and oxygen, respectively, of the watery vapors. These substances, with several others, are washed down by the rains during thunderstorms, and are then easily found in the rain water. So Barral found, besides nitric acid and ammonia (nitrate of ammonia), sulphate of lime, oxide of iron and common salt, and even organic nitrogenized compounds in rain water, while in almost the whole of England and all countries where large metallurgical operations are going on, free sulphuric acid is always present in the atmosphere and washed down with every rain. Sulphuretted and phosphoretted hydrogen are almost always found over swamps or places where matter is decaying, and even in and around the abodes of men. Who has not noticed the tarnishing of silver ware when exposed to the air in our houses? It is due to the formation of a coat of sulphide of silver, easily washed off by a solution of hyposulphite of soda, in preference to the customary polishing by friction, which removes also portions of the pure metallic silver, involving an unnecessary loss. These tests have last winter been brought to a degree of exquisite refinement by W. F. Barret in England. He made a flame of pure hydrogen gas, which is so faint that it is utterly invisible in even weak daylight. In order to prove that, when this flame becomes visible and colored, it is due to the minutest traces of foreign substances, he placed the 50,000th part of a grain of milk of sulphur on clean platinum foil; and a blue flame shot forth from it on his bringing the burning hydrogen jet into contact with the foil. If the reader asks the way to obtain the 50,000 part of a grain of any substance, we simply refer him to the homœopathic method of mixing ingredients with one another. In this case it was precipitated silica, which does not color the hydrogen flame, neither does pure platinum, nor pure water.

If, however, a platinum surface, porcelain plate, or block of marble has remained exposed to the ordinary atmosphere, and then a burning jet of hydrogen is directed against it, there instantly appears at the point of contact a deep blue and glowing image of the hollow flame; if the flame is kept for a long time at the same spot, the color and glow become fainter and will finally disappear. If, however, the flame is directed against an adjoining portion, the blue color will instantly reappear. If, in order to prove that this blue color is due to sulphur, collected by the platinum or porcelain during its long exposure to the air, the spectroscope be resorted to, the characteristic blue and green bands of sulphur are readily detected. When the jet was directed downward on the surface of water, this blue color showed itself when the merest trace of sulphur was present, while on the surface of sulphuric acid, the phenomenon was especially brilliant.

Barret finely applied this method of directing a pure jet of hydrogen against solid surfaces, to detect the slightest traces of different gases, vapors and dust, deposited on the same from the atmosphere. Even breathing against this flame produced a pale lilac tinge; the same was observed when the air contained one per cent of carbonic acid. It appears that the one fifteenth of one per cent of this substance, normally present in the air, is too small a quantity to affect the color of the hydrogen flame.

NARROW AND CHEAP RAILWAYS.

A convention was recently held in St. Louis, Mo., in the interest of narrow gage railways. About fifty gentlemen, including engineers, contractors, car and engine builders, and managers, all well known throughout the country in connection with railroading, attended and interchanged their different views relative to the comparative merits of the narrow gage or broad gage systems. After discussion, the conclusion, reached through the report of a committee, was that the narrow gage road is not only the most advantageous, both in construction and operation, but that it is by far the best means for a general and quick development of the national resources.

During the progress of the proceedings, information was given concerning the system in question by gentlemen connected with roads on which the same had been adopted. This, however, is somewhat meager and unsatisfactory. The lines referred to as now in operation have been but recently opened, and, besides, extend over but short distances, so that the experience gained by their practical working ought hardly to be considered as having so much weight, in the determination of the superiority of narrow gage, as is ascribed to it by the gentlemen advocating the adoption of the system.

The Denver and Rio Grande Railroad has 117 miles of road completed. Colonel W. H. Greenwood, its general manager, stated that as much business can be done thereon as on nineteen twentieths of the broad gage roads. As to speed, an average of twenty-five miles an hour has been made, although the usual rate of travel, including stoppages, is fifteen, which is considered sufficiently fast. The speaker preferred narrow gage passenger coaches to those of broad gage. The cost of the road could not be considered any criterion, as it was built over a very rough country at the foot of the Rocky Mountains. On the entire line, the saving effected by the use of the narrow gage is estimated at $199,500, or, with equal distances, its cost would amount to 64 per cent of that of the broad gage.

There is little question, in our minds, but that a narrow gage is the most suitable for a rough or mountainous country, where speed is necessarily subordinate to other requirements. There is no doubt but that the system is much less costly to construct in such localities, and is perhaps more generally advantageous than the broad gage; but in reference to the railroad above referred to, we can hardly coincide in the opinion that 15 miles per hour is a proper average rate of speed. Twelve miles per hour was the time made by the old fashioned English stage coach, to return to which would be much better economy rather than to lay railroads at an average cost of $10,000 a mile, to gain an advantage of but twenty-five per cent in increased rapidity of travel.

The preference for close and crowded narrow gage coaches is evidently not shared by the general public, as is amply proved by the long trains of spacious drawing room cars which daily leave our depots, and the willingness with which people pay increased fares in order to avail themselves of their accommodations.

Mr. Edmund Wragge, chief engineer of the Toronto, Grey, and Bruce Railroad in Canada, gave a sketch of the 3 ft. 6 in. system built under his supervision. He stated that 88 miles of the road were in operation, and that it required a 20 tun locomotive, heavier than those ordinarily used on narrow gage roads, to draw a train containing 600 passengers over a grade of 165 feet to the mile.

The remarks of Mr. Thomas M. Millington, chief engineer of the Memphis and Knoxville Railroad, also show the advantages of the narrow gage in rough or mountainous sections. On his road, a saving was effected by it of 41 per cent.

Another speaker dwelt upon the advantages of the system in developing the resources of the South, particularly in Georgia, in which State the people cannot afford the expense of a five feet road. Iron and coal abound, and can be readily produced and manufactured if narrow gage roads can be built in convenient localities.

The report of the special committee of eleven deals with the subject in considerable detail. It recommends that the 3 feet gage be adopted as the standard, and states that its cost of construction over mountainous districts would not be over one fifth of that of such roads as the Erie, Pennsylvania Central, and Baltimore and Ohio. In broken or rolling country, the saving will be about one half, and on plains, three fifths, of the present cost of the broad gage. Referring to the comparative expense of operating the two systems, a hypothetical case is taken of a narrow gage coach weighing 12,000 pounds, which is claimed to carry, when full, 36 passengers with a dead weight of 12,000: divided by 36—333 lbs. per passenger; while a broad gage coach, capacity 56 passengers, weighs on average 19 tuns, giving a dead weight of 38,000 divided by 56—678 lbs., or a difference of 345 lbs. per head in favor of a narrow gage. This argument, it strikes us, is somewhat lame—particularly in reference to the complement of passengers. An ordinary street car weighs a tun and a half, and is often packed with sixty passengers, the dead weight to each being reduced to a minimum, whereas the same sixty people, if wishing to travel comfortably, would fill three large and heavy drawing room cars.

Narrow gage locomotives, it is asserted, can be constructed of sufficient power and speed to answer all general requirements, in proof of which the Denver and Rio Grande Railroad is again appealed to for results. A 17 tun freight locomotive on that road has hauled a train of 24 cars with ease, up a grade seven miles long averaging 40 feet to the mile—four miles of the same having a grade of 75 feet to the mile. The total weight of cars, load, and locomotive was 157 tuns. A 12 tun locomotive has hauled cars and load amounting to 55 tuns up the same grades at schedule time, namely, 15 miles per hour. A remarkable performance was that of a passenger locomotive which ran 181 miles with only 2,340 pounds of coal, hauling the usual train of one baggage car and two coaches. Of this distance, 102 miles were run up an average grade of 40 feet per mile, and 8 miles at 75 feet per mile.

As regards cars, the report states that they furnish every requisite called for by a first class coach and that they will eventually become as popular with the public as the latter; a fact which, we must add, is merely an assertion and remains to be satisfactorily demonstrated by experience. In saving of dead weight, the narrow gage is claimed to have the advantage in all cases, and examples are cited in proof of the same. With reference to transportation, fares, etc., it is believed that they will be lowered in proportion to the cheapness of the first cost of the road, machinery, rolling stock, etc. For the transportation of cotton, it is stated that 10,000 miles of narrow gage road have been constructed by the East India planters, who control a labor market, the cheapest in the world. It is considered, in view of these facts, a serious question whether, with the dear labor and high rates of transportation in this country, we can maintain our supremacy in the production of cotton. The reports of the Festiniog line in Wales and of other short roads in Norway are also quoted in support of the theory that the narrow gage system has ample capacity for any business of any line on this continent.

The committee sum up the advantages of the system as follows: It costs only about one half as much as broad gage. It is within the reach of all sections to build and hence will enable them to avail themselves of railway facilities, with which they would otherwise be obliged to dispense. Its small cost, light expenses, etc., will make it a paying investment. It will supply cheap transportation and so develop dormant interests. Its general adoption through sections unprovided with railway facilities will enhance the value of property. Penetrating new sections, it will bring a large increase of business to the broad gage roads; and finally, a failure to adopt the narrow gage in the sections referred to will necessarily defer the construction of railways until the time when their means will admit of the more costly broad gage with its consequent high rates.

