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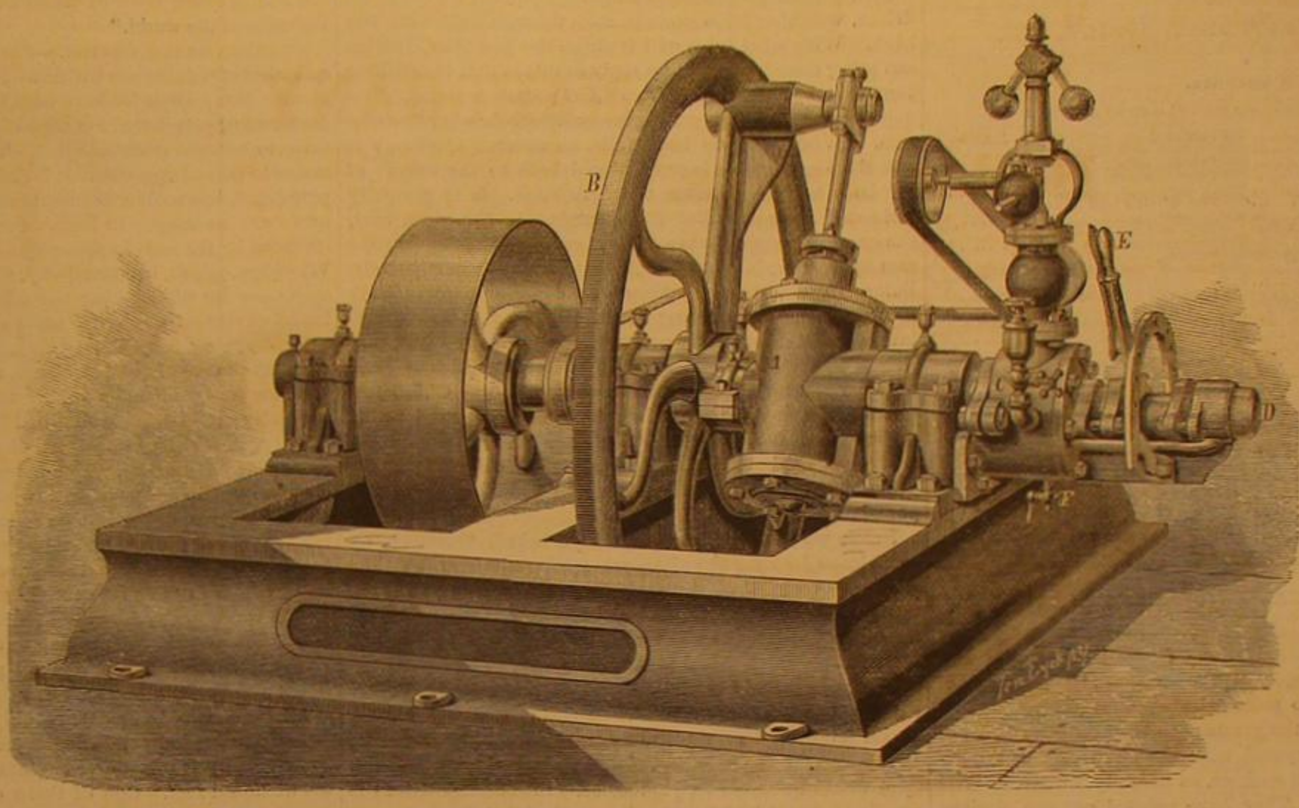
REVOLVING STEAM ENGINE.

The steam engine represented in our illustration is of an entirely novel form, and possesses the peculiarity of a cylinder which revolves with the flywheel. It is claimed that the device is both efficient and desirable, while it is clearly compact and simple in construction.

A is the steam cylinder, and B the flywheel. The steam chest is at C, and the exhaust extends through to D. E is the reversing lever, and F a cock for discharging condensation. The invention is so clearly shown that further detailed reference is deemed unnecessary.

The piston rod, it will be noticed, is attached directly to the wrist pin, consequently all the friction of slides, cross heads, and connecting rods is done away with. The motion of the cylinder is produced by placing it at half stroke on one side of the flywheel center. The journals are cast solid upon the cylinder, and both the latter and the flywheel revolve upon their own axes. The valve is stationary and placed upon the exhaust pipe. The steam passes under the face of the valve and then out of the pipe. The valve seat is movable, and if necessary both it and the valve can be removed for repairs by simply taking off the cap over the end of the chest. Within the latter, the steam port is always exposed to the steam. The crank pin has an oscillating motion of about $\frac{1}{16}$ of an inch to a six inch stroke and, it is claimed, is thus prevented from heating.



SCOTT & MORTON'S REVOLVING STEAM ENGINE.

The lever is situated upon the exhaust pipe and is attached to semi-circular leaves, answering for a link. By turning it in one or the other direction, the engine can be reversed or started ahead; or by moving it up or down to the proper places, the lap of the valve can be altered while the engine is in motion.

The inventors state that they have had one of these machines in constant use for six years. Its cylinder is 3 × 6 inches, and it makes one hundred revolutions per minute, driving three printing presses. It has been ascertained by experiment that an engine with a cylinder 6½ × 8 inches gives, by dynamometrical test, 14 horse power, 55 lbs. of steam, and 120 revolutions. Attached to a 24 inch burr millstone and a corn sheller grinding corn, a machine of the above dimensions under 55 lbs. of steam, made 250 revolutions per minute, with 430 revolutions of the stone. The detailed results given are very satisfactory, indicating large economy of fuel, although the boiler employed was of a disadvantageous form.

Patented through the Scientific American Patent Agency by Scott and Morton. For further information in regard to purchase of engines, etc., address Peter Black & Sons, manufacturers, Hamilton, Ohio; or in relation to rights, etc., address the patentees at the same place.

REVERSIBLE REST SINGLE WHEEL GRINDER.

In the machine here represented especial attention has been paid to providing a convenient and easily adjustable rest upon which to place the work, and also to supplying an accurate method of grinding long knives or other straight edges with emery wheels.

In the cut, A represents a knife being ground. B B are braces supporting an extension table, and C is a Tanite emery wheel. The knife is held in a clamp, D, which is adjustable by hand nuts and bolts to thick or thin, wide or narrow, blades. The angle at which the edge of the blade is ground is regulated by the hand bolt, G. E is the carriage or slide which is passed to and fro in front of the wheel, C, on the shears or bed, F. This machine is furnished with two small rests having each a surface 4 by 8½ inches, also with a large rest or table 8½ by 20 inches in dimensions. These surfaces are faced with accurately ground reversible plates of saw steel, and either rest can be brought to either edge of wheel at or below the center, or raised, if desired, 8 inches above the center of the arbor. They can also be adjusted on either side of the wheel at such point as is desirable. The general design of the machine, combining metal where strength is required, lightness where extra metal would be useless, and artistic taste with utility, will commend it to all mechanics.

THE TANITE CO.'S REVERSIBLE REST SINGLE WHEEL GRINDER.

When the knife-grinding attachment is removed, the table rest forms a true surface for holding gang or mulay saws while grinding the teeth either to sharpen or "gum" them.

The machine is very handsome in appearance, and the high standing of the manufacturers is a sufficient guarantee of its efficiency. For further particulars address the Tanite Company, Stroudsburg, Pa. See advertisement on last page.

Scientific Research versus New Inventions.

At the recent meeting of the American Institute of Mining Engineers, Boston, Mass., Professor R. W. Raymond made the following remarks:

"I suppose we shall be told that mining and metallurgy are not sciences, but arts; and that we who pursue them occupy a place a grade below that of the disciples of scientific research, the seekers after truth as truth, *for its own sake.* Gentlemen, I would do no injustice to any form of science, physical, mental, or moral. But it should be borne in mind that the absolute truth is what we never can attain; our utmost investigations give us only the truth as it is related to man. And it is truth for man's sake that we seek.

"It was my good fortune to be present at the farewell banquet given to Professor Tyndall by the scientific and literary men of New York, and attended also by a host of guests, comprising an unequalled array of the scientific and literary men of the United States. Aside from the relations between religion and science, which received perhaps an undue share of attention from the orators of the evening, the principal stress was laid on the great value of scientific research, as distinguished from mere invention or applications of natural laws to useful ends. It is announced that Professor Tyndall has generously devoted to the encouragement of the former the entire profits of his American lectures. Far be it from me to detract one iota from the praise which is due to the earnest, honest, and disinterested inquirers who have made the secrets of nature available for the use of man. But when so much emphasis is laid upon that kind of physical investigations which promises no immediate benefit, as if it were a higher kind; as if truth lost something of its dignity when conjoined with utility; as if it were aristocratic to deal with abstractions, like atoms and ether, but vulgar to find out things that it happens to be worth money to know; then I feel justified in vindicating the dignity of the craft of those who work for money and for man.

"For what is the significance of the statement that a discovery is 'worth money?' Merely this, that it lessens human toil, refines or enlarges the product of toil, transfers toil from the ruder muscular sphere to the sphere of mind, which is the sphere of machinery. A machine, a mechanical or a metallurgical process, is the incarnation of the spiritual power, the symbol of man's control over nature, and every new one lifts us higher in the scale of potency, making the race more and more dominant over its circumstances. The money that a discovery is worth constitutes the general estimate of the good it will do. This estimate may be erroneous, the world may be short-sighted in the measurement, but the element of utility is not therefore an unworthy one. 'Not as the servant of Mammon,' says Professor Tyndall, 'but as the supporter and enlightener of the mind of man, would I have you take science to your bosoms.' Very good; but minds supported and enlightened in that way will certainly make money, that is, they will save labor, or do more work with the same labor. The fact is that it is impossible to prevent science from being useful to mankind, unless it be locked up in the bosom of the student. This would be strictly seeking truth as truth, seeking merely for the sake of knowing; but our great philosophers would scorn such selfish isolation. To know truth that we may tell it, apply it, make it fruitful, is the key note of science; and the truth about ores and minerals, fire clay, fluxes, and blasting powders is as worthy of knowledge as the atmosphere of a fixed star."

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Contents.

(Illustrated articles are marked with an asterisk.)

THE INTELLECTUAL ENJOYMENTS OF SCIENCE.

Those who, for several years past, have been advocating the more generous introduction of scientific training into our schools and colleges, at the expense, if necessary, of giving less attention to philological studies, have, as a main argument, insisted on the greater utility of the knowledge of scientific truths as compared with the knowledge of the ancient Greek and Roman authors, so liberally imparted to our college-going youth. They have pointed out the glorious results with which science has enriched human society in the nineteenth century, and the comparative sterility of the so-called classical studies; they have pointed out the success in practical life of those men who have received a scientific education, while those whose whole training was merely philological have, in many cases, been starving for want of capacity to earn an honest living by useful practical labor, either mental or mechanical. In short, they have confined themselves to the task of praising science from a mere utilitarian point of view, forgetting that it may have higher claims, not only equal to those on which the friends of the old and time honored custom of studying the classics base their defense, but even surpassing anything which may be asserted in favor of the effect of studies of the dead languages and literature on the development of the human mind.

The higher classes of society, especially in England, consider labor, if not directly degrading, at least below their special domain. They are apt to regard that kind of knowledge which is merely useful and such as men in practical business are in need of as without interest; and in place of attempting to acquire, for instance, so much knowledge of light and electricity as to be able to understand some optical apparatus or the electric telegraph, they prefer to concentrate their attention upon the writings of Virgil or the poems of Homer. A knowledge of Latin and Greek is supposed to be about the highest enjoyment reserved fo a man of high culture, for the reason that these studies are pursued, not for a secondary, base, utilitarian purpose, but out of pure love for what is beautiful and true.

Those lovers of science who feel and know that in the study of God's handiwork, Nature, there is much more enjoyment, beauty and truth than in the study of literature, which is a mere human production, have therefore recently been raising their voices so as to persuade the most cultivated classes, if possible, that the pursuit of scientific studies is at least as much worth their notice as the pursuit of philology; that that they should not abhor a chemical laboratory, or philosophical cabinet, as dull and dry; that there are fascinations hidden in these sacred precincts of science, which have only to be tested, with the purpose of impartial investigation, in order to be appreciated. This order of defenders of science have found a powerful advocate in Professor Tyndall, who, in his recent lectures, so often insisted that the classes of people for whom he spoke "should take science to their bosoms, not as the servant of Mammon, but as the supporter and enlightener of the mind of man." And the effect of his often repeated appeals has been something marvelous; people of high standing in society, and of corresponding cultivation of mind, who have been accustomed to occupy themselves in their spare hours with reading poetry and works of fiction or, at the very best, the so called classics, have furnished their libraries with works on science, and are studying optics, the polarization of light, etc.; and some have even gone so far as to buy, in place of useless ornaments, prisms, microscopes, and polariscopes, and are delighting themselves and their friends with the revelations made by those instruments, which seem to give us additional organs of sense.

We make no objection to Professor Raymond's remarks (republished elsewhere in this number) made lately before the Institute of Mining Engineers at Boston, and again taking up the defence of scientific pursuit from the utilitarian point of view; we wish only to defend the position of Professor Tyndall, who in aristocratic England has, by his social status, during his whole life been compelled to appeal to the feelings of the higher classes in regard to that which is worthy of their attention, and who by his untiring efforts has elevated the standing of science and of the men of science, in the eyes of the rulers of society and of the whole world, to a hight never before reached.

PILE DRIVING AND THE LAWS OF IMPACT.

A subscriber propounds the following question: "A pile driver, weighing 2,500 pounds, falls through guides 25 feet high. With what force will it strike the last blow, friction not being considered?" The reply to this is that the striking force may be any amount from 2,500 pounds upward. The question, as asked, does not give sufficient data for its solution. When a heavy body falls, an amount of energy is stored up in it which is proportional both to the weight of the body and the distance fallen through. It is generally estimated in units called foot pounds. In the given case, the energy accumulated in falling, or the work done on the ram by gravity, is equal to $2,500 \times 25 = 62,500$ foot pounds. Before the ram can be stopped, an equal amount of work must be done in retarding it, since it is a well ascertained law of nature that the energy stored in a body while putting it in motion, is precisely equal to that which it gives out in resisting arrest. This amount of work, 62,500 foot pounds, can be done either by a force of one pound acting through 62,500 feet, by 62,500 pounds acting through one foot, or by any force acting through such a distance that the product of force into distance shall be equal to 62,500 foot pounds.

Before we can answer the question asked, therefore, we must know how far the pile moves while resisting the falling weight. Again, if we were told the mean resisting power of the pile, we could calculate precisely how far it would be driven by the last blow. Were the ram to strike the pile after falling $23\frac{1}{2}$ feet and to come to rest at 25 feet, the mean force exerted would be $62,500 \div 1\frac{1}{2} = 41,666\frac{2}{3}$ pounds. Were the pile driven 3 feet at the last blow, the ram still having a total fall of 25 feet, the mean pressure would be $62,500 \div 3 = 20,833\frac{1}{3}$. If the pile moved but an inch, the force developed would be $62,500 \div \frac{1}{12} = 750,000$. In actual practice the pressures would be less than those calculated, because part of the work done would be expended in crushing the head of the pile, and in overcoming the friction in the guides. Our figures are maximum values, which may be approached but never quite reached.

Knowing the distance moved by the pile under the last blow of the ram, and calculating, as we have done, the mean resistance offered by it, it is customary, with some engineers, to take one eighth the latter figure as the safe load which can be put on that individual pile without danger of its sinking. In ordinary soil this rule is sufficiently correct, but it sometimes happens that a heavy pressure, suddenly applied, will move a pile almost imperceptibly, while it will gradually sink to an indefinite distance under a very light load. In other cases, as along our docks, a pile may be set with apparently very feeble carrying power; and yet, after the mud has become well packed about it, and has been rendered somewhat compact and adherent by the superincumbent pressure, the pile will carry a heavy load. Experience and judgment only can be safely trusted in such cases. The load carried by a pile in the stiffest soil has been, in some cases, made as great as 80 tuns, but a usual load is 20 or 25 tuns.

The velocity of striking is calculated by multiplying the hight of fall by 64·3 and extracting the square root of the product. The coefficient, 64·3, has been determined by careful and a thousand times repeated experiment.

WATER AS FUEL.

"On Monday and Tuesday afternoon," says the San Francisco *Alta*, "a large number of citizens, by invitation, visited the brass foundery on Fremont street, for the purpose of witnessing some experiments with a new fuel recently invented. They were shown into that portion of the establishment occupied by the furnaces, and in one corner found a brick furnace, some eight feet long and six feet high. On the top of this was an iron tank holding about ten gallons, which was filled with crude petroleum. From this tank a pipe about an inch and a half in diameter led into the side of the furnace. A small jet of oil, not larger than a small goose-quill, was permitted to flow out of this tube; a light is placed beneath this jet, and it immediately ignites. Another pipe, about an inch in diameter, leads from a steam boiler stationed some fifteen feet away. This pipe leads a small jet of steam upon the burning oil, and the moment the steam strikes the oil the oxygen in the water is set free and ignites with a tremendous roar, generating in a very few moments a most intense white heat.