OXYHYDROGEN STREET LAMPS.

Within the past few weeks, the New York Oxygen Gas Company has extended pipes from their works in Eleventh avenue, corner of 41st street, to and through 23d street to the plaza formed by the intersection of Broadway, Fifth avenue, 23d and 24th streets, where they have erected large and beautiful chandeliers for the display of their new and splendid oxyhydrogen lights. The exhibition is a most gratifying success. The whole square is magnificently illuminated at night. The plaza is an excellent locality for showing the invention, as it is one of the most prominent places in the city, crowded at nearly all times with pedestrians and vehicles.

The light is presented in the form of intense white tufts of flame, which burn very steadily and yield most brilliant illumination, imparting a cheerful radiance to every object in the neighborhood, bringing out the natural colors almost like sun light. The company is now in readiness, we understand, to contract for the lighting of all the streets by this method. We need hardly say that its general introduction for this purpose would be a great public improvement. Our streets, thus lighted, would be rendered attractive and safe. Men who love darkness because their deeds are evil would have to emigrate to places where oxygen lights were unknown. A single jet of the new light is alleged to be equal in illuminating power to sixteen of the ordinary street gas jets. When the two lights are placed side by side, the common gas flame looks exceedingly poor and dingy.

The ordinary oxyhydrogen light is produced by directing a combined jet of oxygen and hydrogen against a block of lime, which latter is raised to a white heat. Each light requires constant special superintendence for the purpose of changing or turning the lime, as it crumbles away; it is therefore unsuitable for ordinary street uses.

The improved light is produced by the simple union in one burner of a jet of oxygen and a jet of common street gas, no lime or special attendance being required. The street gas supplies the hydrogen and carboniferous matter requisite for illumination.

The company make the oxygen gas by the manganese process, discovered by the distinguished French chemist Tessié du Môtay, consisting, substantially, in subjecting a quantity of manganese, placed in a retort, to a heat of 850° Fah., in combination with a steam jet, whereby the oxygen is liberated and carried into the gasometer for use. The manganates are regenerated, and are used over and over, without loss, by condensing the steam and directing upon them currents of atmospheric air. Oxygen is thus very rapidly and cheaply produced. This process will be found fully described in back volumes of the SCIENTIFIC AMERICAN, particularly in Volume XVIII.

One of the earliest exhibitions of the improved light in this city was at the premises of the Pneumatic Railway under Broadway, at Warren street, where the underground waiting room and also the pneumatic passenger car were for some time by it lighted. The oxygen was condensed in cylinders and carried upon the car.

In addition to the uses of oxygen gas for illuminating purposes, it is becoming extensively employed in this city as a medical agent. It is administered to patients suffering with asthma, pneumonia, croup, etc., either by charging the apartment with the gas, or by mouth piece and bag. The vivifying effects of oxygen upon the human system are well known.

END OF THE EIGHT HOUR STRIKE.

The great uprising which has been agitating the city of New York for the past ten weeks has at length reached its termination. Toward its close, it has been gradually but surely weakening. One by one the different trade organizations withdrew their support and returned to labor under the old system until, with the exception of the iron and metal workers, none of the great leagues, which in the beginning made such a show of strength and placed such confidence in their own powers, were left in existence. It was reserved for the above mentioned Society to give the finishing stroke to the movement, which it did by declaring by vote in solemn conclave that the strike was at an end. At the same time this colossal association which but lately threatened, through the aid of English gold and its emissaries sent throughout the country, to revolutionize the entire relations of capital and labor, decided to disband, leaving its members to follow their own inclinations in the matter of returning to work at old hours and former wages.

The men from Singer's sewing machine factory, numbering one thousand, followed the example set by the iron workers, and, dissolving their organizations, resumed their labor under the ten hour system, thus still further decimating the numbers of adherents to the movement. As we go to press, the marble workers, a few stone cutters, upholsterers, barbers and furriers, together with a small remnant of the once gigantic German League, are all that remain of the army of eighty thousand men which a few weeks since believed itself unconquerable.

The unfortunate results of the strike are too plainly before the public to require any special demonstration from us. The losses to the employers, from their works being left in idleness and their consequent inability to meet their contracts, have been enormous, and probably far in excess of any estimate yet published. It is only necessary to walk through the manufacturing portions of this city to prove the truth of this assertion. Factories have been closed by the score, buildings innumerable have remained unfinished, while the operatives leaving their labor have congregated in the halls and saloons where their meetings have been held. To the workmen, the effects of their ill advised action have been even more baneful. Apart from the pecuniary expense to which they have been put in order to maintain themselves for the past ten weeks, they have brought incalculable suffering upon their wives and children, and at the same time have opened a breach between themselves and their employers which will not readily be closed. During the heat of the controversy, little heed was given to what its after effects would be; failure was never thought of, and the fact of a few men having gained their point through taking advantage of their employers while the latter were hampered and powerless seemed to turn the heads of the entire working population of the city. Although the mechanics and laborers in the building trades at the time succeeded in obtaining a satisfactory compliance with their demand, it is now considered extremely doubtful whether the employers will stand by their concessions since the movement has turned out a general failure.

The past strike, like all similar uprisings heretofore, has tended but to prove that the workmen have yet to learn how to conduct such affairs with success. In the beginning the men used up all their available money, and then, being out of work and unable to earn anything, turned to outside unions for assistance. With the funds thus obtained, they were enabled to exist a little longer; but these exhausted, as a natural consequence the whole undertaking collapsed. The workmen will discover that they have gained nothing, earned nothing, and are indebted to other organizations for amounts loaned for the repayment of which their wages for some time to come will be taxed by the deduction of a large percentage. If each trades' union had taken the money it has squandered on this unfortunate failure, and organized a business on the coöperative plan, it could have opposed not only a serious competition to the employers, but would have been able to obtain raw material for labor, to afford employment for a large portion of its members, and at the same time have sufficient funds remaining to constitute a fair working capital.

To the trades' union system, the strike has given a serious blow. Men are beginning to understand the hollowness and weakness, besides the arbitrary injustice, which has characterized the course of the majority of the societies. Large numbers of workmen who, having no sympathy with the cause, were forced to quit their labor by the intimidations of their associates, have changed from passive supporters of the system to its most bitter opponents, while the proceedings of such revolutionary bodies as the Internationals and kindred associations have been emphatically repudiated.

The time has yet to come in this country when the workmen will be able to coerce employers into concession to demands the sole results of which would be ruinous to both classes.

The lesson of the strike is fruitful both to employer and employed, although it is one which we trust may never be renewed. It teaches through numerous instances in our past experience, which now are corroborated by the successful adjustment of the late great English lock-out, that the true method of satisfactorily settling such extreme measures as strikes and lock outs is not by open warfare and bitter controversy; but by the meeting of both parties for the calm and temperate discussion of the questions involved.

PAPER HANGINGS AND THEIR MANUFACTURE.

Paper has been used as a wall covering by the Chinese from time immemorial. It was introduced in Europe, as a substitute for the ancient tapestry hangings, by the French, among whom its manufacture has always been a prominent industry. Paris contains numerous factories employing over 3,000 workmen, and several large establishments exist in the southern cities of France.

In New York city, three factories are in operation. Philadelphia has six, producing annually paper hangings to the value of $800,000.

Wall paper is prepared in several different ways. The cheap varieties are rapidly printed by ingenious machinery, but for the more elegant and elaborate patterns hand labor is almost invariably used. The paper is procured by the manufacturer in large endless rolls, weighing some eighty to eighty-five pounds each. In this condition, if of fine quality, it costs about seventeen cents per pound; if ordinary or cheap, the price fluctuates according to the market.

The designs to be printed are prepared as follows: Sketches of the different patterns are made in this country by artists employed for the purpose. These, on being approved, are forwarded to France, where elaborate drawings are made from them. Each color entering into the design must be printed separately, so that there must necessarily be as many blocks or types prepared to make the impressions as there are tints in the pattern. The blocks are constructed of two layers of wood, a thin piece of maple fastened to a thicker backing of pine board. Each block is about twenty inches wide, two feet long, and an inch and a half to two inches in thickness. On the maple, all of the design to be printed in a single color is drawn and afterwards cut out by engravers, or rather wood carvers, so that the lines are left in high relief. When the carving is completed, the work is brushed over with boiled oil and, when dry, sent to the printer for use.

The paint employed for coloring the paper is ground color mixed with warm size and passed through several sieves so that it is rendered perfectly smooth and free from lumps.

The design being decided upon, the block carved, and the paint mixed, the first process the paper has to undergo is its uniform covering with a ground tint. This is effected by passing the paper over an endless rubber belt working on rollers. A copper cylinder at one end of the machine used for the purpose rotates in a box of prepared color. From the cylinder, the paint is distributed to revolving brushes, by which it is applied to the paper passing over the belt. As the paper issues from the machine, it is drawn out along the loft and then hung up, in festoons over sticks resting on long frames, to dry. It is then wound on a large reel from which it is cut by boys into pieces of eight yards in length.

In case a pattern resembling oak wood is to be applied to the paper, another machine is employed. The paper is passed around a large cylinder, receiving an impression resembling the grain of oak from a smaller revolving wooden cylinder, which is suitably engraved and covered with the proper colored paint.

The rolls of paper, as they are wound by the boys from the large reel, are sent to a workshop below, where they are stamped with the patterns. This process is done by hand. The workman stands before a table over which passes the paper. Hanging above the table, supported by an india rubber cord, is the block on which the design is carved. The upper end of the rubber cord is attached to a small wheel traveling on an iron guide, so that the block may be swung from the table over to the place where it receives its covering of color.

The method of making the impression is very simple. The paint is obtained from what is termed the "slush box," which consists of a shallow box, the bottom of which is covered with painted ticking made watertight. This box floats on water contained in a larger box, so that its bottom is always perfectly level. Inside of the first mentioned box is placed a piece of woolen cloth on which the paint is uniformly distributed. The workman first places the paper across his table, then swings the block over to the slush box, and brings its carved side down on the paint. Next he carries the block back again, and places it on the paper, of course using great care in the registering so that the impression may fall exactly on the right place. A vertical movable arm attached to a frame above is now rested upon the back of the block, and forced down by means of a lever worked by the foot of the operator, thus completing the impression. This process is repeated until the whole piece is covered with the pattern, when it is hung up for from five to ten days until perfectly dry.

If the design is to be gilded, the parts which are to receive the gold leaf are printed in the same manner as above described, only glue size is used instead of paint in the impression. Gold leaf is afterwards applied by girls in the ordinary method.

Satin papers are sometimes prepared by mixing with the coloring matter sulphate of alumina and finishing off with a brush. Velvet or flock paper resembling velvet plush is made after printing the colors, by fixing to the surface some finely ground fibers of wool of the proper hue, by means of glue or white lead and oil.

Paper after being printed is also often embossed by being passed between steel rollers on which a design has been engraved.

The great care which is exerted in printing the many tints of the more elaborate decorations has rendered hand labor necessary in place of machine power; but the expense of producing the material has of course been proportionally increased. Large quantities of the finer qualities of hangings are imported hither from France, but it is a well known fact that much that is represented as of French manufacture is in reality made in just such establishments and by the same processes as above described.

Of late paper has been printed in patterns which have been suitable for theatrical scenery. At Booth's theatre, several of the handsomest scenes are thus made, while in Wallack's, the decoration of the entire auditorium is in paper.

In price, the fine grades of wall paper vary according to quality, but average from twenty-five cents to four dollars and a half per roll of eight yards.

SOLID EMERY GRINDER.

The value of solid emery wheels in various branches of manufacture and for various uses in the workshop is about being properly appreciated by metal workers and others. Wheels of good construction and properly mounted can be adapted by modifications of their shape, size and cut to numberless purposes, varying from the fine polishing of metallic surfaces to the gumming of a mill saw. Perhaps their economic value is nowhere better shown than in their employment as grinders, where they take the place of the file and render unnecessary the time and labor consumed in the use of that tool.

We may naturally conclude from the foregoing that a compact and efficient grinding machine that could readily be set up in any workshop requiring it would be an article in great demand.

Such a machine is produced by the Tanite Company of Stroudsburg, Pa., and called by them the "Table Emery Grinder." It is complete in itself, having its counter shaft and driving pulleys, fast and loose pulleys, and belt shifter all disposed commodiously at the lower part of the ta[illegible]. It carries two solid emery grinders, with many appurtenances, and can be run at varying speeds.

The Tanite Company have added a machine shop to their emery wheel factory, and have made a specialty of the manufacture of grinding machines of various characters, by which means they very much economize the production.

New Method for Indelible Writing and Printing upon Cloth and other Substances.

At a recent meeting of the French Photographic Society, in Paris, M. Dumas, made a very curious demonstration in the presence of his colleagues and a select audience of the public. The illustrious chemist, says the *Photographic News*, poured upon a piece of white stuff a few drops of a solution of nitrate of silver; he then pressed the fabric lightly in a pad of blotting paper to remove the superfluous liquid, and upon certain portions of the stuff was then pressed a metal seal, bearing a design in relief; immediately there appeared impressions in black of the design wherever the stamp had been applied to the fabric. This method of printing, at once so simple and rapid is the invention of a chemist in Paris, M. Em. Vial, who has already communicated to the Academy several engraving processes.

The particular method experimented with by M. Dumas is founded upon the circumstance that in the presence of zinc, lead, and copper a solution of nitrate of silver is immediately decomposed. Thus when a printing block engraved upon one of these metals is pressed upon a sheet of paper or any kind of fabric—cotton, linen, or silk—impregnated with nitrate of silver, this latter is decomposed as soon as contact takes place, and the silver is precipitated in the form of a black powder, faithfully reproducing in every detail the design traced in relief on the printing block. By a simple washing of the fabric afterwards in water, the remainder of the solution is removed from the stuff, and we obtain an indelible image, which adheres so tenaciously to the fabric that the design lasts as long as the linen or silk upon which it rests.

The color of the impressions may be varied at will from a very light gray to the most vivid black, according to the nature of the silver bath used for sensitising the paper or fabric, and according to the metal of which the printing block is composed. In general, the image is of a more intense black the more affinity the metal possesses for oxygen, and the further it is from the order in classification.

Cotton, linen, woolen, and silken stuffs, paper, and, indeed, any kind of material of this nature that can be impregnated with the solution, is capable of employment for this kind of printing. A slight dressing in the material favors the operation, and the finer and closer the fabric and stiffer without being dry, the better will be the results. Silk yields by far the finest impressions. In support of the communication, M. Vial submitted to the Academy a collection of proofs of different kinds, remarkable both for the fineness as for the sharpness of the designs.

THE NATURE OF COMETS.

Professor Zöllner, of Leipsic, in a lately published work on the nature of comets, makes it his purpose to explain the remarkable phenomena they present by an application of the established principles of physical science alone.

He starts from the fact that water, mercury, and many other substances, even solids, undergo evaporation to a certain extent; and he infers from the odors of the metals that they also, even at very low temperatures, are constantly giving off vapor, though in an inappreciably small amount; from which he concludes that a mass of matter in space will ultimately surround itself with its own exhalations, the tension of which will depend upon the gravitative energy of the mass and the existing temperature. If the attractive force of the body be insufficient to give the surrounding vapor its maximum tension for the temperature, the evolution of vapor will go on until the entire mass is converted into it. A further analytical inquiry leads to the result that a finite mass of gas in unlimited space is in a condition of unstable equilibrium, and must become dissipated by continual expansion and a consequent decrease of density; and a necessary consequence of this result is that the space contained in the stellar universe must be filled with matter in the form of gas.

By assuming, for the purposes of calculation, that stellar space is everywhere filled with atmospheric air, and taking the temperature as that of melting ice, he finds that gas in space, at its lower limit of density, is so attenuated tnat a mass of air, which on the earth's surface would occupy a volume of one cubic decimeter, would, when reduced to this density, fill a sphere of inconceivable dimensions; a ray of light would not traverse its radius in a less number of years than is expressed by the numeral one followed by ninety-eight ciphers. Such a medium could have no appreciable effect either upon rays of light or the motion of bodies.

Solid bodies in space must, by virtue of their attractive force, condense the gas so as to form an atmosphere on their surfaces, and the density of the envelopes can be calculated when their size and mass are known. The value found for the moon is a vanishing quantity, and perfectly in accordance with the fact that no lunar atmosphere has ever been detected. For the larger planets, however, the value is very great, and the high density of their atmospheres must occasion perceptible effects upon the light reflected by them.

The temperature of a fluid mass, existing far from the sun or any body capable of radiating heat to it, would be that of the surrounding space, and if its attraction were not too great, slow evaporation would convert it into a sphere of vapor. Should it, on the contrary, approach the sun, the heat would cause the whole to be vaporized in much shorter time than in the former case, and the smaller the mass the shorter the time would be. The smaller comets, which often appear like spherical masses of vapor, are examples of bodies of such a nature.

The self-luminosity of comets he sets down to electrical excitement; and if it be granted that electricity may be developed by the action of solar heat, in the process of evaporation or the mechanical and molecular disturbances arising from it, we have a cause sufficient to account, not only for their self-luminosity, but also for the formation of their trains.

He then proceeds to discuss the quantitative difference in the effect of gravitative and electrical forces upon masses at a distance, and shows that, when a body is under both influences simultaneously, an increase of the mass results in a preponderance of gravitation, and a sufficient decrease of the same, in a preponderance of the electrical action. Hence the nuclei of comets, as masses, are subject to gravitation, while the vapors developed from them, which consist of very small particles, yield to the action of the free electricity of the sun. Careful investigation shows that, supposing the free electricity of the sun to be no greater than has been repeatedly observed on the Earth's surface, it would speedily communicate to a sphere, 11 millimeters in diameter and $\frac{1}{100}$ of a milligram in weight, a velocity of over 408 geographical miles per second, or such that it would pass over a space of over 70,000,000 miles in two days. The comet of 1680 developed in two days a train of 60,000,000 miles, which is a magnitude of the order calculated. It is therefore sufficient to attribute to the sun an electrical energy no greater than that supposed to account satisfactorily for the appearances presented by cometic trains; and it is quite unnecessary to assume the existence of some other repulsive force. When comets appear with trains directed towards the sun, instead of away from it, such direction is easily explained by the supposition of opposite, in place of like, electrical characters, resulting in attraction instead of repulsion.