"From this small source the entire chamber of the furnace, which is some two feet by five feet, is filled with a flame so brilliant and dazzling that one cannot gaze on it for more than a moment at a time. This flame possesses all the heat of an oxyhydrogen flame, and beneath its fierce power the hardest metals melt in a few moments. The inventor of the apparatus by which the elements of heat, which nature so generously provides, can be utilized is a very modest man, saying that he did not want to bring his discovery before the public until he had fully demonstrated that it would do all he claimed for it. He says that the cost of his furnaces will be only a nominal sum that will be within the reach of every one who owns a quartz ledge, while the amount of oil consumed in twenty-four hours will not exceed ten gallons, at a cost of two dollars.

"The inventor has every confidence in his discovery, and declares his ability to furnish fuel for a voyage of one of the Panama steamers to and from Panama for the insignificant sum of $200, while the entire quantity will weigh not to exceed twenty-five tuns. He further says that, at an expense of five dollars per day, he can run furnaces that will smelt one tun of ore every thirty minutes. If only one half of what is claimed can be accomplished, the discovery will prove of incalculable advantage to the mining interests of the Pacific coast, and will create a revolution in steam travel throughout the world."

REMARKS BY THE EDITOR.—There are, in the above article, a number of points upon which we propose to make a few comments: Many attempts have been made to construct furnaces for burning petroleum, but none of them have gained enough favor to be universally adopted. There are a few establishments in the country where it is claimed that the fuel is crude petroleum, but authentic reports of the economy of the furnaces are wanting. In Paris an ingenious contrivance was invented by the well known philosophical instrument maker Wiesnegg, which, in a small way, yielded good results. The appliance for distributing the oil consists of a pipe with branches and of a grooved grate along which the oil flows after dropping from these tubes. A wrought iron cistern contains the supply of petroleum, and is connected with the distribution by an india rubber tube. The grate is placed vertically; the air, being admitted between the bars, supplies the oxygen for the combustion of the petroleum vaporized by the heat of the fire. The petroleum is supplied to the grate a little in excess of the requirements of the furnace, and the surplus drops into a receiver and is volatilized by the heat of the furnace and the vapor is consumed. No blast is necessary. A somewhat similar contrivance was suggested by Deville for use on locomotives and on steam ships. This savant was employed by the French government to conduct a series of experiments looking to the employment of petroleum as fuel. Samples from all parts of the world were tested and the heating effect was determined by the number of kilogrammes of water that could be raised from zero to one degree centigrade by one kilogramme of oil. A trial was made by Deville upon locomotive engines arranged to permit the use of liquid fuel. One of these consumed about thirteen pounds of oil for every eleven hundred yards of distance traveled; while the coal burning engines of the same class required for the same work more than twenty pounds of solid fuel. The Deville furnaces for burning petroleum have been tried in this country, but little is known about them and it is a question whether, at the present low rates for crude material, they could not be advantageously introduced for many purposes. Deville and Wiesnegg accomplished the combustion of petroleum by introducing the oxygen of the air through peculiarly constructed grates. Neither of them could have been so unphilosophical as to try steam, for they would have known that, in order to generate the steam, so much fuel would be required as to take away the entire economy of the application. One furnace would have to be built to generate the steam to carry on the combustion of the petroleum in the second furnace. We have here again the perpetual motion of combustion lurking in the minds of the careless spectator, and there is something so captivating in the thought of burning both water and petroleum as fuel that everybody is at once ready to adopt the new invention as a wonder of the age. We do not say that water cannot be burned; every scientific man knows that it can, but we assert that cannot be burned economically. In order to bring water to the condition of fuel, other fuel must be consumed. If this result is attained by means of a galvanic battery, zinc and sulphuric acid are the fuel; if by a magneto-electric machine, the machine must be driven by a steam engine. If steam is burned in a grate by coals or by petroleum, we must first use fuel to get the steam. It generally happens that the original fuel burned costs more than the fuel produced by the water, so that there is a clear loss. If the two fuels have the same value, the process is not economical, as the cost of machinery and the wear and tear of manipulation must be taken into consideration; and what would be the use of transforming one fuel into another which is no better?

This water burning business has become a nuisance that can only be abated by the dissemination of correct scientific principles. Pumping water into a reservoir by a costly engine in order that it may drive a small wheel at the bottom is fully as economical as any of the contrivances for burning water with which we are acquainted.

CHEMISTRY IN LEIPSIC.

The university of Leipsic possesses one of the finest and best equipped laboratories in Germany, with no less a person than Professor Kolbe as lecturer on chemistry. Recently a thick octavo volume of nearly 700 pages has been published, giving a detailed account of the original investigations made in that laboratory for the past six years. The results of nearly, or quite, all of this work were published to the world from time to time as each investigation was completed, but the collection of them together in book form impresses us with the magnitude of the work, and shows how much can be accomplished in a single institution. Of course, many of these investigations are the direct product of Professor Kolbe's fertile brain, and equal results cannot be expected everywhere. But some results like these, though fewer in number and of less importance, ought to be produced in a dozen of our highly endowed American institutions, where to-day the dust lies deep on long unused apparatus.

It may be objected that these investigations have neither lead to startling discovery, nor brought in much money to the investigator. But science can point out so many occasions where the pursuit of knowledge for her own sake has benefited the world at large, that this charge will not avail much among the thoughtful, and especially among intelligent capitalists and inventors. From the time when Priestley discovered oxygen or Liebig prepared chloroform, to the time when Hoffmann discovered the beautiful aniline dyes that bear his name, the most valuable and beneficial chemical inventions have sprung from the study of science for her own sake. Nature can be compared to the wary heiress, who repels each suitor who, as she thinks, is courting her for her money, and bestows her heart only on the true lover who, ignorant of her wealth, adores her for herself alone; and like the cautious heiress too, she often disguises herself as a pauper to test the devotion of her followers. On the other hand, the fortune seeker, who marries the milliner's apprentice in the expectation that she will turn out a millionaire in disguise, deserves the disappointment; and science often thus disappoints her mercenary followers.

SINGULAR CAUSE OF FIRE.

The works of the Rubber Cloth Company, at Naugatuck, Conn., were destroyed by fire several weeks ago under the following singular circumstances: The building, an old one of wood, was 100 feet or more in length. The cloth is prepared by treatment with alcohol and linseed oil, and, during the operation, is passed over wooden rollers and extended along, for fifty feet or more, into a smaller vulcanizing chamber some thirty feet in length, where it is hung in folds from the ceiling to be dried and heated. The heating is done by steam pipes. Electrical sparks had often been noticed in passing the cloth along over the rollers. On the morning in question, which was exceedingly cold, the sparks had been observed to crackle louder than usual. A snow storm was in progress at the time. The workman, who was engaged in hanging the folds of cloth in the vulcanizing chamber states that suddenly there seemed to come from his hands a sheet of electrical fire, there was an explosion, the whole place was instantly in flames, and himself and others had to run for their lives. The building and contents were soon destroyed. The theory is that the fumes of alcohol and oil formed an explosive gas in the apartment, which the electrical sparks ignited, just as gas ordinarily is fired by electricity.

New works have been put up and the rolling machines have been connected by conducting wires with the earth. We are indebted to Mr. Allerton, the manager of the company, for these particulars.

VESUVIUS.

About two thirds of the way up the side of Vesuvius, stands a small building, plainly visible from the Naples side of the bay. During cloudy and wet weather, it is shrouded in the dense veil of smoke which settles around the summit; and in times of eruption, the fiery streams seem to encompass it and flow far below its level. In this structure, thus dangerously located, Professor Palmieri, a well known Italian savant, has established an observatory and, with marvellous intrepidity, has remained at his post watching the convulsions of the volcano at times when his house stood between torrents of liquid fire, the heat from which cracked the windows and scorched the solid stone of the walls.

The knowledge obtained at so great a risk has been recently given to the world in an ably written volume, which contains *data* calculated to be of invaluable assistance in the future investigation of volcanic phenomena. Professor Palmieri considers that, to a certain extent, eruptions may be predicted, a belief which he bases upon late observations that the central crater commences the agitation, which is then followed by a series of light convulsions which terminate in the grand outbreak. This concluded, the volcano becomes again quiescent. A vivid impression of the enormous force developed during an eruption is conveyed in the fact that on April 26, 1872, the volume of smoke, ashes, lava fragments and bombs projected upwards from the crater attained the hight of no less than 4,265 feet from the edge.

It is difficult to convey an adequate idea of the appearance of Vesuvius when thus convulsed. It was our fortune to witness the eruption of 1868, which, in point of magnitude, was probably little inferior to that of last year. Pictures of the phenomenon invariably exaggerate it, as they depict a steady column of fire of a hight equal to or greater than that of the mountain. As the latter is over 3,000 feet above the sea level in altitude, the impossibility of a fiery pillar of such proportion is obvious. Red hot stones are occasionally, as we have above stated, thrown to greater hights; but such is by no means of common occurrence. By day, an unceasing flow of white smoke rises like a gigantic plume from the crater, and is visible for miles distant; while at night, the base of the column becomes radiant with a lurid glare. During the hight of an eruption, the smoke is ejected in greater quantities, and the summit of the mountain belches fountains of flame. The latter, however, are by no means continuous. The volcano will often remain quiet for hours and sometimes days, often causing it to be believed that the convulsions are over. Then all of a sudden, the smoke clouds will thicken, a rumbling becomes heard, and a great jet of fire rises for a short distance above the crater and instantly falls back. At the same time, stones and red hot *scoriæ* rise high in the air and add, by their fall, to the noise of the commotion. This goes on at varying periods, sometimes ceasing immediately and again continuing for a day or more. There is a prevalent though mistaken idea that lava, at the time of these great outbursts, pours in rapid torrents down the declivity. In times of repose, it is very seldom that the streak of light due to the red hot mass is seen on the mountain side; though when an eruption first begins, probably after night fall, a jagged lurid line will be remarked reaching below the crater. This extends as the convulsion progresses, and, after several weeks, it expands into several dull red streams reaching down a distance perhaps of two thirds of the slope. The onward movement of the lava is very slow, and of course it is totally unlike the molten rivers represented in popular prints. Its surface soon cools sufficiently to permit of being walked over, though a stick thrust a few inches down becomes quickly charred.

The danger to the villages at the base of Vesuvius does not lie so much from stones or ashes being heaped upon them, as we have recently seen it stated, but from these descending lava streams extending down far enough to reach populated portions. In regard to the mountain throwing ashes, such is often the case when the wind is high; but the quantity ejected is never enough to cause apprehension. The substance which buried Pompeii and Herculaneum, which seems to be nothing more than fine dry pumice, must have been the result of an eruption to which modern convulsions furnish no parallel. We have seen ashes carried to points several miles distant from the volcano; but, during the entire course of the eruption, the aggregate depth to which they fell could not have exceeded from one eighth to one quarter of an inch. The substance was in black friable grains somewhat resembling gunpowder, but very unlike the material which entombed the Roman cities.

Professor Palmieri has produced a very instructive work on Vesuvius. Now, we would suggest that he supplement his efforts by turning his investigations from an intermittent to a constant volcano—from Vesuvius to Stromboli. The latter, situated on an island in the Mediterranean, is in perpetual eruption, and the light from its summit serves as a well known beacon to sailors. For how long the phenomenon has existed, history does not state; but it seems to us that much valuable cosmical knowledge might be gained from the results of such continuous volcanic action.

THE GREEK NEW TESTAMENT.

The manuscript copies of the Greek New Testament, written before the art of printing was discovered in Europe, are known to differ among themselves in many small points, such as one or two letters in the spelling of a word, which frequently changes the meaning of the word. After the Testament was put in print, in the sixteenth century, different manuscripts were compared with the printed text, and the variations from it noted. The further this comparison, or collation of manuscripts, was carried, the greater was the number of variations discovered; and soon, alarm was excited for the safety and integrity of the text itself. The collation of manuscripts, however, still went on, until a mass of "various readings" was secured, numbering many thousands and constituting in textual criticism what a body of observed facts does in physical science.

About one century ago, Dr. John J. Griesbach began to apply these "various readings" to the actual correction of the text; doing it however in a cautious and sparing manner, yet going far enough to show that the text might be both preserved, and purified and established, by the proper application of scientific principles in the use of the observed facts. But the opinion continued to prevail that the genuine text was to be arrived at by the agreement of the greatest number of readings. As the modern manuscripts far outnumber the ancient ones, this was equivalent to settling the text on their authority, as though, the further you go in time from the original autographs, the nearer you must thus become in fact to the very words and letters in which those autographs were penned. Considering the liability to error in copying, the truth is indubitably in the opposite direction. The nearer we can go to the first century of the Christian era, during which all those autographs were written, other things being equal, the nearer we must get to the actual readings of the autographs themselves.

When our common English version was first put in print, in 1611, the oldest Greek manuscripts available to the translators were written as late as the tenth century. Since their day, manuscripts have been brought to light, and many of them printed, dating back to the middle of the fourth century, and from that point down to the tenth. Two eminent scholars, Dr. S. P. Tregelles, of England, and Dr. C. Tischendorf, of Germany, have also each devoted thirty years to the collection of readings from the ancient manuscripts, and the practical use of them in revising the text. In addition to the testimony of the ancient manuscripts thus secured, they have also developed other principles of criticism, and reduced them to practical rules, so definite in their application that, in most cases, the revised texts of these distinguished scholars entirely harmonize.

Thus through the medium of textual criticism, and by the patient and intelligent application of its principles during long years of toil, we now have the text of the Greek New Testament restored essentially to its original purity, and established on a firm and scientific basis.

Previous to the tenth century, the manuscripts were written in capital letters, and without a space between the words. The three most important and valuable of them are the Sinaitic, the Vatican, and the Alexandrian, many of whose various readings are given by Tischendorf in his Leipsic edition of the English New Testament. The Sinaitic manuscript, critically marked *Aleph*, written about the middle of the fourth century, was discovered by Tischendorf, February 4, 1859, in the convent of St. Catharine, on Mount Sinai, in Arabia, and published by him in facsimile in 1862, and in the common type in 1865. It contains the entire New Testament, and is deposited in the Imperial library at St. Petersburg. The Vatican manuscript, marked B, also written about the middle of the fourth century, has been published only since 1857. It is in the Vatican library at Rome. The Alexandrian manuscript, marked A, written about the middle of the fifth century, was first published in 1786. It is in the British Museum, at London. The Ephraim or Royal Paris manuscript, marked C, of the fifth century, and the Cambridge manuscript, marked D, of the sixth century, are next in value.

As specimens of various readings: In Matt. 7:14, *Aleph* and B have *OTI*, "*because* strait is the gate," putting it on the same ground as the preceding motive for "entering in at the strait gate," and *OTI*, "*because* wide is the gate," etc. But later copyists dropped the *O*, and made it read *TI*, "*How* strait is the gate." In Luke 13:24, *Aleph* and B have *ΘUPAΣ*, "door," corresponding with "the door" spoken of in verse 25. But later copyists changed three letters and made it read *ΠUΛHΣ*, "gate," as in Matt. 7:13, 14. The doxology to the Lord's prayer is not found in any of the oldest manuscripts in Matt. 6:13; just as all omit it in Luke 11:4. But in later times, the prayer, having come into general use in the church service, was closed with the doxology, and with that addition was copied into the later manuscripts of Matthew.

In 1862, and 1865, the American Bible Union, of New York city, published a first, and a second revision of the English New Testament, under the direction of Dr. T. J. Conant, following the revised Greek text, so far as it was then settled. That society is now preparing a third revision, from the completed text of Tregelles and Tischendorf, in the current English of the present day. The Canterbury diocese, of England, is also employing revisers for a similar purpose; but they propose retaining the antiquated English of the common version, except where it cannot be readily understood.

CONTAGIOUS AND INFECTIOUS DISEASES.

Dr. Symes Thompson, a well known English physician, recently lectured on the above topic in London; and from his discourse we glean the following:

It is considered a settled fact that diseases of a contagious nature are caused and spread by influences largely within the sphere of human government and control. Every form of infectious fever has its idiosyncrasy. Enteric fever and cholera tend chiefly to disseminate themselves through water, passing into the wells and fountains of daily supply, and at times traveling from house to house in the milk cans of easy conscienced diarymen. Scarlet fever hibernates in a drawer and, after long months, comes forth with some old and cast aside garment, to be thrown with it around the throat or head of some new victim, and so start thence upon a fresh career. Typhus fever crawls sluggishly from hand to hand and mouth to mouth and is immensely sociable in its spirit, languishing away when condemned to solitary confinement. Typhoid fever generates itself where filth, overcrowding and impure habits of life prevail; and relapsing fever glides in the track of privation and misery.