Professor Zöllner and others think there is no improbability of the existence in space of fluid masses such as described, consisting of water or of liquid hydrocarbons, and the spectra of some of the nebulæ and smaller comets confirm the idea very strongly.

The Corn Cob Humbug.

Carbon, hydrogen, and oxygen, combined in certain proportions, make a good food for producing fat, but the fact that a substance contains either or all of those elements does not make it a valuable food. Add nitrogen to the above elements, and we have the constituents of the nutritious foods. It is not the fact, that an article contains these elements, which makes it a valuable food, but the proportions and their mode of combination. Common rosin, for instance, contains carbon, hydrogen and oxygen, yet but few farmers would care to adopt it as a diet for their cattle. Yet there are uses to which rosin is put for which wheat or corn would be of no value. Chemistry presents many curious contradictions; there are substances, which by analysis contain exactly the same elements in the same proportions, which are utterly dissimilar. Therefore, because a theoretical scientist finds that straw or corn cobs, or any other such stuff, contains a certain amount of carbon, nitrogen, and oxygen, he immediately publishes to the world that they are preferable, as food, to substances which good, old fashioned experience has proven of value. We knew a farmer once who acted upon just such nonsense, and it cost him about 10 cents a pound to fatten his pork on corn meal and corn cob meal mixed, while his neighbors fattened theirs on corn meal and potatoes at little over half the cost.

The next thing we shall hear is that corn cob meal is the best food for dyspeptics, and some vegetarian fool will be urging everybody to scratch their stomachs with it. We think it will do very well to go with the sawdust brandy, an article about which is going the rounds of the papers, and we venture the opinion that the man who eats the one and washes down the dry compound with the other will soon be in the undertaker's hands.

Much more sensible is the idea suggested by some one that the corn cobs be used for fuel and the ashes be utilized for making potash.—*New York World.*

Pneumatic Railway in Texas.

Colonel J. H Simpson, United States Engineers, describes the operation of the cars on the temporary railway now in operation at Matagorda, Texas. The road is used for conveying the materials for the new lighthouse now in process of erection at that place. He says:

"Transportation of material over the railroad at this work has been much facilitated by using a sail on the cars. A great speed as a mile in $2\frac{1}{2}$ minutes was obtained by this means, and the heaviest loads the cars could take were moved along as well almost as if the cars were propelled by steam. It was found that the cars would sail almost as close to the wind as a boat."

ABSORPTION OF GASES BY CHARCOAL.—In the case of ammonia, it would seem that the amount of the gas absorbed by the charcoal continuously decreases as the temperature rises from 0 deg. to 55 deg., but at that point a sudden change occurs, and the amount of gas given off becomes considerably diminished. In the case of cyanogen, the absorption takes place very rapidly, being confined almost entirely to the first ten minutes, and the curve representing the absorption between 0 deg. and 80 deg. is continuous; the results obtained are given in tables, and also represented by absorption curves. Hydrogen and nitrogen are very slightly absorbed by the charcoal.

THE Central Park, New York, is 876 acres in area, and Phœnix Park, Dublin—one of the largest city parks in the world—is 1,752 acres.

Facts for the Ladies.—Mrs. S. W. Clark, Washington, D. C., with a Wheeler & Wilson Lock-Stitch Machine, used her first needle, No. 2, nearly 3 years, until it was worn out, doing all kinds of family and fancy sewing. See the new Improvements and Woods' Lock-Stitch Ripper.

The Times are Hard, is the complaint of many, and yet no family can afford to do without a sewing machine. There is one that has grown to a popularity equalled by few in market. It is the Wilson. Their immense manufactory is now turning out nearly fifteen hundred machines a week, and still they with difficulty meet the demand. The Wilson for family use has no equal, and is sold for fifteen dollars less than all other first-class machines. Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

Business and Personal.

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

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New Style Testing Machines—Patented Scales. Send for New Illustrated Catalogue. Riehlé Brothers, 9th and Coates Streets, Philadelphia, Pa.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

State Rights on improved Cigar Moulds for Sale. Patented June 25, 1872. Inquire of Isaac Guthman, Morrison, White Side Co., Ills.

Wanted—Man with necessary experience to superintend Construction department of first class concern where large, well established business in Iron Bridges, Roofs, etc., is done. Address "Advertiser," care Wm. L. Chase & Co., 93 & 94 Liberty Street, New York.

If you want to know all about the Best Hub and Spoke Machinery, address Defiance Machine Works, Defiance, Ohio.

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The best recipes on all subjects in the National Recipe Book Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

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For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

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

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

Notes & Queries.

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

1.—STRENGTH OF HORSES.—Will some one tell me at how many pounds pressure a horse of average strength can pull for one minute's time?—M. W. H.

2.—INK.—Can some one tell me how to make good ink that will not corrode steel pens?—M. W. H.

3.—IGNITION BY ELECTRICITY.—Can electricity be made to pass off a charged wire and ignite powder in the tube of a rifle, without the wire being connected to the rifle?—M. W. H.

4.—BREAKING WEIGHT.—If a beam, with ninety-nine hundredths of its breaking weight on it while at rest, should be moved at the rate of thirty miles or more a minute, on a level and without any jar, would the motion break the beam?—M. W. H.

5.—MAKING WINE.—Will some one give me a simple recipe for making wine from an abundant crop of grapes?—B. D.

6.—HARNESS BLACKING.—Will some practical tanner or leather finisher give me a recipe for a good, cheap blacking for harness and upper leather, one that will finish with a fine gloss?—A.

7.—DISSOLVING GUTTA PERCHA.—What is the best kind of spirit for dissolving gutta percha in, so as to retain all its sticking quality?—R. J.

8.—RAISING WATER.—What is the best method of raising water from a tank, in a place where the power is limited?—R. J.

9.—GILT DIP AND BLACK DIP.—Will some one inform me what are the right proportions of acids for making the gilt dip and the black dip for gas fixtures?—A. M.

10.—WATERPROOFING PAPER PULP.—Can any reader inform me of any substance, that can be mixed with paper pulp, to render it impervious to water?—W. R. H.

11.—MILL FOR CRUSHING CORN STALKS.—I wish to construct a mill to extract the juice of corn stalks. What size and length should I make the rollers? How many revolutions should they make per minute? I wish to have the mill adapted to run with two horse power.—H. A. S.

12.—POLISHING HORNS.—Will some one please inform me how to polish or clean elk horns so as to make them appear bright?—W. A.

13.—CLEANING IVORY.—How can I remove stains from ivory?—W. A.

14.—COMPARATIVE FRICTION OF VARIOUS GEARS.—Is there any table, showing the comparative waste of power when transmitted through different gearings, bevel gears, belts, quarter twist belts, friction wheels and bevel friction wheels? If so, where can it be found?—J. B. G.

14.—BURSTING OF SAWS.—Is it possible for a circular saw to be run at such speed that it will fly in pieces? Is there any instance known wherein a circular saw flew in pieces from too fast a motion?—G. A. H.

15.—CRYSTAL GLASS.—Would you please inform me what articles to melt together in a crucible to form the beautiful crystal glass? I mean the sort of glass of which the prisms that we see on glass chandeliers are made; they exhibit all the colors of the rainbow.—G. T. P.

16.—HARDENING OF RAIN WATER.—Will some one inform me why rain water becomes hard in my cistern, and how to remedy the evil? It is a common cement cistern, and is covered with planks and earth; it is situated for the most part under a laundry, and has been in use ten years. The roofs from which the water is collected were formerly covered with iron and overlaid with roofing cement, a mixture of coal tar and pulverized slate; but they have lately been covered with tin and painted, with no apparent change in the water.—B. D. A.

17.—MOUNTING CHROMOS.—How should chromos be prepared and mounted, so that they can be framed without glass, and be cleaned like oil paintings?—B. D. A.

18.—CLAY AND COAL OIL TORCHES.—In the bayous in Louisiana, we gig a great many small fish, especially trout, which come close to the bank on dark nights. The light used for this purpose should be quite intense, which the light of pitch pine torches is not; and they are, moreover, very uncertain and irregular. Could I prepare any light that is both cheap and light (in weight) and have the required intensity? Some time since I met a man who exhibited and offered for sale the recipe to make a torch composed of a piece of wire, from one and a half to two feet long, on one end of which was what seemed to be a lump of burnt porous clay; this he would plunge in coal oil until saturated, then light it, when it would burn for half or perhaps one hour, and when exhausted the torch could be re-saturated for an indefinite number of times. The article was not patented, and perhaps by making the lump large enough, or saturating it with some other fluid, it might give a very intense light. How may this contrivance be prepared?—B. J.

Answers to Correspondents.

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

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

THE ATLANTIC CABLES.—J. H. P. is informed that the two cables between America and Great Britain were lifted and repaired in the fall of 1871.

HOT SPRINGS.—W. S. B. is informed that the heat of water, from a mineral spring or elsewhere, can never exceed 212° Fah., so long as it is exposed to the air. The only way in which water can ever rise to a higher temperature than this is by being heated in a confined vessel. Immediately after the water is allowed free contact with the atmosphere, the thermometer placed in it indicates 212° or even a lower figure.

C. W. L. asks: Is there any invention by which a watch can be kept in a waist pocket, dispensing with a chain? Answer: Yes; wear it without a chain, and put a button on inside the pocket.

E. A. W., asks: Can you or any of your readers tell me the probable dimensions of Noah's Ark? Answer: One of our Sunday School friends, whose relative sailed with Noah, says the dimensions of the ark were as follows: 512 feet long, 87 feet broad, 52 feet high.

UNITED STATES COINAGE.—Query 16, page 10, Vol. XXVII.—The large United States coppers were first issued in 1793, and were continued until June, 1857, with the exception of during 1815, in which year only bogus cents were made. The United States half cent was first coined in 1793, and was omitted in 1798, 1799, and 1801, and from 1812 to 1824, and in 1827, 1830, 1837, 1838, and 1839, and were discontinued after 1857. The small eagle cent was first issued in 1856, and in 1858 it was discontinued, after which the "Liberty" headed cent was substituted.—I. P. H., of N. Y.

BLASTING UNDER WATER.—In answer to A. A. P., query 12, page 10, current volume, I would say that the constructing engineer of the Potsdam water works used a tin tube (large enough to hold the charge and a little smaller than the drill), watertight, with a small tube from one end long enough to reach above water, for the fuse to reach the powder.—H. K. W., of N. Y.

CANARIES AND VERMIN.—Query 17, page 10.—D. F. W. should make some perches of elder or anything that he can get a hole through from end to end. Then cut small holes through the wood to the one in the center. It is said by those who have tried it that the vermin will go into the center of the perch in the night, so that they can be killed in the morning. I cannot vouch for this remedy.—H. K. W., of N. Y.

BLASTING UNDER WATER.—To A. A. P., query 12, page 10. Make cartridges, to fit the holes, of either tin plate or stout cardboard saturated with tallow and well secured, around the fuse or insulated wires where they enter the cartridge, with plenty of fat, or cement of rosin and tallow. Tin plate I recommend, as I have used such quite successfully.—E. H. H., of Mass.

MILK SOURED BY A THUNDERSTORM.—To H. C. R., query 1, page 10.—Under usual circumstances the nitrogenous elements of milk begin to putrefy and assume the properties of a ferment, inducing the sugar to absorb oxygen, and become converted into lactic acid. During a thunderstorm ozone is formed in the air, and this, I think, acts on the sugar, causing the formation of the same acid, without the decomposition of the nitrogenous matter. To illustrate this, make a solution of sugar of milk in water and submit it to the same conditions, and you will have a similar result.—E. H. H., of Mass.

STANDARD MEASURES.—To P. E. McD., query 5, page 10.—The standard is the length of a rod or pendulum beating seconds in vacuo at the level of the sea, in the latitude of 51° 29′ north, at a temperature of 62°. The length of this rod or pendulum is a certain quantity, and is divided into 39·1393 parts, whereof one part is called an inch, and 36 parts, one yard. The three barley corns, laid down in the old arithmetics, give only a rough and ready approximation.—E. H. H., of Mass.

F. H. Y. asks: Does an argand gas burner consume more gas than an ordinary one? Answer: It depends upon the sizes of the respective burners. If the ordinary burner is of such a size as to permit the flow of say eight cubic feet of gas per hour, while the argand burner only permits the flow of six feet per hour, it is almost unnecessary to inform you that the first burner will consume the most gas.

COOLING WATER.—To J. A. C., query 7, page 10.—Filter the water through a layer of charcoal, sand, and gravel to purify it. To cool it, fasten close, around a pitcher or other vessel, two or three layers of flannel. Keep these wet, and place in a draft of air. Cover the top in the same way. By the constant evaporation of the moisture from the flannel, the water will be kept quite cold.—E. H. H., of Mass.

STORING LARD.—W. H. C., query 2, June 22.—Lard is not injured by being stored in bright tin cans. I have seen it stored in a tin can several years past, and it remained perfectly good.—M. W. H., of Iowa.

DIMENSIONS OF BELTS.—W. G. S. (query 7, page 416, last volume) should remember that a belt of a given size and length will transmit a given amount of power at each revolution. A two ply rubber belt, running 1,500 feet per minute, will transmit one horse power for each two inches in width; but if the belt runs slower, it must be larger, to obtain the same result. If W. J. S. is constructing a horse power, he had better gear up with cogs until the rim of his speed wheel runs about 1,500 feet per minute.—H. A. S.

Recent American and Foreign Patents.

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

ROUND BELTING.—Albert Holbrook, Jr., assignor to A. and C. W. Holbrook, of Providence, R. I.—This invention consists in folding the margins of the strap over upon the inner portion before twisting it, and adjusting the parts folded so as not to extend quite to the center, by which means the belt is formed with rounded edges meeting together along the spiral line, which gives a much better and neater finish than the raw edges of the ordinary belt. The edges lapped over on the middle portion form the core, around which the said middle portion becomes twisted, and thus saves the sewing on of another strip for forming a core, as in the common way of making round belting.

SASH HOLDER.—Hazen O. Ball, of Sioux City, Iowa.—The object of this invention is to provide convenient and efficient means for supporting the sashes of windows in any desired position, and it consists in the following construction: A rubber roller is supported in a metallic frame let into the frame work of the window, and a rubber strip is applied to the side of the sash so that it bears against the roller. The journal of the roller is corrugated, and a spring, which is adjustable by means of a screw, bears against the corrugations. By adjusting the spring, sufficient friction is caused to hold the sash as required.

BLACKBOARD ERASER.—Frank G. Johnson, of Brooklyn, N. Y.—This invention relates to a new and useful eraser for use on blackboards, slates, and the like; and it consists in a holder of novel construction, which is adapted to hold a number of sheets of woven, felted, or other fibrous substances, so that they are sustained suitably for doing the rubbing by means of the ends of the threads or fibers exposed at the edges of the holder. In this way the rubbing substance is fully utilized.

DISTRESS RUDDER AND DRAG.—Heinrich Rablen, of New York city.—This invention relates to a new distress rudder which is intended to be kept on board of vessels for use in case of the loss of or injury to the regular rudder. It consists in the use of a weighted plank which is hinged to an upright post with projecting claws. Upon being thrown overboard, it floats on edge in the required position, and is adjusted by ropes so that the upright is held fast against the sternpost of the vessel. In this position it is worked by side ropes as an ordinary rudder; or it may be allowed to drag astern.

STRAW CUTTER.—Herman Baldwin, of New Haven, Conn.—This invention furnishes an improved fodder cutter, which is so constructed that the upper or movable feed roller may be made to move up and down squarely, whether the material to be cut be thicker under one end of the same or not, and which may also be readily adjusted to cut the feed longer or shorter, as may be desired.

GUN LOCK.—John H. Byers, of Delta, N. Y.—This invention relates to improvements in gun locks which prevent accidental explosion by contact with the hammer, and simplify the general arrangement of parts. It consists principally in setting the hammer in a recess of the gun stock, and back of a guard which is fastened to it, so that accidental contact with the hammer is thereby prevented. The invention also consists in a consequent change in the position and form of the nipple, which is L shaped; and also in a new manner of combining the trigger, hammer, and mainspring with

WATER HEATER AND STEAM GENERATOR.—George M. Woodward, of New York city.—This invention relates to an apparatus for heating buildings by water circulations or by steam, and for generating steam for all purposes; it consists in a chamber made with two compartments and a series of water tubes which are arranged in pairs, each pair being connected by a return chamber, and the whole arranged in a firebox or arch.

BEE HIVE.—William H. Roberts, of Campbell's Station, Tenn.—This invention relates to an improved moth-miller trap, and consists in the arrangement of passages in the front and base of the hive, and a peculiar disposition of illuminating holes by which the miller is entrapped into a box which can easily be removed from the hive.

THRASHING MACHINE.—John A. Lutz, of Bucyrus, Ohio.—This invention has for its object to adapt an ordinary grain thrasher for immediate use in cleaning timothy. At present thrashing machines, though provided with means for cleaning wheat, are not arranged to clean timothy; consequently, a second machine, a clover huller, is used subsequent to the process of thrashing. The improvement consists in providing an ordinary thrashing machine with an additional peculiar set of sieves secured in the shoe in place of the wheat riddles, by means of which the timothy is cleaned.

RAFTER HOOK.—Carl Gustav Buttkereit, of Toledo, Iowa.—This invention relates to a new hook to be used in connection with fire escapes, hay elevators, etc., with the object of furnishing a secure support, and at the same time permitting the instantaneous detachment of the same from the sill, rafter, or beam on which it hangs. It consists in providing the hook with a pivoted detaching lever and with a stop for the same, in such a manner that, upon pulling on the lever by means of a string attached thereto, it makes a fulcrum of the support on which the hook hangs and raises up the latter until it is clear of the support.