The means now known of controlling these evil ministrants are, in the main, careful isolation of the sick, the preservation of the water from which daily supplies are derived in uncontaminated purity, the uninterrupted ventilation alike of hospitals and dwelling houses, the immediate removal from the vicinity of active human life of all excretions of the sick and the destruction of their morbific influence by mixing them with antiseptic and disinfecting agents (such as carbolic acid, sulphuric acid, chlorides of lime and zinc, permanganate of potash, and charcoal), temperate living, avoidance of any kind of excess, and above all the cultivation of an intelligent familiarity with natural laws.

In regard to antiseptics and disinfectants, Dr. Thompson states that it should be understood that agents of the character of carbolic acid are properly antiseptics, and operate mainly by arresting the process of fermentation and decomposition, while agents of the nature of Condy's fluid (permanganate of potash), chloride of lime, and especially charcoal, are disinfectants, and act by absorbing the noxious products of decomposition. This he showed by experiment, a few drops of carbolic acid causing a cessation in the evolution of gas bubbles from a fermenting solution of sugar; and the violet color of Condy's fluid was instantly discharged when combined with water in which was a trace of sulphureted hydrogen. The lecturer also exhibited the remains of a rat which had been placed in a jar of charcoal six years ago. Only the bones and a few hairs were to be seen; and although the jar had been covered with but a piece of paper, throughout the lengthened period of decomposition, no trace of disagreeable smell was at any time emitted.

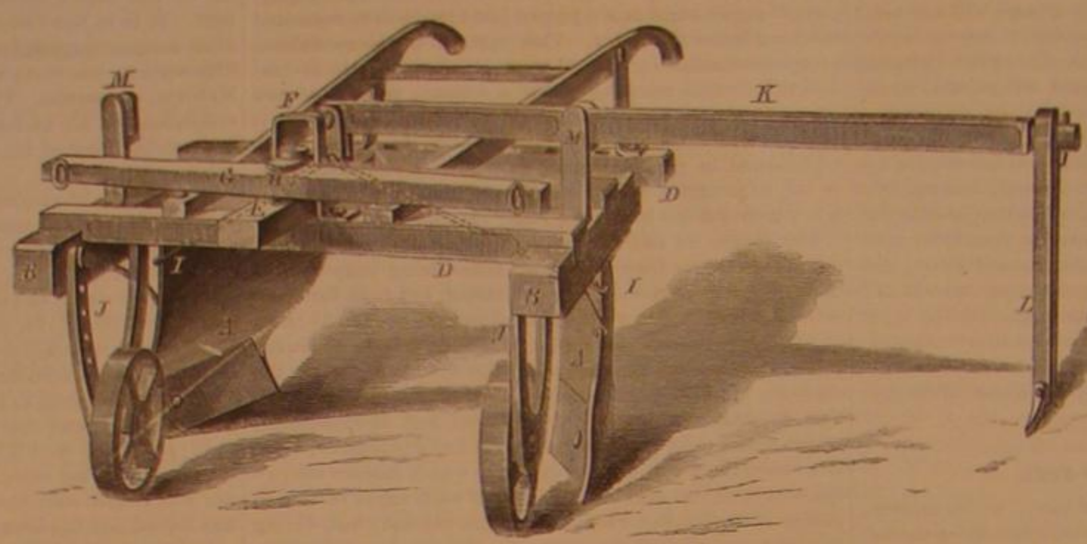
NITRIC ACID IN SPRING WATER.—The water supplied to the city of Munich, Ger., contains nitric acid and saltpeter. Professor A. Wagner states that the amount of water used by the city in one year, by the ordinary water pipes, contains saltpeter, sufficient to make 18,106 cwt. of gunpowder.

CORN PLOW AND MARKER.

The invention illustrated herewith is an improved machine for furrowing the ground for cultivating or preparatory to planting. The standard posts of the plows, A, are pivoted to the under sides of the beams, B. The latter are held in position by the cross bars, D, in which several holes may be made to receive the connecting bolts, so that the plows may be adjusted either wider apart or closer together as desired. E is the tongue which passes through the keeper, F, attached to the cross bar, D, and is loosely bolted at its inner end so as to have vertical but no lateral movement. This construction relieves the horses' necks from having to support any weight, and at the same time leaves the plows free to follow the surface of the ground. G is the double tree to the bolt of which is pivoted a double plate, H, which extends through the tongue keeper, F, and above and below the tongue. To this are secured the draft bars, I, indicated by dotted lines which communicate directly with the plows. The small gage wheels shown are pivoted to the V shaped standards, J. In the forward arms of the latter are a number of holes by means of which the position of standards and wheels may be altered so that the latter may be adjusted to cause the plows to work at any desired depth of ground. The handles are supported by a round, and also by braces on the rear cross bar. They may be inclined to allow the operator while guiding the plows to walk at the side of the row of plants being cultivated.

K is a long bar pivoted as shown to the tongue, so that it has a free vertical, but no lateral movement. At its outer end is swivelled a bar, L, at the extremity of which are hooks or prongs which drag along the ground. To the beams, B, are attached brackets, M, to receive the bar, K, and hold it always at right angles to the machine. The above arrangement, which constitutes the marker, may be turned to one side or the other, as the apparatus passes back and forth across the field.

Patented through the Scientific American Patent Agency, October 22, 1872, by Mr. George W. Meixell, of Hecktown, Northampton county, Pa., from whom further particulars may be obtained.



MEIXELL'S CORN PLOW AND MARKER.

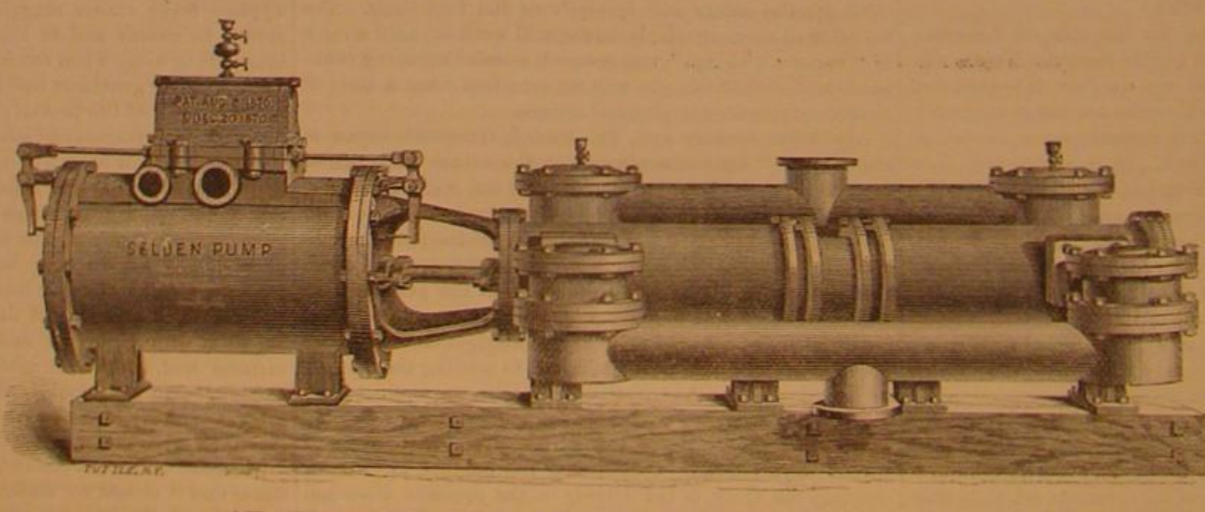
AN IMPROVED FORM OF THE SELDEN STEAM PUMP.

This machine is a recently modified form of a well known and efficient steam pump, especially applicable to the purposes of mines and water works, and arranged with particular reference to pumping water containing dirt or gritty matter.

The portions in the illustration to which attention is directed, are the device for operating the slide valve of the steam cylinder and the arrangements of the water valve chambers. It will be noticed that the valve rod emerges from both ends of the chest and at its outer extremities is connected with the short arms of levers which are pivoted to brackets on the cylinder heads. To the lower and long arms of the levers, two small rods are suitably connected, which pass into the steam cylinder. Against these the piston at either end of its stroke strikes, thus actuating the levers, and through them the slide valve. This movement is evidently positive. It is stated that the pump will not stop so long as there is steam to drive it, while there is no po[illegible] which its motion can be arrested without leaving the steam ports fully open, and thus insuring its operation as soon as steam is admitted. The advantage of this arrangement, apart from its efficiency and simplicity, also lies in the fact that the steam and water cylinders of the longest stroke pumps can be located very near together, just leaving room to pack the glands, and ensuring compactness and strength. It is claimed that the valves will discharge water of condensation without choking, and that the pump will operate with water as steadily and reverse as promptly as with steam. We are also informed that it will run under water, in case of flooding of a mine or similar casualty.

The combination of the two pump cylinders with the plunger between them, the latter connected directly with the piston rod, is generally understood and indeed plainly indicated in the illustration. The water valves are, it is claimed, made so large that, by lifting from three eighths of an inch in the smaller sizes to one and a quarter inches in the larger sizes of pump, they will give the full capacity of the suction and discharge pipe. We are assured that their action cannot be heard, even with the ear upon the chamber, when working under a test pressure equal to 350 feet. The point in the construction of the valve chambers to be noted is that the upper and lower chambers are cast in separate parts; and having the plate upon which is the valve seat between them, the whole being securely bolted together, should any accident occur to the seat plate it can be readily taken out and repaired or renewed, without loss of any other part. The valve seat is made of the best composition and attached to the plate, and may be replaced in a few minutes by removing the cover.

The water cylinder being some one and a half or two inches larger than the plunger gives the pump an advantage over the piston pump in raising gritty water, as the surfaces are not in contact, and are therefore not exposed to grinding and consequent leakage. The machine is designed to be placed directly at the bottom of the mine, so that it obviates the expense of the pipes, etc., attendant upon the use of a pump on the surface. We learn from the manufacturer, Mr. A. Carr, of No. 43 Cortlandt street, in this city, that a sample pump of this description has been forwarded to the Vienna Exposition, and also that he is in receipt of orders for the machine from Germany.



AN IMPROVED FORM OF THE SELDEN STEAM PUMP.

Slates.

A fine, sound texture is the most desirable among the properties of a slate, for, the expense of slating being very greatly increased by the boarding whereon it is placed, if the slate absorbs and retains much moisture the boarding will soon become rotten. But a good slate is very durable. Its goodness, says the *Building News*, may readily be judged by striking, as a piece of pottery is struck. A sonorous, clear, bell-like sound is a sign of excellence, but many pieces of the slate should be tried before such a conclusion is arrived at. Port Madoc slates have a sharp, clear ring, and the slates, though much thinner than Bangor, will bear throwing on the ground without fracture, while the latter often break in the mere handling. The color also is some guide, the light blue sort imbibing and retaining moisture at a far less degree than the deep black blue sort. The feel of a slate is also some indication of its goodness. A good one has a hard and rough feel, while an open and absorbent slate feels smooth and greasy. The best method, however, of testing the quality of slate is by the use of water in two ways. The first way is to set the pieces to be tried edgewise in a tub of water, the water reaching about half way up the hight of the pieces. If they draw water and become wet at the top in six or eight hours, they are spongy and bad; and as the water reaches less up them, so are the slates the better quality. The other method is to weigh the pieces of slate and note their weights. Let them then remain twelve hours in water, and then be taken out and wiped dry. Those that on re-weighing are much heavier, than they were previous to their immersion, should be rejected. Where the character of a slate quarry is not known, these experiments should always be made.

Improved machinery has of late years been invented for sawing and smoothing the slabs of slate. One is a machine for hollowing out blocks for sinks, etc., by means of cutters secured to the ends of revolving shafts. Mr. Matthew's apparatus for cutting and dressing slate consists of a frame provided with arms, cutters, toothed wheels, etc., in such a way that the cutters may be raised by a lever and let fall again with a sudden blow, and this in such a manner as to work the slate out into either plain or fancy surfaces. Besides, billiard tables, pavements, cisterns, walls, partitions and numerous other articles connected with the building and furniture trades are now, and have for some time past been, made of this substance.

New Magneto-Electric Machine.

We have had an opportunity of witnessing the trial of a magneto-electric machine, which appears to be likely to give satisfactory results, says the *Engineer*. It consists of a row of modified horseshoe electro-magnets, surmounted by another row of inverted similar electro-magnets, the poles consequently being face to face, but of course separated by a space. In the central space there revolves a drum carrying the armatures, one armature being supplied to every pair of magnets. The armatures are simply rings or hoops of soft iron, surrounded by a number of helices containing wire. The ends of the wires of each helix are brought down to the shaft of the drum, each insulated from the other, and thence the currents are collected in the usual way. Pieces of iron attached to the poles of the magnets partly embrace without touching the armatures. In the machine in question there were three armatures, one of which was sufficient to excite all the magnets by means of the induced current, as above described, and the other two were sufficient to provide a powerful current, which gave an excellent light in one of Mr. Ladd's lamps. The power required to drive the machine was about 3½ or 4 horse.

Water in Kansas City.

A correspondent of the *Evening Post* says: "There are few instances of more rapid growth in the marvelous settlement of the great West than that of Kansas city, the extreme frontier town of Missouri. In 1865 it had five thousand inhabitants. Today it has forty-two thousand. It is the central point of a spider's web of railroads running to the utmost extremities of the land. Nine railroads come together here, over which fourteen different companies run their trains. These are coming and going all the time—to the lakes, to the Ohio, to California, to the Gulf of Mexico.

"The town is exceptionally well built of brick. The streets are wide, though all up and down hill, and handsomely laid out, and are well lighted with gas. Three or four daily papers keep the town informed of what is going on.

"Among the many causes for amazement that the stranger in one of the Kansas city hotels will have, during the first twenty-four hours of his sojourn, not the least staggering will be the sight of the water with which he is expected to perform his ablutions. He takes up the ewer and pours out a fluid as black as ink. He cannot believe his eyes. It is an absurd mistake somehow, an accident, and he rings his bell. Quickly comes a negro, who assures him that this is the regulation water of the establishment, that everybody washes in it, that there is no other than it but well water, which is so hard that it is impracticable for washing altogether.

"The water has come from the clouds in the form of rain, and been collected in cisterns. Now the fuel used by the people of Kansas city is a soft bituminous coal, furnished abundantly at from $3 to $5 a tun, which fills the air with sooty flakes and coats the house tops with a black deposit. The rain water takes this up before running off into the cisterns, and holds it in solution, necessarily assuming its hue.

"Every effort has been made by intelligent and far-seeing capitalists to secure water, but in vain. Upon the assurance of a geologist of good standing that the drip of the land from the Rocky Mountains promises water at a considerable depth, the Kansas city railroad company bored for it, at a point near Kit Carson, and did not get it fourteen hundred feet below the surface. There they stopped. They have not relinquished the hope of finding water, however, elsewhere."

We wonder if some of the ingenious readers of the SCIENTIFIC AMERICAN cannot discover some plan of clearing the Missouri, which flows near Kansas city, and thus solve the water problem. If not that, they can certainly invent stove attachments for consuming smoke, so that the small supply of water enjoyed will no longer be filled with soot.

THE first public library at Athens was founded in the year 526 B. C.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

For the computations in the following notes (in which approximate places only are given), and for most of the observations, I am indebted to students. M. M.

Spots on the Sun.

A large group of spots can be seen at this date (March 15) near the center of the sun. It can probably be seen with the eye, protected as it always should be by smoked glass. The two principal spots of the group are of intense blackness. If this is the return of the cluster seen in February, it has changed its configuration.

Position of Planets for April, 1873.

Mercury.

Mercury can be seen at this date (March 15) shining beautifully bright in the evening twilight. It does not reach its greatest elongation from the sun until the 18th, when it sets at 7h. 43m.

On the 1st of April it rises at 5h. 48m. A. M., and sets at 7h. 4m. On the 30th of April it rises before the sun, being at that time on the other side of the sun, and sets at 4h. 32m. P. M.

Venus.

On April 1st Venus rises at 6h. 54m. A. M., and sets at 9h. 56m. P. M. On April 30 Venus rises at 4h. 58m. A. M., and sets at 7h. 46m. P. M.

At this time (March 15) Venus can be seen with the naked eye in the day time. When viewed through a glass, it presents the appearance of the moon as seen just before the first quarter.