REFRIGERATOR.—Stephen A. Dunnington, of New York city.—This invention furnishes an improved refrigerator which is so constructed as to enable ice and salt to be applied to produce cold, and which keeps the articles placed in it perfectly dry. The inner box of the refrigerator is made of suitable sheet metal, and its top, which should be permanently attached, is recessed and made to incline toward the center, where is formed a channel inclined slightly toward one side, so that the melted ice and salt may flow off through a hole in the side of the box. The outer box is made larger than the inner, so as to leave a space between to receive the ice and salt. A doorway is formed through the sides of the boxes, and is encased so as to entirely separate it from the space between.

CANAL BOAT.—Peter Roberts, of New York city, assignor to himself and William A. Rees, of same place.—This invention relates to a new paddle wheel mechanism, which can be applied to canal boats and other vessels for the purpose of propelling and steering the same. It consists, first, in a peculiar construction of paddle wheel, which is formed with a double cone hub and two sets of paddles, which are arranged at an angle to one another and with a space between them and the hub; and, secondly, in a spring frame, which takes the shock of obstructions and protects the frame in which the wheel is journaled.

STOVE PIPE CONNECTION.—Charles R. Penfield, of Lockport, N. Y., assignor to himself and Charles Strawn, of same place.—This invention relates to an improved method of connecting stove pipes to the chimney or flue; and consists in a clamp collar which surrounds the pipe, and which is tightened thereon by means of a screw. This collar prevents the pipe being crowded into the flue, and by various attachments, such as a hook, a cam, or a screw and wedge, is the pipe held in position so that it cannot be drawn out.

PAPER CUTTING IMPLEMENT.—James Cook, of Grand Manan, Canada.—This invention furnishes an improved instrument for trimming photographs and doing similar work rapidly and without danger of tearing the paper; it consists in a circular cutter, which is attached to the end of a small cylinder in such a way that its edge overlaps the edge of the form or size plate which is laid upon the photograph to be trimmed. A short journal or shaft passes longitudinally through the cylinder and through the center of the cutter, and to its end, at the outer side of the cutter, is attached a handle.

REACH COUPLING FOR WAGONS.—William P. Ripley, of Friendship, Tenn.—This invention furnishes an improved coupling for connecting the reach to the rear hounds; it is simple in construction and effective in operation, and couples the reach to the hounds in such a way that, while making the connection firm and secure, the reach is at liberty to turn freely in the hounds, but cannot move longitudinally.

BUNG.—Thomas Burke, of New York city.—This invention relates to a new and useful improvement in the bungs of barrels, hogsheads, and all similar vessels, and consists in screwing into the bung hole of the barrel a tubular shell which is provided internally at its bottom with a valve seat. The valve, by which the barrel is closed or opened, is composed of wood, or of metal arranged with suitable packing, and is kept down on its seat by means of a crossbar, which is made to span the shell above it and to enter spiral grooves in the sides of the shell.

LAMP BASE.—Joseph Kintz, of Meriden, assignor to himself and P. J. Clark, of West Meriden, Conn.—This invention consists of a lamp base which is in two parts: the lower one is a hollow cup or approximately cup shaped plate, with four holes (more or less), through the bottom, and the upper one is a plate which covers the hollow one, and has four legs or pins corresponding to the holes through the lower piece, which pins are pressed down upon pieces of soft vulcanized rubber by the bolt which secures the lamp stand to the base, so as to press the pieces of rubber through the holes enough to support the base above the table, and thus prevent it from scratching or injuring it.

BOAT DETACHING APPARATUS.—David McFarland, of New York city, assignor to Adaline M. Ingersoll, of Brooklyn, N. Y.—In this invention the hinged arms, bow and stern, by which the tackles are held are kept in place by sockets which slide over them. These sockets are connected by rods, which are operated by a lever to release the hinged arms by withdrawing the sockets. The improvements consist also in providing plates which serve as guides for the sockets, and in arranging long rods, to which the keel of the boat is bolted, with suitable rings through which the sockets pass when sustaining the weight of the boat. In this way the weight is brought mainly on the keel and frame.

SHEET SEPARATOR AND DROPPER.—William Van Anden and Tristram Coffin, of Poughkeepsie, N. Y.—This invention consists of a holder for sheets of music, etc., and retaining, separating and actuating devices, arranged in such a manner that a pack of sheets suspended on the holder may, by the pulling of a cord or moving of a lever, be let fall one at a time upon a music rack or any other receptacle, in such a way as to be of great convenience to musicians and others by disposing of one sheet and bringing another into use quickly while performing, so that the musical or other performance is not interrupted.

VEGETABLE CUTTER.—Friederich A. Schaefer, of St. Louis, Mo.—This invention relates to an improved hand implement for cutting vegetables or fruits into slices, and consists in forming the cutter of a wire or wires stretched from side to side of a rectangular handled frame. It is cheaply made and easily repaired.

BEE HIVE.—Amos I. Root and Meron Andrews, of Medina, Ohio, assignors to A. I. Root and Company, of same place.—The object of this invention is to so construct the honey frames of bee hives that they may be readily taken from the hive or replaced without disturbing the bees. The ordinary hive frame is fastened at the corners with nails, and it is difficult to detach the frame from the hive or the honey from the frame without more or less injury to the frame and greatly disturbing the bees. The improvement consists in securing the frame and supporting it in the hive by means of metallic arms and corner pieces which are applied and cut so as to brace the frame in all directions. It can readily be detached, as the wax does not adhere to metal as it does to wood.

MACHINE FOR MAKING BLINDS.—James Milne, of Philadelphia, Pa.—This invention provides an improved machine for manufacturing window blinds and consists more particularly in the combination of two pairs of rotary cutters, arranged in movable bearings, and one pair arranged in stationary bearings, with a transversely movable bed upon which the stile or side piece of the blind is carried to have the tenon cut; also, an arrangement of double chisels and boring bits for forming the mortise, in combination with a movable carriage, in such a manner that the boring and chiseling are done simultaneously.

WASHING MACHINE.—Ezra McCoy, of Pontiac, Mich.—This invention furnishes an improved washing machine which is simple, inexpensive, convenient, and effective; it consists in certain additions which are made to an ordinary washtub. At the bottom of the tub is placed a block from which radial arms extend to the sides. A framework, composed of slotted cross bars, is secured by one of them and wooden springs to the top of the tub, and through a hole in the center of the bars is passed a shaft which carries a pegged or knobbed rubber by which the clothes are washed against the lower block and arms. It is operated by a handle at the top of the shaft.

Harrow.—Greenbury Reed, Greencastle, Ind.—In this invention, the construction of harrows is improved so that the teeth can be readily cleared of rubbish. A light additional frame, through which the teeth pass, is arranged close under the ordinary frame and combined with levers and springs, in such a manner that the moving apart of the two frames effects the clearing of the teeth.

Harness Saddle.—Elijah Dixon, Emporia, Kansas.—In this improvement the parts of the saddle above the back bone are all made flexible, with the exception of two curved plates by which they are connected. These plates overlap and slide over each other, so as to admit the adjustment of the saddle to different shaped backs, by means of screws which pass through slots in the plates.

Draft Regulator for Hot Air Furnaces.—Stephen J. Gould, Cornwall Conn.—This invention relates to a new apparatus which can be applied to hot air furnaces for the purpose of reducing the draft if the heat produced should reach or exceed a certain degree. It consists principally in the use of a boiler which is placed within the hot air chamber that surrounds the furnace, and in the connection of the same by means of pipes, with a vessel containing a diaphragm or piston, in such a manner that, when, by an excess of heat, steam is created in the boiler, the diaphragm or piston is moved, and draws the doors of the furnace into the necessary position for reducing the draft.

Tobacco Knife.—William A. Bernard, Danville, Va.—In this invention, the knife handle is made with a thumb rest on the back, and is so fitted by its shape to the hand of the operator as to enable him to make an upward cut. The blade, also, is of peculiar formation, and has a sharp point by which the stalk of the tobacco is readily slit before being cut off. The cut being made with an upward pressure, there is no danger of dulling the knife by contact with the ground.

Barber's Chair.—Johannes N. Ewald, Frankfort, Indiana.—This invention relates to a new barber's chair, which is made with a reversible seat with peculiar devices for locking it in a horizontal position, and with an index to show how often the seat has been turned. The object is to allow one side of the seat to cool while the other is occupied, and thereby avoid the spread of disease by contact with the warm seat. The invention consists in a peculiar support for the sides of the swivel seat, in a new mechanism for removing the same, and in the arrangement of the index in connection with the seat.

Churn.—Thomas Stumm, Ada, Ohio.—This invention consists in forming apertures on each side of the body of a rotary churn, so that a circulation of pure air through the same may be established when desired. By means of slides, which have wire gauze openings to correspond with the apertures in the churn, the air may be admitted or excluded.

Lozenge Package.—Henry W. Booth, Toronto, Canada.—This invention relates to a new method of putting up confectionery, and consists in a box package of lozenges, twenty-four or more in number and of two different colors or shapes, which can be used as men, and a checker or draught board of paper which is folded to the size of the box and added to the contents. Thus all that is necessary for playing a game of checkers is contained in the package.

Wood Stove.—Chauncey H. Castle, Quincy, Ill., assignor to Comstock, Castle & Co., of same place.—This invention relates to an improvement in the construction of the lining of tod-stoves—*i. e.*, elongated wood burning stoves. It consists in making the same flat at the bottom instead of arched, by which the strength and utility of the stove are very much increased and the facilities for cleaning improved.

Waste Pipe Trap.—Thomas Smith, New York city.—This invention is an improvement in the construction of waste pipe traps, and is designed to prevent the escape of noxious gases from sewers; it consists in the arrangement of a valve in connection with a removable cover for the trap box, and in the provision of flanges on the inner side of the box, for the purpose of keeping the valve in an inclined position.

Breast Collar.—Ralph D. Kendall, Richville, N. Y.—This invention consists in forming a breast collar of a metal plate, shaped to the neck of a horse, covered with leather, and having metal loops for attachment of the shoulder strap, the same being secured by rivets. The loops also serve to prevent the leather from sliding or working on the plate, by reason of their projection through the leather.

Ice Cream Freezer.—John W. Condon, Logansport, Ind.—The invention consists in providing a cream vessel, that rotates within a freezer, with a dasher rod having plate arms bent so as to throw the cream upwards and thus to assist in creating a uniform frigidity; in providing the dasher rod with a loosely pivoted sweep that is forced by the current of cream to keep the side of the vessel from any adherence of particles; in a mode of adjusting the sweep to bear more certainly and positively against the side; and finally, in a frame which has clamps and a horizontal bar that may be detachably but rigidly fastened to the case, so as to receive the operating mechanism and fixedly hold the dasher shaft or rod.

Harvester.—George S. Grier, Milford, Del.—The invention consists in operating a rake, by means of an endless carrier, so that it will be transferred edgewise when traveling on the upper side of the belt, be turned at the end with the teeth across the front of the platform, be then drawn in that position to the rear, and, finally, be turned one quarter of a revolution as it ascends to the said upper side of the belt or chain.

Ship's Pump.—Thomas Bell, of Bellport, N. Y.—The object of this invention is to improve the means used for discharging water from ships and for pumping water expeditiously in other situations; the pump is formed of a rectangular box which has the induction pipe at one end and the eduction pipe at the other; within the box are sliding boxes containing the valves, which are hinged. These valves and boxes are made to slide backward and forward by means of rods and eccentrics attached to a driving shaft which passes through the middle of the pump box. The valves are not moved in unison, but are arranged so as to cause a continuous flow of water through the pump.

Thrashing and Separating Machine.—William H. Bassett, of Burlington, Kan.—This invention relates to a new self feeding and band cutting attachment for thrashing machines, and to a new arrangement of discharge screw for the separator by which help is saved in operating the machine. A feed belt for conveying the sheaves of grain to the thrashing cylinder is applied to either side of the frame. A reciprocating knife is suspended above the feed belt from a crank shaft, and is made to move up and down during the motion of the belt. This knife serves to cut the bands of the sheaves of grain that are conveyed to the machine. The grain, after having passed the threshing machine and grain separator, is finally discharged into a transverse trough, in which there are two screws. When these screws are both turned in the same direction, they serve to discharge the grain at one end of the trough. But when the thrashing machine operates with great rapidity, so that one person cannot attend to all the grain that is discharged from it, the screws are revolved in opposite directions and separate the stream of grain so as to discharge it at both ends of the trough.

Hemp Brake.—Philonzo S. Fitch, of Hanly, Ky.—This invention furnishes an improved machine for dressing hemp and preparing it for baling, which consists in peculiar arrangements of stationary and moving knives and other machinery, by the operation of which the hemp is quickly and effectually broken and the shives beaten out.

Gun Sights.—John T. La Rue, of Pleasant Post Office, Ind.—This invention consists in the construction of sights for rifles and other fire arms; and consists in a combination front sight and in a back sight which is adapted thereto. The front sight is composed of two hinged plates, which fold one under the other upon a bed plate, and are controlled by the action of a spring, so as to admit of being set for use either as a globe sight or a plain open sight. The rear sight is stationary, and is provided with openings adapted for use in conjunction with the front sight in either of its forms.

Device for Cutting Screw Threads.—Frederick G. Robinson, of Pittsfield, Mass.—This invention obviates the difficulty which attends the starting of a screw thread cutting die on the end of a rod or tube. A tubular holder is made to contain the die and is adjusted to screw into another tubular holder in which is inserted and fastened the end of the rod or tube. In this way the die is correctly guided and fed on to the rod.

Rotary Steam Engine.—Charles W. Patten, of Elk Point, Dakota Territory.—In this improved steam engine the cylinder is of the form of two cylinders, with about one quarter of each cut off longitudinally and joined together, thereby inclosing one space, which is divided in its longest diameter by a fixed partition, which has a space at the center, where the hubs of two axles are arranged side by side, and fit together steam tight; they also fit the partition steam tight, so that, by them and the partition, the cylinder is divided into two compartments. These hubs are placed in the axes of the two parts of the case, and they have each two wings applied at right angles to each other, one being in each compartment. The hubs, with the wings, oscillate a quarter of a revolution, or thereabout, the wings moving from the partitions to the central point between them, where they meet. The steam is applied between the two wings of one compartment, and between the partitions and the wings of the other compartment simultaneously, so that, practically, it is applied in three separate chambers, corresponding to ordinary cylinders, of which the whole or two, or only one, may be used at a time, which is desirable where the work varies considerably. This plan affords all the advantages of ordinary rotary engines without the objectionable sliding steam abutments or abutment valves; and it affords means for working the steam expansively much better than it can be done with ordinary rotary engines.

Shoe Fitting Machine.—William H. Pruden and John P. Benjamin, of Williamsburg, N. Y.—This invention is an improvement in machines for fitting together the inner lining, gore and outer vamp of a shoe or gaiter, and consists in the employment of three hinged plates, one of which is made to slide, in combination with a suitable punch and an apertured table.

Bolt Heading Machine.—Charles D. Wiley and Mason S. Norton, of Junction, Minn.—This invention furnishes an improved bolt heading machine, and consists more particularly in an arrangement for raising and dropping the hammer by means of a segmental gear wheel and rack bar; and also in apparatus for holding the hammer raised when the blank space of the gear is opposite the teeth of the rack bar.

Basket.—James Graham, of Vassar, Michigan.—This invention furnishes an improved splint or stave basket, which is simple in construction and is strong and durable. The body of the basket is formed of two series or thicknesses of staves or splints, which overlap each other, and the ends of which, at the mouth of the basket, are secured to and between two hoops. The outer series of splints or staves extend entirely across the bottom, crossing each other at the center of the bottom. The other or inner series of staves or splints do not extend across the bottom, but terminate a little within the edge of the bottom board, so that their ends are confined beneath it. The bottom board, hoops and staves are secured in their places by means of clinched nails.

Shuttle for Sewing Machine.—Frederic A. Churchill, of Pittsfield, Mass.—The object of this invention is to provide efficient and convenient means for applying and varying the friction in sewing machine shuttles, so as to regulate the tension of the thread; and it consists in a bent lever which operates in connection with an adjustable spring spindle in such a manner as to increase or diminish the friction on the pivots of the spool.

Key Hole Guard for Locks.—John B. Whitney, of New York city.—This invention relates to a lock, in which the outer key hole is closed by a sliding plate whenever the key is applied from the inside, and in which the bolt may be thrown back by applying the key from the inside when the same has been thrown out or locked by application of the key from the outside. It consists in such a combination, of the slide with the lock tumblers, that it is held by the tumblers and is drawn by a spring in front of the outer key hole as soon as the tumblers are raised by the key applied from within; a plate projects from the slide close to the key, when the same is applied from without, and prevents the slide from moving while the key is in the outer keyhole.

Toy Steam Locomotive.—Francis W. Clark, of New York city.—This invention furnishes an improved toy steam locomotive which runs for a considerable length of time, and has sufficient power to propel it upon carpets or other uneven or resisting surfaces; it is, at the same time, simple in construction and inexpensive in manufacture, and can be put into market at a comparatively low price.

Combined Bureau and Clothes Dryer.—William Hathaway, of Northbridge, assignor to himself and Chester Hastings, of Millbury, Mass.—In this improvement all the requirements for ironing, airing, and folding away clothes are combined in a bureau of ordinary size. It is made with drawers, a folding top, a recess above the drawers and an extension back to which airing frames are attached. When the apparatus is extended for ironing purposes, the recess holds the articles to be ironed; when ironed, they may be arranged on the frames for airing, after which they are folded and laid in the drawers.

Machine for Drying Paper.—Elihu C. Wilson, of Medway, Mass.—This invention consists of a long case, through which the web of bat, paper, or cloth to be dried is carried on an endless apron or belt. The case is arranged so as to cause the air which is forced through it for drying the bat to impinge upon its upper surface, and then escape around the edges and along the under side of the center, and thence through the bottom of the case into a chamber or draft box, from which it is exhausted by a fan blower or other suitable means. By this arrangement the bat is very quickly and effectually dried.

Hand Corn Sheller.—Archibald McLean and James H. Ross, of Carondelet, Mo.—This invention furnishes an improved hand corn sheller which is convenient in use, and does its work quickly without scattering the kernels; it consists in the arrangement of a fixed and a movable jaw, which are provided on their interiors with flanges or threads by means of which the kernels of the corn placed between them are removed. Curved guards are attached to the sides of the jaws to prevent waste, and the operation is performed by moving forward a handle after the corn is placed in the jaws.