Venus will not reach its greatest brilliancy until the 29th of March, and can be seen on that day with the eye, at about half past two in the afternoon, on the meridian at an elevation of 71° in this latitude.

Mars.

Mars sets at 7h. 18m. on the morning of April the 1st and rises again at 9 in the evening. On the 30th it rises at 6h. 26m. P. M., and sets about 5 in the morning.

Mars is becoming conspicuous now (March 15) in the late evenings, being known by its ruddy light. On the 1st it will be near the star α *Libræ*, but is moving westward among the stars, and will be further from it on the 30th.

Jupiter.

Jupiter rises on the 1st of April at 2 in the afternoon, and sets at 4 in the morning. On the 30th it rises a few minutes after noon and sets a few minutes after 2 in the morning.

On February 17th the 1st satellite of Jupiter was seen projected upon the planet, and also the dark shadow of the satellite. The satellite appeared like a snowy white disk upon the brilliant surface of Jupiter, while the shadow was an irregular dark spot, following the little moon it its transit.

On the 25th of February the second satellite was occulted, that is, Jupiter seemed to pass over it and hide it from us; on the 11th of March the first satellite was lost sight of in the same way. It was five minutes from the time when Jupiter's limb was seen to touch that of the little moon until the planet had completely hidden it from view.

These phenomena can be seen with a glass of moderate power.

In an occultation the little moons grow dimmer and dimmer as the great planet sweeps across them. In a transit the satellite seems to glide on to the disk.

Saturn.

On the 1st of April Saturn rises about 9m. before 3 in the morning and sets a little after noon. On the 30th it rises at 1 A. M. and sets at 10½ in the forenoon.

The apparent diameter of Saturn is increasing, but it is not well situated at present for observations.

Uranus.

On the 1st Uranus rises about 17m. after noon and sets before 3 in the morning. On the 30th it sets at 1 in the morning and rises at 10h. 25m. in the forenoon. It is among the stars of *Gemini*.

Neptune.

Neptune rises on the 1st at 6h. 26m. A. M., and sets at 7h. 26m. P. M. On the 30th it rises at 4h. 37m. A. M., and sets at 5h. 35m. P. M.

Auroras.

Auroral streamers were noticed on February 21, February 25, and March 10.

THERMOMETER AND BAROMETER.

At 7 A. M.,	February	23,	thermometer......	—12·°5
"	"	24,	"	— 5·5
"	March	2,	"	— 0·5
"	"	5,	"	—13·5
"	"	6,	"	—16

The highest barometer, March 6, 7 A. M... 30·52 inches.

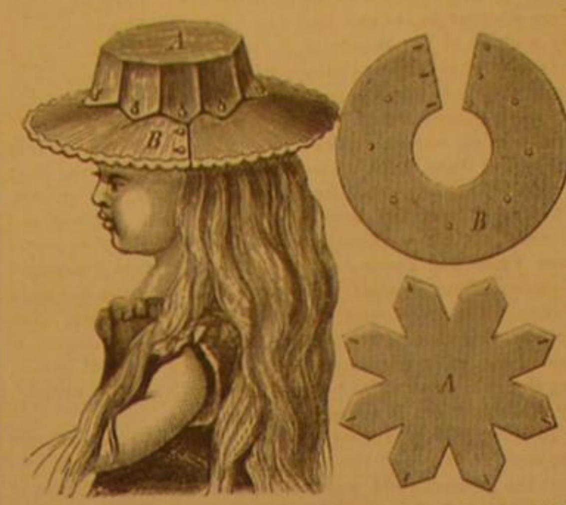
New Determination of the Velocity of Light.

M. Fizeau communicates to *Les Mondes* the results of a series of very elaborate experiments made with a view of the most accurate determination of the velocity of light. The source of the ray was a jet of oxyhydric gas, and the distance between the two stations, as found by careful triangulation, was 33827·1 feet, with a probable error of 0·001.

Six hundred and fifty satisfactory observations were made, the mean of which, multiplied by the index of refraction. 1·0003, gives 185,368 miles per second as the velocity of light to an approximation of 0·003. This result agrees with that determined previously by Foucault, and also confirms the value of the parallax of the sun (8″ 86) obtained by Leverrier. M. Fizeau considers that, with stations separated a distance of 12 miles, the velocity of light could be determined to an approximation of 0·001.

CHILD'S HAT.

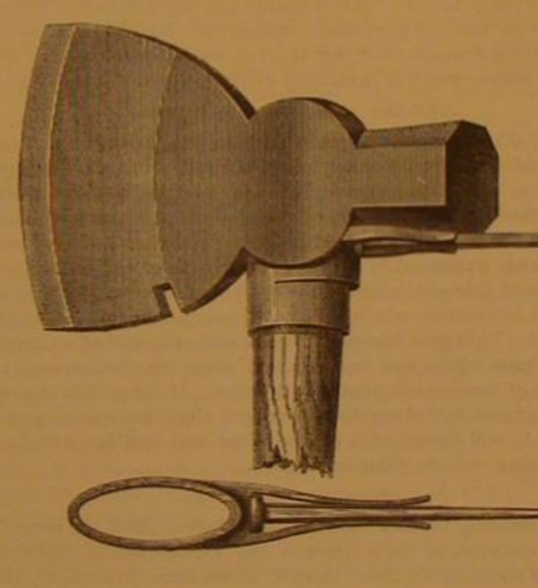
Mr. S. B. Pratt, of Boston, Mass., is the inventor of the novel form of child's hat represented herewith. The crown, A, is made of a single piece, somewhat in the shape of a star, and provided with a number of button holes by which it is attached to buttons on the rim. The latter is simply a circular piece, cut as shown at B in order to give it the necessary conical form. The arrangement of these two parts of



the hat when put together is seen on the head of the child in the engraving, and needs no explanation. When soiled, it is only necessary to unbutton the crown from the rim and wash the fabric in the ordinary manner.

NAIL DRIVING HATCHET.

Every one who has ever experienced the peculiar misery of fingers pounded while vainly endeavoring to hold a nail in an awkward position with one hand, while driving it in by means of a hatchet or hammer in the other, will welcome this invention with delight. All others, who have not undergone such affliction, will require but one trial to cause them to institute anxious inquiries for just such a device as we now illustrate.



It is nothing more than an ordinary hatchet, to the collar of which are secured two springs, the bases of which are at such a distance apart as to hold the head of a nail between them, while the outer ends grasp the body. A single blow starts the nail into the wood, when the hatchet is detached and the driving home proceeds in the ordinary manner, everything being done with one hand. To Mr. S. Daugherty, of Belle Vernon, Pa., is due the credit of this invention, which was patented, through the Scientific American Patent Agency, September 10, 1872.

WASHING MACHINE.

Mr. Samuel Berry, of New York city, has recently patented the ingenious laundry convenience shown in our engraving.

The device consists in a tub or box, the bottom of which is made corrugated. A circular brush fits loosely within the tub, and is movable by the lever handle represented. A close fitting cover, held down by a bar and loops, covers the receptacle. The clothes are thoroughly washed by placing them between the brush and corrugated bottom, and rotating the former.

Economic Value of Science.

It is noticeable that scientific subjects have received more attention from the newspaper press of late than formerly. This is partly owing to the efforts of scientists towards popularizing their respective specialties, as exemplified in the recent course of lectures in this country by Professor Tyndall. But there is another and more potent reason for it. In the scramble for wealth or the conveniencies of life, the utility of knowledge is esteemed more than its speculative quality of abstract truth. It is becoming more generally known that discoveries, that seemed at first to be without any application to the wants of mankind, have at length, through the higher development of commerce by means of them, contributed to the general good. Experiments in magnetism and electricity, which led to the invention of the electric telegraph, were made from curiosity only. The modern chemist takes little note of the monetary value of his discoveries; but the practical man presently finds their application to some use that has its equivalent in dollars and cents. None could have anticipated the use of spectrum analysis to the arts, and yet it is found invaluable in the manufacture of steel.

Many other instances may be noted to illustrate the proposition that every addition that may be made to physical science is capable of an economic use, and that the practical value of all the knowledge we now have may appear with further discovery.

For such reasons, science is likely to receive increased attention from the practical, money-making world; but a real love of knowledge for its own sake is the characteristic of few, and we must not expect that a very large portion of mankind will pursue the truth merely for the purpose of knowing it.—*The Typographic.*

An Atlantic Cable Broken.

After nearly two years of uninterrupted operation of both the Atlantic cables of the Anglo-American Telegraph Company, the 1865 cable failed at twenty minutes past twelve o'clock P. M., on March 11. The tests at Heart's Content show that the fault this time is on the other side, probably not far from the Irish coast. The eminent English electrician, Mr. Willoughby Smith, left London on the evening of March 11 for Valentia, to verify the tests made on this side and definitely locate the fault.

The 1866 cable and the French Atlantic cable are both in excellent condition, and will be able to satisfactorily and promptly transmit all the business offering. Probably the only unfavorable result of the interruption will be the expense to the company of picking up and repairing the cable, and this they can well afford to do, being in a very prosperous condition. The new cable which is to be laid this season by the French Atlantic company is rapidly approaching completion, and within a few weeks New York will be in direct cable communication with Great Britain.

The project of laying a competing cable, by the Great Western Telegraph Company, has been abandoned.—*The Telegrapher.*

Small Fast Steamers.

Messrs J. I. Thorneycroft & Co., of Chiswick, Eng., near London, have built a number of vessels of this class, one of which, the Firefly, on a recent trial made the excellent speed of 18 miles per hour. Her dimensions are as follows: Length over all, 53 feet, breadth, 6 feet 6 inches, draught of water, 2 feet 6 inches. Inverted direct acting engines, two cylinders 6 inches diameter, 8 inch stroke. After the trial this boat was coaled and lifted on board a steamer and shipped to Ghent, Belgium, where on arrival she was lowered again into the water, fire lighted, and she steamed off to her destination near Ghent.

The same builders have lately tried another small craft of about same size, with similar results.

The Effect of Flat Wheels on Railroad Track.

A correspondent of the *Railroad Gazette* considers that the surface or tread of car wheels should be tested by the use of a hammer, and when blisters are found the wheels should be rejected because the blistered spot soon becomes flat and not only damages the rail but shakes the whole car so as soon to do as much damage to the car as the price of a good wheel. It is believed that these flat wheels making 200 revolutions per minute, with the flat spots making steam-hammer blows on the track at each revolution, are a frequent cause of broken rails.

A SINGULAR occurrence, illustrating the force of the wind and the mechanical effects of pneumatic power, recently took place at Kaighn's Point, N. J. While twenty-five men were at work upon a vessel in the great ship house of Wood, Dialogue, and Co., the wind suddenly lifted up the building and carried it away without injuring any of the men or the vessel. The building was 250 feet long, 80 feet wide and 80 feet high. Loss, $15,000.

APACHE TELEGRAPH.—The Apaches have a very simple and yet effective system of telegraphy, which has unquestionably been in vogue from time immemorial. Lookouts are stationed on every prominent peak, within the range of one another's vision, commanding a complete view of the entire country. No human being can enter the region under surveillance unnoticed. Anything happening necessary to communicate to his fellow watchmen, the lookout at once ignites a pitch pine brand, which he moves in a manner intelligible to his confederate on the adjacent eminence, each movement having a significance familiar to them. This is repeated with lightning rapidity from mountain top to mountain top, until it reaches the chief in his fastness. Instructions are conveyed to his scouts in a like manner.

THE INCREASING WEALTH OF THE WORLD.

We are at present in such a stage of the development of the industry of all civilized nations that the increase in producing capacity far outstrips increase of population, so that the amount produced and consumed on an average by every person far exceeds in quantity and value that which was ever before known. It should not be lost sight of that only food, drink, fuel, and clothing are entirely consumed, but that all the other products of industry are utilized for building and manufacturing, by which operations nothing in reality disappears; but, on the contrary, the value of the manufactured material is increased. Thus the stone and timber are transformed into dwellings and furniture, the iron into railroads, engines, and steamships, and the products of metallurgy into all kinds of tools and machinery, all much more valuable than the material used to produce them; so that in their case the value of property is raised by two steps, first by the production of the raw material, second, by the use of this in making the objects desired. Even the fuel consumed under the steam boiler of a manufactory gives more than its equivalent in the products of the manufacture; and who will deny that the value of the development of human society is not worth a great deal more than the value of the food and other necessaries consumed by the human race? Therefore, strictly speaking, even in this case nothing can be considered lost, but humanity in general is the constant gainer. So the workman who earns his wages gives the products of his labor back to his employers, a value surpassing that of his earnings if this was not so, he would not have been employed; and thus the workman has, besides earning a living for himself and his household, contributed his share to the increase of the wealth of the world. Even the Chinaman who, after several years of toil here, returns to his native home, carrying some of his earnings with him, if looked at from this point of view, leaves behind him in the results of his labors a greater value than all that he can possibly carry off; he has thus been a benefit to us, and has the full right to go where he pleases.

If we look at the statistics of the increase of productive capacity in various branches among different nations, we are especially struck at the development that has taken place during the last decade. Let us, for instance, take the single article of iron. In the United States, in 1860 it was confined to half a million tuns, while in 1870 it was increased to over two million tuns, employing 150,000 workmen; while 850,000 men are employed to work this iron into all kinds of machines, etc., making one million men employed by the iron industry alone. The value of the raw material is estimated at $200,000,000, increasing by further labor to $1,000,000,000. The production of steel manufacture in Germany is still more startling; in 1860 only 250 tuns of manufactured steel, worth three millions of dollars, was produced by 4,000 workmen, while in 1870, 2,000 tuns, worth twenty millions of dollars, was the result of the labor of 14,000 workmen.

Let us take a totally different branch, cheese; in 1853 one million pounds of cheese were exported from here to England, and in 1870 seven million pounds. The State of New York alone has now nearly 1,000 cheese manufactories, which use the milk of more than 250,000 cows, making therefrom 80,000,000 pounds of cheese, which is 1,000 pounds of cheese for every three cows. The cheese production of the whole United States is now over 100,000,000 pounds, of which 60,000,000 are exported. England exports scarcely 3,000,000 pounds, while little Holland, which used to be the principal cheese producing country of the world, exports at present 25,000,000 pounds. This latter fact suggests the extent which the cheese production of the United States may reach in the course of years, and the wealth which its exportation will bring back, as the Hollanders used to boast that their cheese production alone was more valuable and reliable than a gold mine, very few of which surpassed the Dutch cheese in the profits realized.

We could easily fill many pages with other illustrations of the immense increase of the production which, as it continually far outstrips the increase in population, cannot fail to increase the sum total of valuable property. This view of productive capacity and its results is the best argument against that conservative class of people who sometimes raise their voices against useful inventions and new patents, under pretext that such improvements often take the bread out of the mouth of the workmen, who are unable to compete with hand labor against machine labor. Experience has proved that all such fears are totally groundless, and in every case have the machines which increased production been a blessing in the end, giving more labor and higher wages to those using them than they could obtain by their unimproved methods and much smaller productive capacities. So since the art of printing has superseded manual copying, there are probably a thousand printers for every manuscript writers of the olden times; when at a recent period the sewing machine superseded a great many of the most tedious duties of the seamstress, the prophecy that its use would impoverish a large class of women who made their living by sewing was not fulfilled. On the contrary, the sewing machine has been a benefit all round; and so it must be with every invention which enlarges the total amount of the valuable products of labor, and therefore contributes its share to the increase of the world's wealth.

Commissioners to Vienna.

There are a sufficient number of Commissioners to the Vienna exhibition appointed by the President to make a respectable show here if they would remain at home. Some eighty have been appointed and confirmed by the Senate, and we are informed that the end is not yet.

SCIENTIFIC AND PRACTICAL INFORMATION.

GOLD IN LAPLAND.

Traces of gold had been discovered years ago in different parts of Lapland, but not until a certain Ewast, formerly a California miner, with some companions explored the country was much attention given to it. They found in a short time gold to the value of more than $190. A large number of adventurers rushed to the gold districts, many of whom were without means and had had no experience in mining. By a ukase of the Senate of Finland, dated April, 1870, it was decreed that the privilege of obtaining gold should be granted only to applicants who had sufficient capital for the effective prosecution of the work. Several companies were then formed, and about 19 of them were registered towards the end of June, 1870. They began near Ivalo, on the river Tanna, where large buildings for the workmen were erected. This river forms the boundary line between Lapland and Norway, and the working was soon extended along its shores near Vasko and Tanna-Juk, also along the rivers Kenna and Kytnien. The greatest yield was obtained from the river Tanna. The gold found showed traces of platinum. The gold-bearing sand of the river showed great resemblance to that of the river Sacramento, Cal. The method of obtaining the gold was similar to that used in California, namely, by washing it out in a wooden trough.

In July, 1870, a Norwegian captain named Daal explored the western shore of the river Tanna and the result was that the greatest yield was discovered at the confluence of the Ivalo and Tanna. The Norwegian government then granted to the Russian companies the privilege of extending their works to their side of the river. In the middle part of September, every vestige of vegetation disappeared, owing to the approach of winter, and compelled the abandonment of the work till the following spring. In the seven weeks from July 21 to September 9, 124,141 cubic feet of gold-containing sand were washed, yielding 615 ozs. of the precious metal.

INK PLANT.

The botanists of Europe are endeavoring to acclimatize a plant growing in New Granada, which is valuble for the manufacture of ink. The juice, called "Chanhi," is reddish, but changes after a few hours into a deep black, and is then ready for use. The "Chanhi" has less destructive influence on the steel pens than common ink. Experiments made in Spain demonstrated that the ink was not even spoiled by sea water, which is invariably deleterious to ordinary ink.

TESTING GOLD USED IN GILDING.

P. Guyot proposes for this purpose the use of a solution of chloride of gold or a solution of nitrate of silver. Neither affects at all the genuine gilding, but imitations, when touched with the former solution, show a brown spot, and with the latter, a gray spot. The gilt designs of wall papers are examined by Guyot with chloride of sulphur. One drop of this salt, placed on imitation gold paper, produces a dark brown rim, which does not appear when gold has been used. Thin gold leaves, if placed with chloride of sulphur in closed bottles and well shaken, show no change, but alloys of base metals gradually blacken. If the gold is placed in hermetically closed bottles under a slight aerostatic pressure, it will disappear in a short time and combine with the chlorine to form chloride of gold.

CONSUMPTION OF TIN.

According to the *Polytechnisches Central Blatt* the annual consumption of tin in America and Europe was in 1868 and 1869 about 22,000 tuns; in 1870, 24,000 tuns; in 1871, 27,000 tuns. Should the consumption increase in the same ratio, possibly the production will not be equal to the demand, as during the last year only about 27,593 tuns were produced, as follows: Of English tin, 10,500 tuns; of Banca tin, 90,000 tuns; of Straits tin, 9,500 tuns; of Billiton tin, 2,700 tuns; total, 27,593 tuns.

CINCHONA TREES IN INDIA.

In the plantations of the English government on the Neilgherry hills, there are about 2,600,000 cinchona trees, which cover over 950 acres of land. The largest trees are 30 feet high with a circumference of three feet. The quantity of 7,295 pounds of splendid bark was sold last year in London at the price of from 50 to 60 cents per pound. There were also furnished about 35,000 pounds to the Indian depots, so that the proceeds amount to about $8,000. The capital invested by the government for the introduction of this important tree will soon have been repaid with interest. Hundreds of natives have been cured of fever annually with the quinine obtained, and the object of the beneficent intention of bringing the antidote of fever within reach of the poorest has been fully realized.

TO PRESERVE CHEMICALS.

Earthen vessels are now constructed with a groove near the top. The groove is filled with castor oil, with which the cover is brought in contact in closing. The connection with the outer air is thereby totally interrupted. Chloride of lime, for instance, was preserved in this manner for two years, without deteriorating in the least by the absorption of moisture.

SOLIDIFICATION OF NITROUS OXIDE.

Mr. T. Wells exhibited, at a recent meeting of the Chemical Society in London, the formation of solid nitrous oxide in large quantities. Liquid nitrous oxide quickly solidifies if a current of air be passed through it. Unlike carbonic acid, the liquefied gas can readily be preserved for some length of time in an open vessel, provided it be kept still. Liquid carbonic acid becomes solid immediately it is allowed to escape from the vessel containing it, since the vapor tension of the carbonic snow at the time of its formation is much above the atmospheric pressure: whilst liquid nitrous oxide boils at 1·92 Cent. and solidifies at 1·99°, so that the vapor tension of the solid is less than one atmosphere. The density of the liquid at 0° is ·9004, and, like liquid carbonic acid, it is very expansible and immiscible in water.

ADULTERATION OF RHUBARB AND YELLOW MUSTARD.

When rhubarb or mustard is adulterated with turmeric root, the adulteration is easily detected by shaking it for 1 or 2 minutes with absolute alcohol, filtering and then adding, first a concentrated solution of borax and then some hydrochloric acid. If the solution turns brown on adding the borax and retains its brown color on the addition of the acid, it indicates the presence of turmeric. This is a simple case of reversing the usual turmeric test for borax, and making the borax the reagent which detects the turmeric. It seems strange enough that until recently this had not been thought of.

IODINE IN SUBSTANCES CONTAINING TANNIN.

It is a well known fact that iodine, when dissolved in liquids containing tannin, cannot be detected by the ordinary starch test. Tessier has found, however, that on adding to such a solution a few drops of a neutral solution of chloride of iron, the iodine is at once set free, and can be detected by covering the test glass with a watch glass or an inverted funnel, coated on the inside with a starch paste.

UTILIZATION OF SOAPSTONE CLIPPINGS FOR BUTTONS, ETC.

The powder or other filings of soapstone (steatite) obtained in the manufacture of gas burners is saturated with soluble glass, dried, and ground. In a suitable press, buttons and similar articles are pressed from this powder, burned in retorts, dipped again in solution of glass and once more burned. They are then placed in a rotating cask, polished by water, dried and again polished by rotation in a similar cask with soapstone powder. Dominoes and dice are pressed in similar manner in dies of brass or steel, and then polished.

Hygiene.

A new fortnightly journal of sanitary science, bearing the above title, comes before the public in an attractive form from the press of G. P. Putnam's Sons, New York city. $2 per annum. From the last issue we extract the following:

Regimen for Spring.—The amount of work done in the human body during the winter, in the mere maintenance of our normal 100° of heat, would of itself be sufficient to overload the system with tissue waste by the return of spring. But when to this is added the special nerve waste caused by the wear and tear of the brain and nervous system, in the whirl of excitement and mental activity of a city winter, there should be no wonder that March is accredited with bringing "humors" and giving rise to "pains." Increased production and reduced excretion of waste, or refuse matter, of the ashes of the human furnace, are the real causes, and not any occult influence of the season. Knowing this we are the better able to understand why roots and salads, "green food" and little meat, are now craved by the natural appetite; and to recognize the wise hygienic principle in the observance of Lent, with its meager diet and abstinence from worldly gayity and excitement. What we need, physically, in this milder weather, is to "train down;" to favor the "moulting of the tissues," as Chambers says; and, mentally, to get rid of brain fag and worry—for only by rest can the nervous system be restored.

Abundance of exercise, free bathing, spare diet, should be the rules for the coming month or two. To use the furnace illustration again, the amount and quality of fuel should be reduced, and the flues and pipes be cleansed. Exercise and bathing, by favoring excretion and elimination, will do the latter, and rid the system of much perilous stuff accumulated during the suspension of out door exercise. As to the fuel, fish, with its food for the brain and nerves, but scanter supply for adipose and muscle, should enter largely into the spring dietary. Fruits also, of which, thanks to modern methods, there is abundant supply even now, and vegetables, too, favor the "wasting" process. The class of agents of which we wrote in our last—tea, coffee, tobacco and alcohol—which retard tissue change should be used either more sparingly or not at all; and thus the usual "bilious" and other complications of spring may be largely avoided.

A Voice from Colorado.

Messrs. Munn & Co.,

Gentlemen:—I hereby acknowledge the receipt of the Scientific American for all of the members forming the club which I sent you, also of two copies of the Science Record, and of one copy of your splendid steel engraving, which came in good shape. All of the subscribers express entire satisfaction, and many much regret not having taken your paper years ago. Everybody should have it; lawyers, doctors, ministers, farmers, mechanics, all classes should have it, as it contains the most authenticated, useful and interesting matter published. Accept my best wishes.

Yours truly, John H. Price.

All new subscriptions to the Scientific American will be commenced with the number issued in the week the names are received at this office, unless back numbers are ordered. All the numbers back to January 1st may be had, and subscriptions entered from that date if desired.

The winter in the vicinity of the White Mountains was very severe. Snow to the depth of twelve feet fell, while the thermometer indicated forty degrees below zero on several occasions.

Stupidities.

Under this head, Dr. Hall, in his *Journal of Health* for March, 1873, humorously discourses on the tendency of the times, as follows:

It is really a great wonder that everybody is not dead and buried, and the world itself used up entirely, if the thousandth part of what is told us about microscopical and other "discoveries," so called, is true. One man will have it that the glorious Union over which the stripes and stars float so proudly will soon become depopulated, because respectable people don't have children; another has discovered myriads of bugs in the chatelaines and waterfalls of the ladies, boring into their skulls and sucking out all the remaining brains of the dear delightfuls. A German *savan* now tells us that every sip of tea we take is full of oily globules which get into the lungs direct, weaken them, set up a cough, and the person dies of consumption. Another man has found that the purest spring water, clear as crystal to all appearance, if let alone will deposit a sediment which generates typhoid fever; hence he proposes that everybody shall quit drinking water. Another says that bread has so much lime in it that it is turning us all to bone, and makes us stiff in the joints, that being the reason we have no lithe, sprightly old men now-a-days; hence we are full of limps and rheumatics long before our time, therefore we had better quit eating bread altogether, and live on rice and sago and tapioca. The water cure folk assure us that pork and beans and ham and eggs are full of abominable *trichinæ*, and that, if one is swallowed and gets fairly nestled into the system, he, she or it will breed a million more in a short time, and that roast beef has juvenile tape worms in it. And here come Tom, Dick, and Harry, all in a row, loaded down with microscopes and spy glasses which show as plain as day that the air is swarming with living monsters and putrid poisons, which fly into the mouth and crawl up the nose and creep into the ear; hence it is death to breath such pestilential air, and that the best way is to keep the mouth shut, plug up the nose, and ram cotton into the ears.

Ever so many learned professional gentlemen have been torturing poor figures for years to make them tell the stupendous fib that everybody is either crazy or soon will be; that the annual increase is ten per cent, consequently in eleven years everybody will be crazy, and more too.

The fact is that the people who spend their time in hatching out these tomfooleries, ought to be put to work and be made to earn an honest living. This world has been pretty well taken care of for some thousands of years, increasing in comfort and wealth and life, the average length of which last has doubled within two centuries, and the population increased perhaps three fold; and the presumption is that the Great Maker of all will so arrange all the antagonistic forces of life for the future as eventually to make "the wilderness and solitary place to be glad, and the desert to rejoice and blossom as the rose," and the race be happy still.

Rolling Mill Notes.

It is estimated that one tenth of the entire population of the United States is dependent for support upon the production and manufacture of iron. The value of the metal annually manufactured is $900,000,000, and 940,000 workmen are employed in the industry, the aggregate of whose wages reaches $600,000,000. There has been a vast increase of furnace capacity and additional machinery put in by our rolling mills during the past eight or ten months, and there is every prospect of still further growth.

We are indebted to a pamphlet lately issued by Messrs. Lewis and Rossiter, of Pittsburgh, Pa., for the following interesting information in reference to iron and rolling mills: Regarding material, English and American irons differ from each other in certain general characteristics. American is softer than English. As respects resistance to tensile strain, it is more ductile and tougher; while yielding more readily to immediate force, it will stand a greater ultimate strain; it also undergoes vibration without crystalizing better than does English iron. The latter, being harder, stands a greater immediate tensile strain but yields to a less ultimate force. The same general difference exists as regards compressive strain.

If a bar of iron is measured and found to be exactly one foot long when cold, after it is heated to a darkish yellow it will have expanded from one eighth to one quarter of an inch in its length, varying with the degree of heat used and the quality of the bar. It follows, then, that in order to turn rolls which shall produce a definite section of iron, the last groove should be made somewhat larger than the section desired. It requires considerable experience and practice to place the exact amount of contraction in bars of complicated sections. The most accurate way of measuring the contraction is by means of a double ended calliper, having one side longer than the other. A very convenient size for use is when one side measures 4¼ inches and the other 4⅜ inches from center to tips. For finishing work in roll turning the best of steel should be used; but in turning up and roughing out hard iron, cast iron cutters chilled on the surface may be employed to advantage. It is also advisable to use water in turning up hard iron or soft iron with fast speeds.

Fire, under rolling mills that have been built on made ground, has been the occasion of much trouble. Some of the mill owners, to prevent a recurrence of damage, have caused to be laid, beneath new furnaces, brick paving some two or three feet in depth and wider than the base of the furnace usually requires. Others, when making ground, have mixed common earth with the cinders that are thrown from the mill. Lately a fire under a Pittsburgh establishment burned over one year and was then only extinguished by an unusually high flood in the river. When laying foundations for machinery on ground made from rolling mill refuse, the pits should be dug low enough to reach solid ground, and then only the floor will sink in event of a fire.

An ingenious way of getting speeds for a roll train has recently been put in practice. The train has two sets of pinions and two sets of housings which, of course, are in the usual position between the roughing rolls and the crab. The pinions nearest the crab are different in diameter, the top one being the smallest. Between these two sets of pinions, but one spindle is employed, and by using this spindle on the top pinions, the fastest speed is gained. By using it on the larger middle pinion, the train is made to run slower; and by dropping to the lower and largest pinion, the slowest required speed is obtained. Between the first set of pinions and the crab is the usual breaking spindle, always coupled to the middle pinion; and between the second set of pinions and the roughing rolls are the three spindles: these are never changed. The idea was put in use with an eight inch guide train that could not otherwise well be altered from the original mode of driving. The plan is capable of further application.

A rail mill pinion has been in use for the last twelve months with two false teeth which were put in as follows: A dovetail groove was cut about one inch below the roots of the teeth and a cast iron piece having two teeth was nicely fitted in. This piece is firmly held in position by two wrought iron bands shrunk on each end near the teeth. A straightening plate, after getting hollow on its surface through use, has been straightened by hammering on its concave sides. A good steel punch is capable of piercing through a thickness of iron equal to the diameter of the punch.

A correspondent, referring to the rolling mills of Belgium, says that they are but poorly managed. The largest establishment is the John Cockerill works at Seraing on the river Meuse. The buildings cover one hundred acres and twelve thousand hands are employed. Locomotives and marine engines of the most powerful form are constructed. The company has its own coal mines and blast furnaces.

High Pressure Steam.

The compound cylinders are supposed to be so adjusted, says Professor Osborn Reynolds, that the work done in each cylinder equals half the whole work, that is, the expansion in the first cylinder equals the expansion in the second. This rule will not be quite accurate, but nearly; I do not know that there is any rule in practice. The difference in cylinder room, it must be noticed, is very much in favor of high pressures, as it diminishes in each case as the pressure increases. Thus the area of piston required at 300 lbs. is only half that required at 20 lbs. pressure in a condensing engine. And it is to be noticed that in the compound engines the necessary increase is much smaller for high pressures than for low pressures. At 20 lbs. the high pressure cylinder has half the area of the low pressure cylinder, whilst at 300 lbs. it has only about one twelfth.

Now as regards the strength of the engine. This is the great objection to the use of high rates of expansion. The machinery of an engine to work at 300 lbs. must, only to do the same work, be seven times as strong as that which works at 20 lbs. Here, then, is a fatal objection against the use of steam at high pressures, unless it can be met in some way. This is where the advantage of compound engines comes in: while the pressure in the one increases from 76 to 438, the other increases from 63 to 112. Thus by the use of compound engines the pressure on the pistons can be kept quite within reason.

To sum up then: By the use of steam at 100 lb. we may do with little more than half the coal required for a pressure of 14 lbs. with only three quarters the cylinder room, and shall only increase the greatest pressure on the piston by about 10 per cent. With 300 lbs. we do with 20 per cent less coal than at 100 lbs. with two thirds the cylinder room, and we must increase the strength of the machinery by 40 per cent.

I think, then, that we must look for economy by increasing the ratio of expansion and the use of high pressure steam so far, and only so far, as is necessary for the expansion for engines in which the release takes place at or below the pressure of the atmosphere. There will be advantage in pressures at least up to 120 or 130 lbs. Beyond this it must be a question for experience to decide how high we shall go.

In such engines as use a blast we shall find that there is great economy in using very high pressures of steam, provided the rate of expansion is increased. Thus, in a locomotive in which the blast was fixed at 30 lbs. it would be much more economical to use steam at 200 lbs. and expand four times, than at 100 lbs. and expand twice, and the blast would be much the same.

A New Mode of Treating Dyspepsia.