Feed Water Heater.—John Gates, of Portland, Oregon.—This invention relates to a new feed water heater and mud retainer for steam boilers, in which the heat of the exhaust steam is fully utilized and the sediment from the water collected before it is admitted to the boilers.

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The South African Diamond Fields. By J. L. Babe, Special Correspondent of the "New York World." New York: David Wesley & Co., 7 & 9 Warren Street.

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The Model Potato: An Exposition of the Proper Cultivation of the Potato, the Causes of its Diseases or Rotting, and the Remedy; its Renewal, Preservation, Productiveness, and Cooking. By John McLaurin, M.D. 50 cents: S. R. Wells, Publisher, 389 Broadway, New York.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only 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.

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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.

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Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING JULY 9, 1872, AND EACH BEARING THAT DATE.

Amalgamating gold and silver, A. B. Crosby, (reissue)........ 4,961
Annunciator, C. H. Greenleaf........ 128,724
Apple corer and slicer, Dean and Potter........ 128,865
Bags, catch for traveling, Fenton and Bratt........ 128,868
Baking dish, B. Harrington........ 128,725
Bale tie, wire, E. S. Lenox........ 128,803
Barrels, machine for making, W. Brown........ 128,786
Basket, fruit, W. A. Trissler........ 128,927
Baskets, casting metal for metallic, W. H. Trissler........ 128,928
Bath tub, A. R. Robb........ 128,755
Bed bottom, spring, G. E. Burt........ 128,704
Bed bottom, spring, F. De Witt........ 128,867
Bed bottom, spring, J. Johnson........ 128,886
Bed bottom, spring, S. Pufler........ 128,905
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Thill coupling, J. T. Hards........ 128,797
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Trap, fly, J. O. Greene........ 128,87[illegible]
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Vehicle wheels, axle box for, D. Dalzell........ 128,861
Vehicles, hub for, C. G. Gray........ 128,79[illegible]
Vehicles, axle for, M. Chapin........ 128,85[illegible]
Vehicles, dash rail for, H. W. Warner........ 128,9[illegible]
Vehicles, wheel for, J. W. Ford........ 128,87[illegible]
Ventilator, F. Z. Tucker........ 128,9[illegible]
Vessels, propulsion of navigable, Brand and Moore........ 128,84[illegible]
Vise, pipe, C. E. Haynes........ 128,77[illegible]
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Washing machine, E. B. Hull........ 128,88[illegible]
Washing machine, A. C. Langworthy........ 128,89[illegible]
Washing machine, R. P. Gillett........ 128,87[illegible]
Watch case spring, J. Laurent........ 128,89[illegible]
Water closet attachment, W. G. Rhoads........ 128,90[illegible]
Water wheel, F. H. Palmer........ 128,90[illegible]
Weather boarding, A. W. Murray........ 128,89[illegible]
Wells, reamer for rock drills and, Perin and Callaway........ 128,74[illegible]
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DESIGNS PATENTED.

5,974.—Button.—J. R. Farrell, Boston, Mass.
5,975.—Case for Ribbons, etc.—J. Gross, N. Y., A. Ruth, Decatur, Ill.
5,976.—Cooking Range.—D. Hathaway, Green Island, N. Y.
5,977.—Beer Mug.—J. H. Hobbs, Wheeling, W. Va.
5,978.—Ends of Belting.—B. A. Lewis, Plainville, Conn.
5,979.—Stove.—G. G. Wolfe, N. S. Vedder, F. Ritchie, Troy, N. Y.

TRADE MARKS REGISTERED.

884.—Attrition Flour.—Chicago Attrition Pulverizing Co., Chicago, Ill.
885.—Gunpowder.—Laflin & Rand Powder Company, New York city.
866.—Printing Machinery, etc.—V. E. Mauger, New York city.
887.—Soaps, etc.—Proctor & Gamble, Cincinnati, O.
888.—Oil Can.—I. C. Smith, New York city.
889.—Whisky.—H. K. Thurber & Co., New York city.

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20,727.—Cartridge.—G. W. Morse.

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APPLICATIONS FOR EXTENSIONS.

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

21,698.—Hay Rake.—M. Raezer. September 18, 1872.
21,864.—Screw Cutting Lathe.—G. W. Daniels. October 2, 1872.
21,917.—Hull of Vessel.—R. and T. Winans. October 9, 1872.
22,157.—Pipe Tongs.—J. R. Brown. November 13, 1872.

EXTENSIONS GRANTED.

20,727.—Cartridge.—G. W. Morse.
20,756.—Ore Separator.—H. Bradford.
20,824.—Planing Moldings.—H. B. Smith.
20,834.—Ear, Cheek, and Chin Muffs.—W. P. Ware.
20,841.—Railway Bridge Signalizer.—A. Burnham.
20,920.—Spinning Frame.—A. Houghton.
20,923.—Machine for Cleaning Grain.—W. H. Orr

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Cloth Cutting Machine.—L. Fenno, P. Howe, Boston, Mass.
Copper Covered Wire.—S. Hiler, New York city.
Drying White Lead, etc.—J. B. Pollock, Port Richmond, N.Y.
Furnace, etc.—B. Franklin, Indianapolis, Ind.
Gathering Attachment, etc.—A. Johnston, Ottumwa, Iowa.
Hydrant.—J. Fricker, Jr., Cincinnati, Ohio.
Making Oil, etc.—W. B. Fisher, Newark, N. J.
Making Vinegar, etc.—R. D. Turner, I. Vanderpoel, New York city.
Musical Instruments.—T. Atkins, H. Drewer, Cincinnati, Ohio.
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Railway Brake.—F. A. Canfield, Dover, N. J.
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Safety Valve.—J. R. Cazier, North East, Pa.
Securing Knobs to Spindles.—W. B. Chapin, Wickford, R. I.
Sewing Machine, etc.—G. Lowden, Brooklyn, N. Y.
Trench Trap.—N. Thompson, Brooklyn, N. Y.
Stop Motion.—W. Corney, S. S. Turner, Westborough, Mass.
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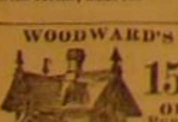

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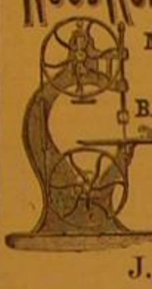

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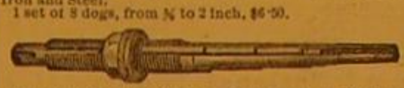

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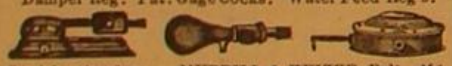

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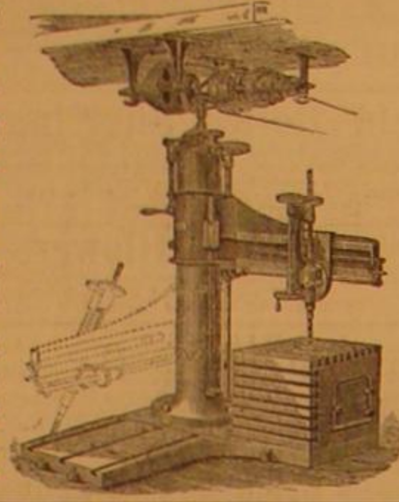

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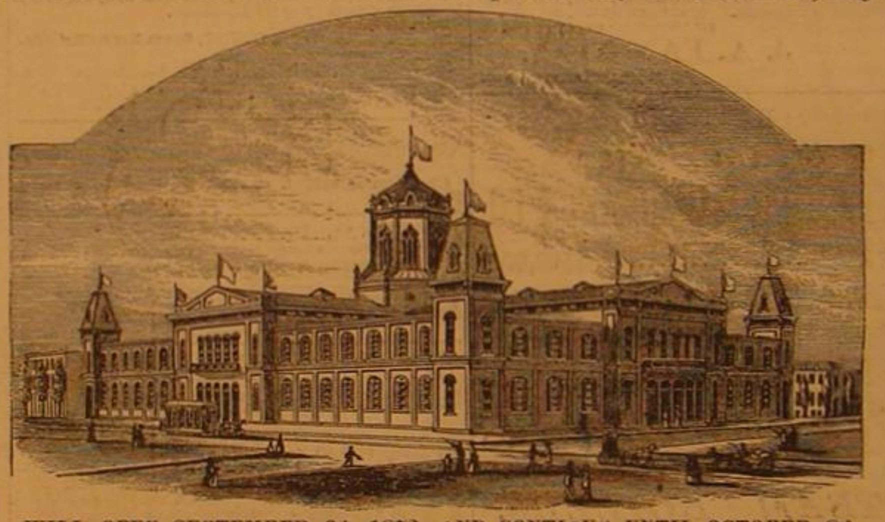

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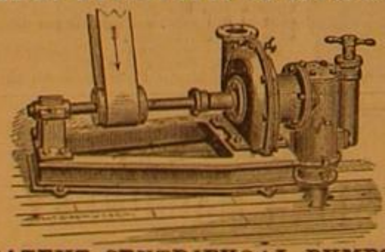

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