The Archives of Scientific and Practical Medicine, a new monthly edited by Dr. Brown Séquard and published by the Lippincotts, contains, among other very interesting articles, one in which the editor describes a novel mode of treatment which he first tried with perfect success in a very bad case of dyspepsia in 1851, and which has since been tested, with more or less satisfactory results, in many cases of dyspepsia, chlorosis, and anæmia. The following is an extract from the account of the first case:

"After a few days, finding that he had not improved, I decided to try a radical change of his alimentation, as regards the quantity of food to be taken at a time. Instead of three meals a day, I made him take sixty or more. Every twelve or fifteen minutes he took two or three mouthfuls of solid food, chiefly meat and bread. He drank a little less than a wineglass of Bordeaux wine and water every thirty or forty minutes. On the very first day this mode of alimentation was begun his digestive troubles disappeared, and within a week he was so well that he returned to Paris. * * * He continued the same mode of alimentation for almost three weeks, and then gradually diminished the number of his homœpathic meals, and increased the amount taken at each of them, until in about eight or ten days he came to eat only three times a day, and a full meal at each time."

The following paragraphs will serve to give the reader a clearer idea of the treatment commended:

"The plan consists in giving but very little of solid or fluid food or any kind of drink at a time, and giving these things at regular intervals of from ten to twenty or thirty minutes. All sorts of food may be taken in that way, but during the short period when such a trial is made, it is obvious that the fancies of the patients are to be laid aside, and that nourishing food, such as roasted or broiled meat, and especially beef, mutton, eggs, well baked bread, and milk, with butter and cheese, and a very moderate quantity of vegetables and fruit ought to constitute the dietary of the patients we try to relieve. This plan should be pursued two or three weeks, after which the patient should gradually return to the ordinary system of eating three times a day.

The most varied diet as regards the kind of food can be followed under this plan as well as when one has only two or three meals a day. The only absolutely essential points are that the amount of food taken every 10, 15, 20, or 30 minutes be very small (from one to four mouthfuls), and that the quantity of solid food in a day be from 32 to 40 ounces, or a little less when, instead of water, the patient drinks beef tea or milk."

Japanese Boys in the Boston Schools.

Mr. Charles L. Flint, chairman of the committee of the Rice school district in Boston, in presenting his quarterly report to the School Board, made the following interesting statement respecting the education in that school of a number of boys from Japan:

"At the beginning of the present school year, September 2, 1872, four boys from Japan, Kentaro Kaneko, fifteen years, Zeikichi Tanaka, fourteen years, Takuma Dan, thirteen years, and Chokicni Kikkawa, twelve years of age, entered the Rice school. They had then been in the country only six months and under the instruction of a private teacher. They were found to be able to enter upon the studies of the fifth class according to the present course. Kaneko today ranks at the head of the second or sub-masters' class; Tanaka and Dan nearly at the head of the third or ushers' class; while Kikkawa is among the first of the fourth class. Their conduct has been entirely unexceptionable, and their example in each class has aided the teachers and stimulated their classmates to greater exertion. Their gentle and gentlemanly manner has made them friends throughout the school, no boys being more popular with their classmates than they. When they entered the school it was with great difficulty that they could be understood. Now they speak and read quite plainly, and write in better English than a majority of even first class boys! A composition of several pages recently written by Kaneko required scarcely a single correction, either in grammar or spelling. It would be a most excellent thing for the whole school if there could be a dozen such boys in every class. They are very thorough in everything, and rarely require to be told anything twice."

A Singular Fish.

The *Rochester Union* describes a curious fish caught three months ago, in Chautauqua Lake, the third of the same sort captured in the Lake within the past forty years:

The fish is about six feet in length, and when caught weighed one hundred and thirty-four pounds. There are one back and three belly fins. But the head is what is most wonderful and peculiar about the fish. The mouth opens far back and wide enough to receive a nail cask. There is a large falling lip or jaw that sets back and upward as the mouth opens. The inside of the mouth is covered with a species of coarse hair somewhat resembling the small feathers or down of an ostrich. Projecting for almost fourteen inches from the upper jaw is a sort of shovel blade made of a hard substance. This instrument would seem to be intended for throwing food into its mouth rather than for attacking other objects or defending itself against assault. As this fish has no teeth, it is supposed that it subsists upon animalculæ or other substances, floating in the water, which are drawn or forced into its mouth by the blade attached to its jaw.

Economy of Fuel.

A correspondent in *The British Workman* tells how to build a fire as follows: The person laying a fire should fill the grate up to the top bar with coals, putting large pieces at the bottom and smaller over them, then upon these, paper enough to light the sticks, which should be laid upon, and not under, the coal. Cover the sticks with the cinders remaining from the previous day's fire; these will soon become red hot; the coal below will be warmed sufficiently to make it throw off gas; this, passing through the hot cinders, will be kindled, and will burn with a bright flame, instead of going up the chimney in smoke, as it does when the coals are laid on the top.

The fire thus laid will require no poking, and will burn clear and bright for from six to eight hours without the necessity for more coals to be thrown on.

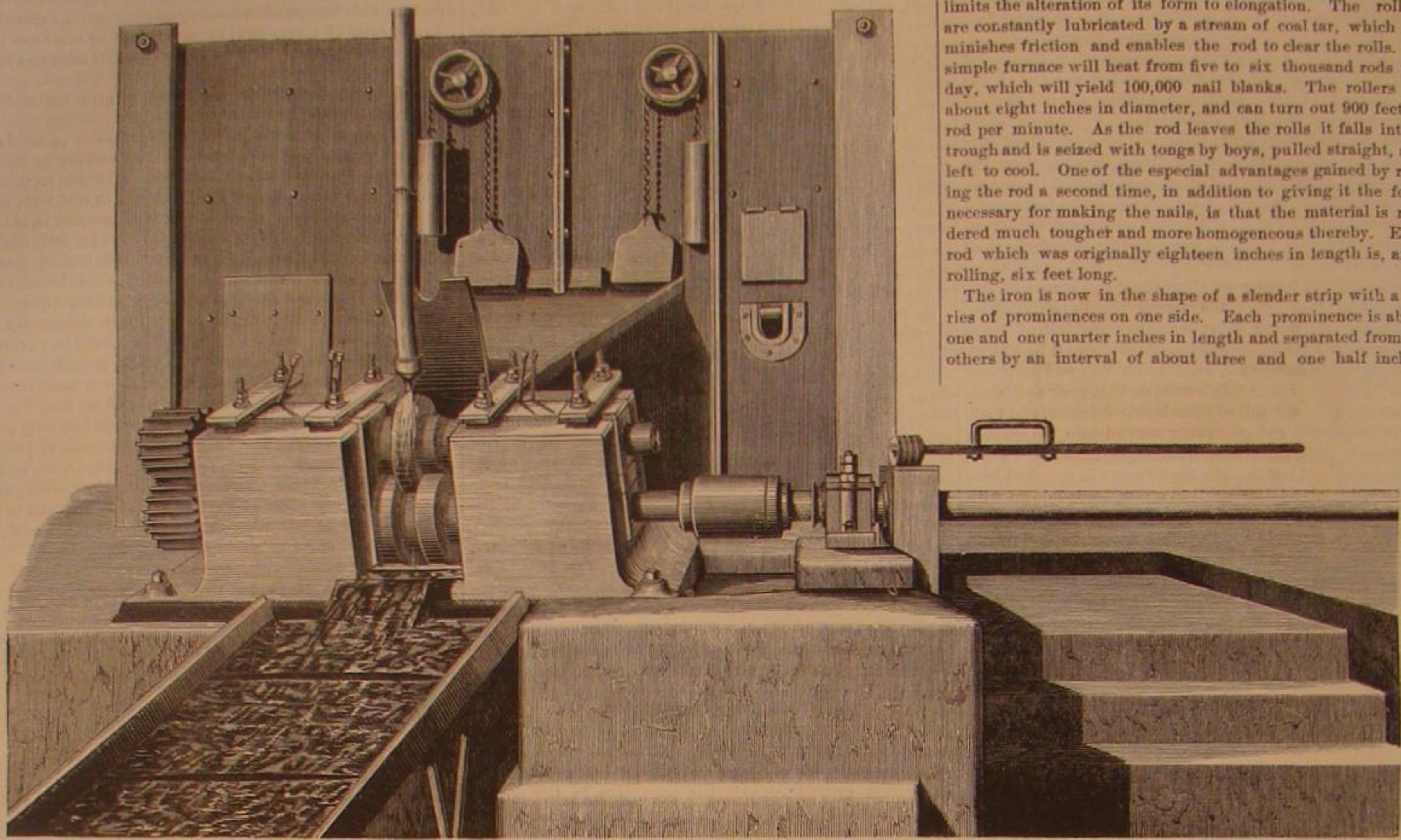
HORSESHOE NAIL MACHINERY.

A horseshoe nail must be made from a peculiar description of iron. It must be tough and flexible, and yet capable of penetrating the hardest hoof without bending. The head must be well secured to the shank, and not liable to be severed from it by the shocks incidental to the rough wear and tear it receives. In fine, it would seem that its necessary qualities are so numerous that mere machinery would be inadequate to accomplish its manufacture except in the matter of shape. Nevertheless machines have been invented and placed in operation in England which answer every requirement, and a single factory at the present time is able to produce five tuns of finished horseshoe nails per week.

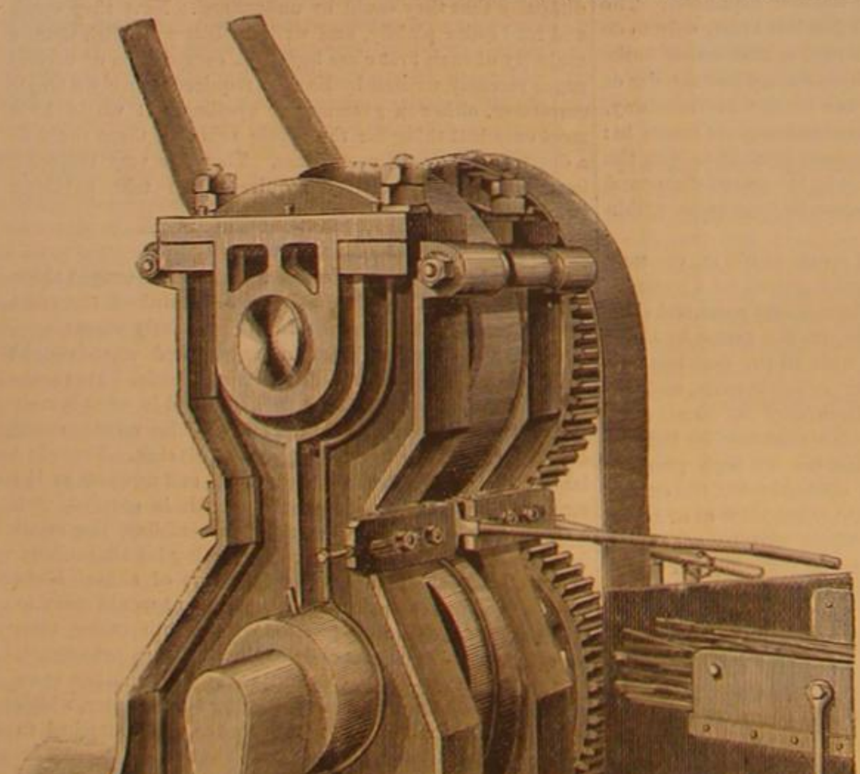
Of these very ingenious devices, we present herewith illustrations, for which we are indebted to the *Practical Magazine*. They are six in number, and represent the rolling mill, and flattening, cutting, rumbling, heading, and shaping machines, which are all inventions of the Messrs. Huggett, father and son.

The rolling mill, in which the iron is first manipulated, has for its upper roller a simple cylinder; the lower roller has a series of depressions or small nicks on its circumference, separated by intervals. Each depression corresponds to two nail heads, each interval to two shanks: and the surface of the roller is curved in the intervals so as to place the most prominent part in the center. The iron is in the form of rods, each eighteen inches long, by half an inch wide and one eighth inch in thickness. These are heated in a Siemens furnace, which is provided with two openings, at each of which a workman is stationed. The cold rods go in at one door and hot ones come out at the other, and as fast as one opening is supplied the other is exhausted. As the rods emerge they are drawn out upon a chute down which they run to the rollers, which revolve at the rate of 500 revolutions a minute. The rolling surface is very narrow, corresponding to the thickness of the rod, and a strong ring is fixed on the rolling shaft which prevents the smallest lateral spreading of the rod during the process of rolling, and limits the alteration of its form to elongation. The rollers are constantly lubricated by a stream of coal tar, which diminishes friction and enables the rod to clear the rolls. A simple furnace will heat from five to six thousand rods per day, which will yield 100,000 nail blanks. The rollers are about eight inches in diameter, and can turn out 900 feet of rod per minute. As the rod leaves the rolls it falls into a trough and is seized with tongs by boys, pulled straight, and left to cool. One of the especial advantages gained by rolling the rod a second time, in addition to giving it the form necessary for making the nails, is that the material is rendered much tougher and more homogeneous thereby. Each rod which was originally eighteen inches in length is, after rolling, six feet long.

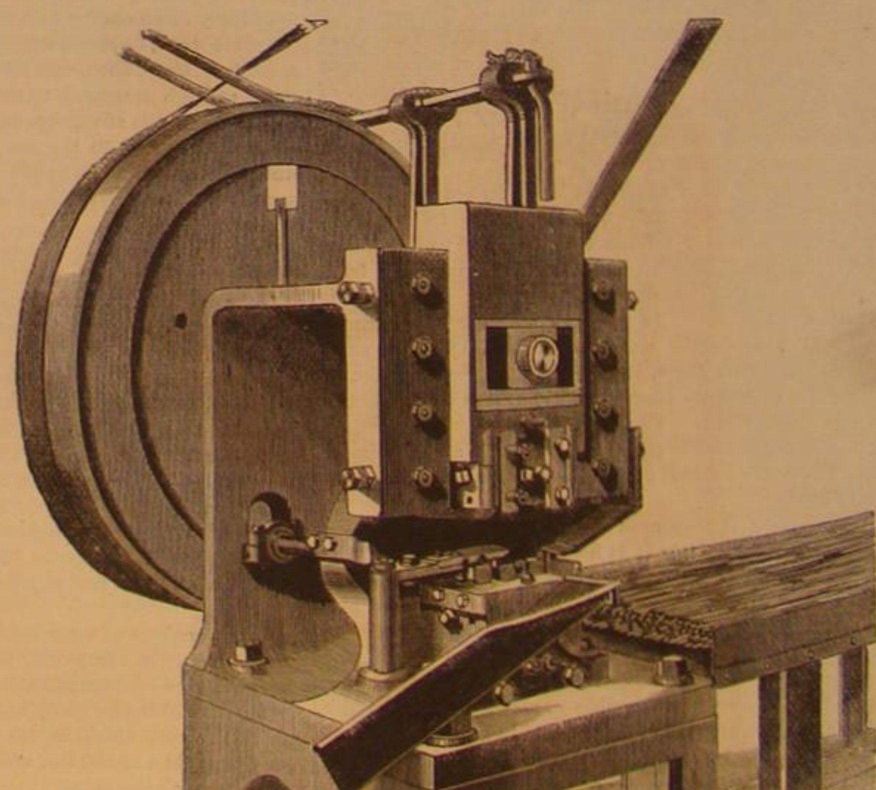
The iron is now in the shape of a slender strip with a series of prominences on one side. Each prominence is about one and one quarter inches in length and separated from the others by an interval of about three and one half inches these dimensions varying with the size of nail to be made. The rod is then passed while cold into the flattening machine, which affects only the prominences, making them nearly square in section, and afterwards into the cutting machine, which cuts it into lengths. In the latter apparatus there are three blades, two of which are at right angles to the rod and cut straight through the center of a prominence, dividing it into two nail heads, and a central knife which is set skew



THE ROLLING MILL



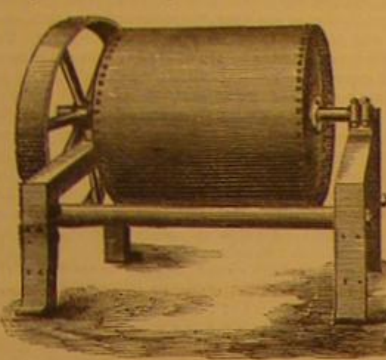
THE FLATTENING MACHINE.



THE CUTTING MACHINE.

to the rod and divides each shank into two beveled points. The pieces thus formed, called nail blanks, are placed in the rumbling machine, a revolving sheet iron barrel, the motion of which causes the blanks to clean and polish each other by friction.

The finishing process follows, calling into use the heading and shaping machines. The first of these consists of a massive die, which rises and falls in a vertical direction. Beneath it a wheel turns intermittently on a horizontal axis, and from the circumference of this wheel project several pairs of dies, which receive the nail blanks with the heads upwards. When the vertical die descends it meets one of the pairs of wheel dies beneath it, ready to receive its stroke. When it rises, a partial revolution of the wheel takes place, and the next pair of wheel dies is ready in its turn to receive the next blow. The wheel dies consist of blocks of iron hollowed out on their opposing faces to receive the blanks, and hollowed at the top so as to give proper space to the heads. The blocks are kept at a little distance apart by springs inserted between them, so that they hold the nail blank loosely, but as each pair in succession reaches a verti-



THE RUMBLER.

cal position, and just before the plunger descends, a pair of jaws closes upon the blocks and presses them tightly together, so that the blank is firmly fixed while being struck. As the plunger rises the hold of the jaws is released, and the blocks are separated by the springs. During the revolution of the wheel each pair of blocks receives, in its turn, a blow from a hammer, which loosens the nail blank so that it falls out as soon as its head turns downwards.

After being thus roughly headed, the unfinished nails are transferred to a Siemens annealing furnace, and thence passed to the shaping machine. In this apparatus they are placed singly but successively on the perimeter of a wheel. They are prevented from falling off by stops, and are compressed between a descending plunger and two lateral dies, which remove all irregularities and produce a nail of perfect finish and form. One more process yet remains to be accomplished. It consists in placing the nails, five hundred weight at a time, in cast iron pots, which are ranged in a furnace. As soon as the nails become red hot they are emptied out upon concrete floor and left to cool. A thin film of oxide is thus formed upon their surface, which effectually prevents them from rusting.

These machines, with the exception of the rolling mill, are all attended by girls. The cutting machine can cut over 30,000 nails per day; the maximum number ever reached was 37,000. One girl, sitting at the heading machine and feeding it, can turn out 24,000 nails in an ordinary day's work.

Horse nail making by machinery in this country, as well as in England, has become quite a large industry, being carried on by the Au Sable Horse Nail Company, of Keeseville, N.Y., the National Horse Nail Company, of Vergennes, Vt., the Globe Horse Nail Company, of Boston, Mass., a company in New London Conn., and other localities. We hope before long to illustrate and describe the Kingsland patent machinery and processes, owned and operated by the Northwestern Horse Nail Company, of Chicago.

Aniline for Printing Black.

The degree of purity of commercial aniline, says the *American Chemist*, is of the greatest importance in the manufacture of different colors, and especially of blue and black. As aniline black is developed by printers themselves and not bought ready for use, the following test will enable them to determine the quality of the article they have to use:

Any aniline oil which does not boil under 192° C. must at once be rejected; and the nearer its boiling point is to that of pure aniline, 180°, the finer will be the black color produced. For practical tests several methods may be followed. Baumé's areometer gives some indication of quality. Any aniline of from 20° to 30° B. always gives a black color if not fraudulently adulterated. If heavier, it generally contains undecomposed nitro-benzol, if lighter, too much toluidine. Fractional distillation gives a more reliable result. The percentage of aniline distilling between 180° and 185° C. represents the true value of the article. Concentrated sulphuric acid diluted with three times its weight of water is also a good test. About one part of aniline is mixed with at least three parts of the dilute acid; a thick paste of sulphate of aniline is formed, and more water is added to dissolve the salt, when any tarry impurities and also nitro-benzol collect at the top.

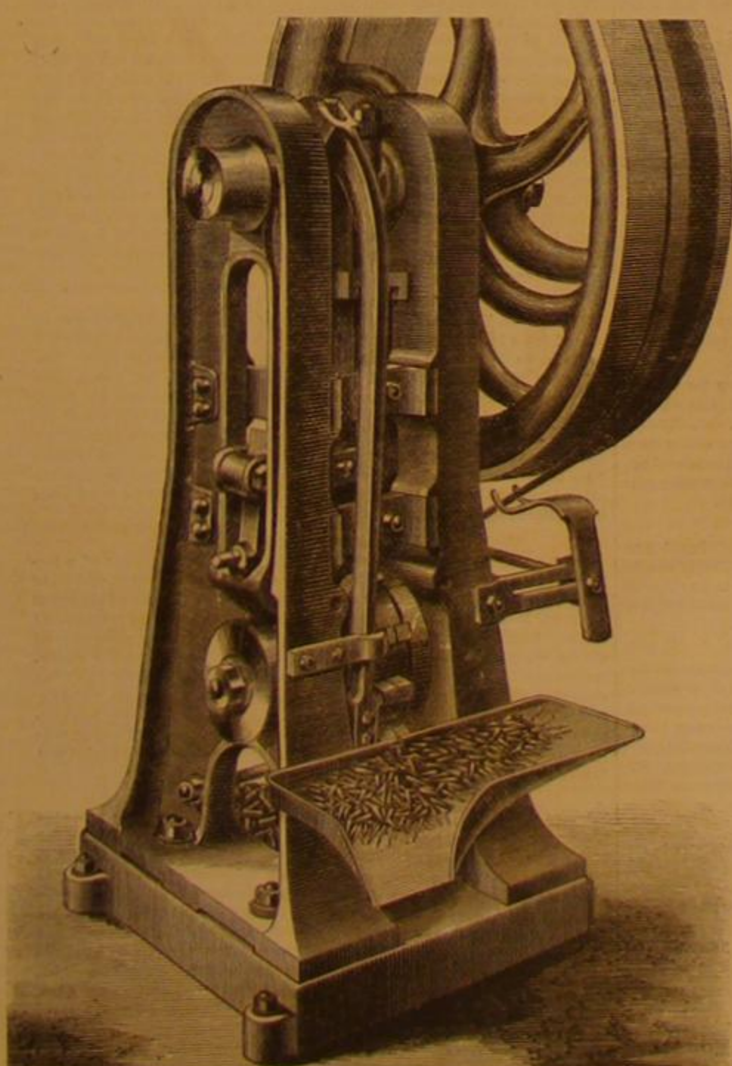
The quantity of aniline oil used is enormous, being, in 1869, 3,500,000 pounds, or about 10,000 pounds per day. Of this, Germany took two million pounds and the rest was divided between Switzerland, England and France. The quantity of coal which must be converted into gas to furnish sufficient benzol for 3,500,000 pounds of aniline is astonishing. It is estimated that 1,600 tuns of coal will produce one tun of aniline. Three and a half million pounds or 1,600 tuns of aniline require therefore 2,500,000 tuns of coal, which, in the first instance, would give 25,000,000,000 cubic feet of gas.

Dynamical Theories of Heat.

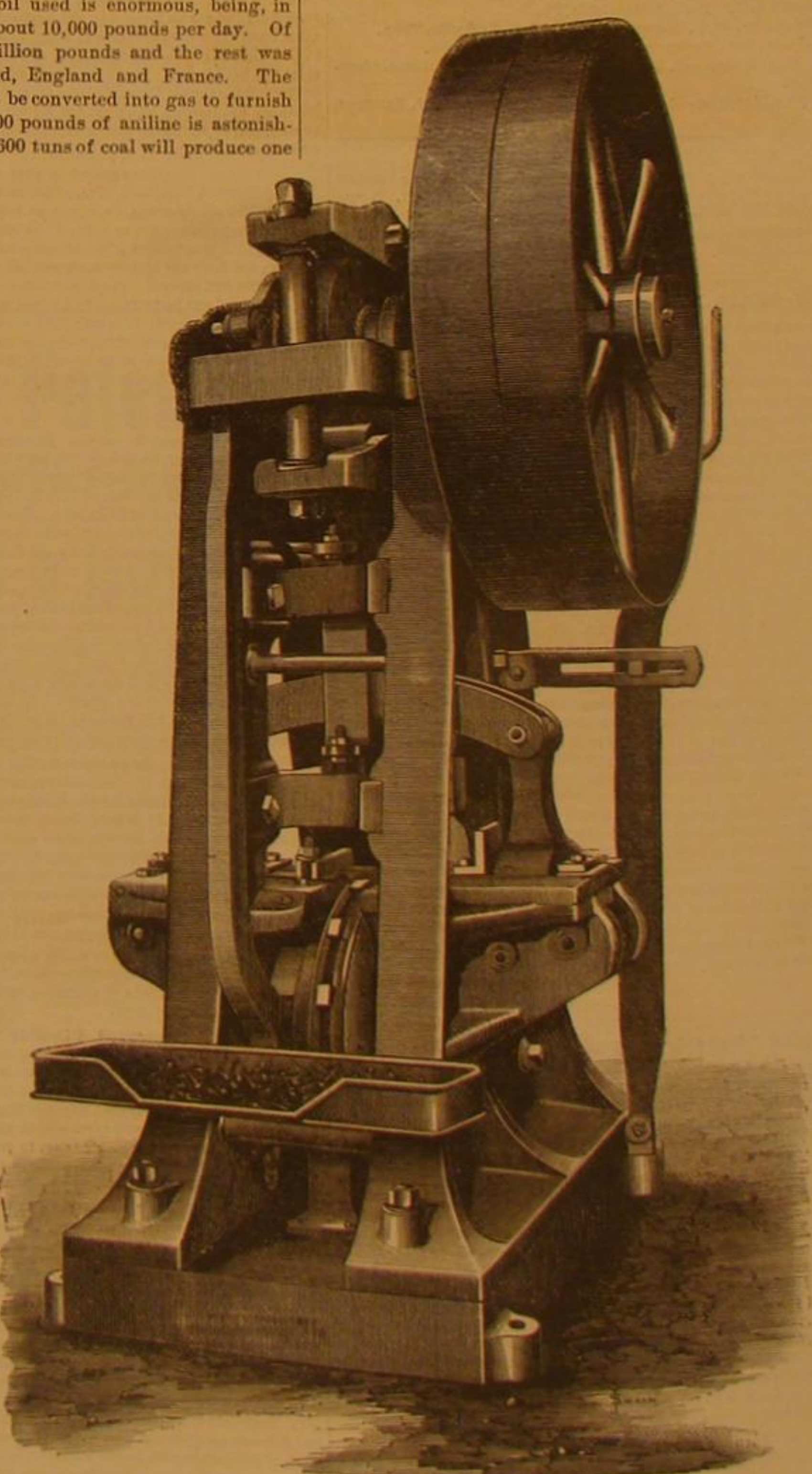
Professor W. A. Norton publishes in the *American Journal of Science and Art* a lengthy treatise on the above topic, more especially in answer to the query: Is heat any mode of motion of the atoms of ordinary matter: such atoms being regarded, in accordance with the common notion of an atom, as incapable of experiencing any change either of form and dimensions or in the intensity of their acting forces? The conclusions arrived at are that the atoms of bodies must be made up of distinct parts, bound together by certain forces; and that heat must consist in some movement or relative displacement among these constituent parts of the atoms. Two possible conceptions of an atom with its essential accompaniments are given: That it consists of a true atom, surrounded solely by an atmosphere of luminiferous ether, or that it has, in addition, an envelope of distinct electric ether immersed in the ethereal atmosphere. In view of these results, it is considered probable that heat and light originate in some mode of motion occurring in the ethereal atmosphere or in the electric envelopes of the atoms, or more probably, in the force or forces by which such a movement is produced.

Simplified, Professor Norton's theory, though at first conveying the negative idea of a complex atom, transfers the source of heat from the atom proper to a supposed ethereal atmosphere or electric envelope, one or both, and therefore, following the hypothesis, to a form of matter considered to be nearly, if not quite, as subtle as the medium of light, and whose elastic forces are nearly or quite as intense.

WILLIS WILLIAMS, of Islesboro', Me., was out on the ice hunting seagulls, when an accidental discharge of his fowling piece wounded him so badly in the thigh that he could not walk. He smeared the dog's face with blood and told him to go home, which the sagacious animal did, and by signs and the blood alarmed the family, who followed him to the place where the young man was lying.



THE HEADING MACHINE.



THE SHAPING MACHINE.

DECISIONS OF THE COURTS.

United States Circuit Court---Southern District of New York.

WHEEL STAMP PATENT.—THOMAS J. W. ROBERTSON vs. THE SECOMBE MANUFACTURING COMPANY.

BLATCHFORD, Judge.

This suit is brought on reissued letters patent granted to the plaintiff, December 12, 1871, for an "improvement in hand stamps," the original letters patent having been granted to the plaintiff September 22d, 1857, and extended for seven years from September 22d, 1871. The reissued letters patent are granted for twenty-one years from the 22d of September, 1857. The specification says: "My invention relates to the construction of stamps for producing an impression such as a postmark or other analogous device, a part of which requires to be frequently changed, such as the date, and part requires to remain the same, as the name of the post office. In order to give such stamps any considerable utility, the impression must be readily made and that part of the type which requires frequent change must be always on hand. This result I secure by combining in a hand stamp fixed type for producing that part of the inscription designed to be always the same, and a series of combined changeable types bearing the necessary characters to allow of any desired change, which shall be connected with and form part of the stamp. These types are connected and arranged to revolve in substantially the same manner as the combined types used in book-paging machines, but differing therefrom in having an arrangement by which the devised inscription may be printed repeatedly, without changing at each impression." [The invention covers nearly all the wheel stamps now so commonly used in banks, counting rooms, and offices, and has come into very extensive use.]

The principal defence set up in this case is that the improvements claimed by the plaintiff in his reissued patent were previously invented by one Marcus P. Norton, of Troy, N. Y. So far as regards the contents of a caveat filed in the Patent Office by said Norton on the 21st of June, 1855, it is sufficient to say that the improvements claimed by the plaintiff are not found on the caveat. So far as regards the contents of the paper called "an additional caveat" and purporting to be dated August 21, 1855, and set up in the answer as having been filed in the Patent Office on the 25th of August, 1855, in, and with, and as a part of the said caveat filed June 21, 1855, it is sufficient to say that, after due notice to said Norton and a trial had before a commissioner appointed by the Commissioner of Patents, the said paper was, in September, 1871, adjudged by the said commissioner to be fraudulent and to have been surreptitiously introduced into the caveat file of said Norton filed June 21, 1855, and that thereupon the Commissioner of Patents endorsed on said paper a memorandum signed by him, that said paper does not form a valid portion of said caveat.

There remains the evidence as to the prior existence, in fact, as completed inventions, made by Norton, of the plaintiff's improvements. As to this the burden of proof is on the defendants, and they do not establish the fact satisfactorily. Norton's own evidence is manifestly not to be relied upon. The circumstances attending the taking of his deposition in this suit, the contradictions in sworn statements he has made at different times regarding the alleged caveat, and the manner in which, as shown by the record, he caused witnesses to testify in *ex parte* depositions, to matters of which they had no recollection, make it impossible to rely on his testimony.

But the evidence of Norton and that of the other witnesses for the defendants shows nothing done by Norton, prior to the plaintiff's invention, which amounted to more than an unsuccessful experiment. The plaintiff made the first successful practical working machine.

The infringement of the patent is admitted. There must be a decree for the plaintiff, for a perpetual injunction, and an account of profits, and an ascertainment of damages and costs.

Frederick H. Betts for plaintiff.

Nelson Cross for the defendants.

[We understand that the Chamberlain Manufacturing Company, No. 10 Courtlandt street, New York, and N. L. Chamberlain, Boston, Mass., have purchased the exclusive privilege of working this patent, to whom application should be made for further information.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From February 21 to February 27, 1873, inclusive.

CHEMICAL TELEGRAPH.—T. A. Edison, Newark, N. J.

JOURNAL BOX.—S. W. Wilson, Philadelphia, Pa.

LOCOMOTIVE BLAST.—C. B. Knowles, J. E. Saunders, Nashville, Tenn.

PERCUSSION CAP, ETC., MACHINE.—A. Payne, Bridgeport, Conn.

PRODUCING COMBUSTION.—R. F. McCarty, F. F. Olds, F. H. Mason, Cleveland, Ohio.

TYPE WRITING MACHINE.—E. Densmore, Meadville, Pa., C. H. Farnham, Milton, N. Y.

NEW BOOKS AND PUBLICATIONS.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC FOR 1873 is an invaluable condensation of the newest and best things in the beautiful art. It contains 160 pages, full of useful suggestions and fresh information which every photographer ought to posess. London: H. Greenwood. New York: Milner & Rogers.

HOW SHALL I INTRODUCE MY INVENTION?

This inquiry comes to us from all over the land. Our answer is: Adopt such means as every good business man uses in selling his merchandise, or in establishing any business. Make your invention known, and if it possesses any merit, somebody will want it. Advertise what you have for sale in such papers as circulate among the largest class of persons likely to be interested in the article. Send illustrated circulars describing the merits of the machine or implement to manufacturers and dealers in the special article, all over the country. The names and addresses of persons in different trades may be obtained from State directories or commercial registers. If the invention is meritorious, and if with its utility it possesses novelty and is attractive to the eye, so much the more likely it is to find a purchaser. Inventors, patentees, and constructors of new and useful machines, implements, and contrivances of novelty, can have their inventions illustrated and described in the columns of the SCIENTIFIC AMERICAN. Civil and mechanical engineering enterprises, such as bridges, docks, founderies, rolling mills, architecture, and new industrial enterprises of all kinds possessing interest can find a place in these columns. The publishers are prepared to execute illustrations, in the best style of the engraving art, for this paper only. They may be copied from good photographs or well executed drawings, and artists will be sent to any part of the country to make the necessary sketches. The furnishing of photographs, drawings, or models is the least expensive, and we recommend that course as preferable. The examination of either enables us to determine if it is a subject we would like to publish, and to state the cost of its engraving in advance of its execution so that parties may decline the conditions without incurring much expense. The advantage to manufacturers, patentees and contractors of having their machines, inventions, or engineering works illustrated in a paper of such large circulation as the SCIENTIFIC AMERICAN is obvious. Every issue now exceeds 45,000 and will soon reach 50,0 0, and the extent of its circulation is limited by no boundary. There is not a country or a large city on the face of the globe where the paper does not circulate. We have the best authority for stating that some of the largest orders for machinery and patented articles from abroad have come to our manufacturers through the medium of the SCIENTIFIC AMERICAN, the parties ordering having seen the article illustrated or advertised in these columns. Address

Recent American and Foreign Patents.

Improved Spindle Bolster.

James Barnes, Holyoke, Mass., assignor to himself and James Woodhouse, of same place.—This invention consists of a long tubular cup with a hole in the bottom, in which the spindle is fitted oil tight. A metal cap is arranged in the bolster rail, within which the upper end of the cup, which turns with the spindle, has a bearing. The cap has a tubular extension from the hole through which the spindle passes, fitting into the cup at the top.

Improved Machine for Planing Clapboards.

James Atkins, Augusta, Me.—This improvement relates to that class of machines which plane the side of the clapboard and joint the thick edge at the same time, and has for its object the feeding of the boards so that the jointing of the edge straight will be secured, and the feeding of the board and planing of the surface in the most perfect manner will be insured. It consists in an arrangement of heavy feed rolls geared together in pairs, as in ordinary surface planers, but with a series of spurs on each lower roll of the pair, and an adjustable arrangement of the lower rolls for causing them to correspond exactly to the inclined surface of the bed of the machine, whereby the said objects are secured.

Improvement in Stereotype Blocks.

Wm. Schnauffer, Baltimore, Md.—This invention consists in divided stereotype plate blocks, each division having a pair of supports so as to enable all to be capable of being used separately or in connection with each ckter.

Improved Burglar Alarm.

Henry L. Brower, New York city.—This invention consists of a small, light, portable, and ornamental alarm or call bell, so contrived that the devices for restraining or holding the clock mechanism (used for actuating the bell hammer) in check will be caused to release the said mechanism and allow it to act, if the alarm be lifted from the table or other support, or if a knob be lifted or pulled, or turned to the right or left. It may be used for a burglar alarm by attaching small threads or cords to the knob, and arranging said threads so that the opening of a window or door, or the passing through an open door or window by a person will, by his coming against the cords or threads, pull the knob or turn it, and thereby set the alarm in motion; also, for a fire alarm by having weights or springs, let go by the burning of the threads to pull or turn the knob and liberate the sounding mechanism.

Improved Tool for Laying Tile.

George W. Nevill, Richmond, Va.—This invention consists in a tool formed of two adjustably connected tubes on which the tiles are held firmly while being carried into the ditch, and from which they may be then readily detached. The advantages of this tool are that the operator is enabled to lay the sectional tiles by means of a level, or otherwise, at a regular and more uniform pitch; to lay a line of tiles with much greater accuracy, with far greater rapidity and with an economy of at least 50 per cent in the cost.

Improved Sewing Machine Table.

James W. Cheney, Detroit, Mich.—This invention has for its object to furnish a simple and effective method of connecting the cover of a sewing machine table to the edge of the same for forming an extension thereof when not used as a cover for the operative mechanism. The invention consists primarily in the employment of a hooked or curved plate applied to the under side of the cover and interlocking with a slotted plate secured to the edge of the table for forming a detachable fastening device which will cause the cover and table to be flush or even with each other when arranged in position. The invention also consists in the provision of a hinged supporting arm applied to a pendent bracket secured to the table, for maintaining the cover in its proper position when used as an extension leaf. The invention also consists in combining with the hinged supporting arm and bracket a pair of spring jaws for securing the hinged arm when it is turned into a vertical or inoperative position.

Improved Railroad Train Indicator.

Samuel W. Hemenway, Lansing, Iowa.—This invention consists of one or more miniature ways constructed on a scale proportioned to the real railway as to the stations and distances between them, with the time of starting from the end and the time the trains are due at the stations marked opposite them; also blocks representing cars and a screw, with each way, for actuating them. The screw is worked by a clock, so that a block being put on the track at the time for the starting of a real train will show to the eye the position of the train on the railway at any time during the trip.

Improved Plow.

James R. Nichols, Bastrop, Texas.—The invention consists in a plow cutter having a bend at one end, sharpened at the other and perforated at different points, to adapt it to be used with a sweep or plow.

Improved Candlestick.

Charles R. Doughty, Newburgh, N. Y.—This invention consists of an open socket for the candle formed by the vertical edges of four thin plates radiating from a common center, but sufficiently distant from the center that in pressing the candle down between them, they will cut or press into the sides and hold it fast. Three or more of the plates may be used. At the bottom of the socket the said plates extend to the center. The object is to provide a candlestick which cannot fill up in the socket by melted tallow or wax, and by which the lifting of a pusher to expose the light is avoided when the candle is nearly burned to the bottom.

Improved Paint Brush.

Philip Wagner, New York city.—This invention relates to a new extension brush case. The top or bridge of the brush holder, which is usually soldered flat upon the upper edge of the face plates, is, in this invention, provided with side flanges. The bridge thus made is sprung over the top of the case and fastened by solder, and will then and by the aid of its flanges be held firm and secure. The lower part of the case is made movable up and down, and can be fastened by a screw at suitable hight. This slide or sleeve is made of metal or other hard material, and will, when set down, shorten the working part of the hairs, or lengthen them when moved up. The paint or varnish will be arrested by the lower edge of the extension, and cannot enter within such extension. For thicker varnish or paint the sleeve is moved down; for thinner material it is set up, and also when the hairs are worn short.

Improved Grain Binding Harvester.

Charles F. Goddard, St. Ansgar, Iowa.—This invention has for its object to furnish an improved harvester, which shall be so constructed as to cut the grain, rake it into gavels, and bind it. In using the machine one end of the straw band is attached to an arm. The other end of the band is passed around a hook and secured in the spring jaw in the end of the short arm of a crosshead, placing the band being all the attendant has to do. As the rake moves forward it pushes the gavel over the arm and raises said arm into a vertical position. As the rake head rises and moves back a lever is operated, which turns the crosshead around one and a half times, twisting the band. As the crosshead completes its movement its long arm strikes and pushes back the hook, which catches the end of the band and draws it through said band. At the same time the spring jaws of the crossheads strike against stops, which open said jaws and release the bands, and the bound bundle drops to the ground. As this operation is completed the lever slips from a pin and the spring draws it back, which turns the binding device back into its former position ready to receive another band.

Improved Sulky Plow.

William Ough, Orion, Ill.—This invention consists in means for raising, lowering, and holding the frame which sustains the plows, and thereby graduating the depth of furrow which is to be cut by the latter. The device can thus be used in almost every kind of soil. By connecting both ends of the plow beam with the lever, it is raised and lowered in a level position, or nearly so, moving the plow up and down, which is much easier than drawing it diagonally through the soil, as is usually done.

Improved Butter Bucket.

John F. Dumont, Kansas City, Mo.—This invention consists in forming an air tight butter bucket in three easily detachable parts so that it can be speedily subdivided and all portions thereof nicely and thoroughly cleaned, also in the particular mode of clamping these three parts together and of locking and unlocking them.

Improved Ditching Machine.

George W. Nevill, Richmond, Va.—This invention consists in means for enabling the vehicle to turn in a small circle at the end of ditch, or when it becomes necessary, and after cutting one layer of earth to return and cut another; also in means for enabling the flanged soil-carrying wheel to adjust itself both laterally and vertically in an easy and non-frictional manner to the inside of ditch; and finally, in means for supporting the ditching wheel frame in its true position while the front axle may move independently of it, and *vice versa*.

Improved Substitute for India Rubber.

Dr. Elbert H. Rogers, Tuscaloosa, Ala.—This invention consists in the process of obtaining rubber pulp from bamboo and other berries by first expressing the juice, secondly, drying the hull, pulp, and seed in a mass, thirdly, disintegrating said pulp, hull, and seed by trituration, and finally separating the pulp therefrom by a fan.

Improved Furnace for Melting Brass and other Metals.

Ira D. Bush, Detroit, Mich.—This invention consists of a rotating grate frame, constructed and arranged in a furnace. The furnace is supported in the frame on trunnions. The improved grate frame or plate is confined to the under side of the furnace bottom on a central pivot and pin. There are three, more or less, air ports in the bottom of the furnace one for each space or compartment in the furnace between the partitions. Each of these apertures is provided with a removable grate, either attached to or cast with the rotating grate plate or frame. By turning the plate the grates are readily removed from the air ports, which allows cinders and refuse to be discharged during the process of melting.

Improved Railway Dust Preventer.

John Wellby, Fredericton, Canada.—This invention consists in a dust shield for cars, carriages, and other vehicles. It is a frame made with close triangular ends, which is designed to be secured to the lower part of the car body, and which should project downward so as to be as close to the ground as practicable. To the upper parts of the ends of the frame are pivoted the journals of a roller, to which is attached one edge of a canvas screen, the lower edge of which, when unrolled, is designed to be secured to the lower bar of the frame, so that by detaching the lower edge of the screen or blind it may be rolled upon the roller to give convenient access to the wheels when desired. The end screens consist of a frame covered permanently with a cover of wood or thin sheet iron, and should project so that the end screens of adjacent cars may come as near each other as practicable without danger of being broken.

Improved Bread Worker.

Joseph H. Balderston, Colora, Md.—This invention has for its object to furnish a machine for working or kneading bread. In using the machine the bread, mixed to the proper consistency for working or kneading, is placed in the closed end of a box. The lever is then moved up and down and actuates arms to the ends of which balls are fastened. The effect of this is to cause the dough to revolve toward said balls, so that by continuing the operation a short time the dough will be thoroughly worked.

Improved Apparatus for Loading and Unloading Hay.

George W. Long, Delaware Center, Iowa.—This invention has for its object to furnish an improved device for unloading hay, corn in the ear, etc.; it is simple in construction and is said to be effective in use. The invention consists in the combination of the sling, the ropes attached to it, the block, crank shaft, lock and trip latch and trip rope with each other. Two timbers of a length about equal to the length of the hay rack are connected by a number of small ropes of such a length that when extended across the hay rack the timbers may hang down at its sides. To one of the timbers is suitably attached the end of a rope, the other end of which is left free. To the other timber, at equal distances from its center, are attached the ends of another rope, upon the center of which is formed a loop or eye to receive a hook attached to the pulley upon the hoisting rope. The same rope passes through holes in the sides of a block in the middle part of which is formed a large hole or opening, across which extends a shaft to one end of which is attached a crank. A catch and lever is arranged to hold the crank in any desired position. In using the device, a sling is extended upon the wagon rack, the load is built upon it, and the loaded wagon is drawn upon the barn floor, to the side of the stack, or to any other place where the load is to be unloaded. The end of the rope first mentioned is then attached to the shaft on the block to wind the rope upon the shaft. When the sling has been drawn sufficiently tight about the load the latch is adjusted to catch upon the crank to lock it, and the hoisting rope is drawn upon to raise the load and carry it to the desired place. When the load is brought over the place where it is to be deposited, the trip rope is drawn upon to withdraw the latch and release the crank and shaft, allowing the rope to unwind and the load to drop.

Improved Awning.

John Boyle, New York city.—The invention consists in the mode applying tension rods to awnings. To the ends of the main rod are attached the sockets or couplings to which the brackets are fastened. To the sockets are attached, or upon them are formed, two eyes. Two strengthening or straining rods, which are passed through the eyes, are drawn taut by nuts screwed upon one or both their ends. Bridges are used, according to the length of the rod, and are made with two arms, through the outer ends of which are formed holes for the passage of the straining rods. The eyes and bridges are so arranged that one of the rods may be below the main rod to resist the downward pressure, and the other upon the inner side of said rod to resist the inward pressure.

Improved Bed Bottom.

Benjamin Holmes, 95 Grand Street, New York city.—This invention relates to the construction of spring bed bottoms. Double conical springs are attached by straps to the slats of the frame. Each spring has two fastenings, one on each side of the slat. By making the slats of the proper width and arranging the springs upon either side, the requisite number of springs is distributed uniformly and so that each may bear its proper proportion of the weight. The springs are held at top and bottom by twine or cord, arranged in the usual manner, with a border band of rattan or wire surrounding them and forming the boundary of the bottom. The bottom is incased in strong cloth with cotton batting in the sides.

Improved Oscillating Chair.

William T. Doremus, 266 Canal Street, New York city.—This invention has for its object to furnish an improved chair, which shall be so constructed as to yield to the weight of the sitter as he sits down and leans back, thus relieving him from encountering the rigid resistance found in sitting upon an ordinary chair. Bars are placed at either side of the chair, the upper ends of which are pivoted to the chair seat by a pin passing through the said bar and into the said seat. The lower part of each bar passes down through the pedestal and has a nut screwed upon its lower end. Rubber springs are placed between the back parts of the pedestal and seat. By this construction, when a person sits down upon the chair his weight compresses the springs, and at the same time slightly inclines the chair seat to the rearward which inclination may be increased by leaning back heavily against the chair back. The front part of the pedestal is provided with a stop to receive the forward part of the seat when said seat is allowed to come into its ordinary position.

Improved Oil Still.

Emil Schalk, New York city.—The retort or still, in which the oil is to be heated, has a large passage through it from side to side between the bottom and top, so that a chamber is preserved below and another above, also spaces at the sides for the oil to be distilled; through this passage are arranged vertical tubes as close together as will best promote the direct application of the heat which passes through the still to the oil, which circulates through the tubes, and not obstruct the draft. The oil enters the lower chamber at the pipe where the heat is lowest and the residue escapes from the upper chamber where the heat is greatest. The tubes, being vertical and having a large chamber below, will not be obstructed by the accumulation of impurities.

Improved Torpedo.

Charles Nelson, East New York, N. Y.—This invention consists of a torpedo in which the fulminate is separated from the powder, gravel, and other filling, and inclosed in a paper sack and fixed on the center of the paper wrapper. It is thus placed at the bottom part of the completed torpedo. It is either inclosed in one wrapper, or in a package of two or more plies of strong paper. The fulminate is placed at the bottom, and the whole, including an exterior thin fancy colored paper, is folded over the powder and secured by twisting together and gumming the twisted parts. The object is to guard against explosion by concussion of the sides of the torpedo, and to provide a wrapper or case that will not break open easily when subject to concussion, as the torpedoes now made do to such extent that if one in a mass or package explodes the whole will be fired.

Improved Sofa Bedstead.

James K. Stockton, New York city.—This invention relates to a new sofa bed, and has for its object to permit the use of short frames and cushions for such purpose. The seat of the sofa, having projecting pins or trunnions, is pivoted thereby to the frame so that it can be entirely revolved. To the front of the seat is hinged a cushioned frame of similar extent, which in the sofa is folded under the seat. To the back of the cushioned frame is hinged the sofa back, which is cushioned on both sides. A plate of wood is placed into the back of the sofa, projecting outwardly and forming a recess for the admission of the cushion. When the sofa is to be transformed into a bed, the back is carried forward, the seat completely revolved on its pivots and the cushion thereby brought forward of the seat. Legs, sliding in recesses of and pivoted to projecting arms fastened to T-shaped pieces, are drawn out and turned down for the support of the cushion. A foot board is folded up till it rests on the projecting extension of legs. Clutches, applied to the sides of the cushion, are turned up and hold the foot board firmly pressed against the legs, stiffening them and producing a stable support to the cushions. In this manner a bed is completed whose length is obtained by the successions of the several cushions.

Improved Steam Generator.

Patrick J. McMahon, New Orleans, La.—An ordinary vertical tubular steam boiler is employed with a superheater above the upper tube sheet, through and around which the products of combustion pass on their way to the chimney. Into the bottom of a tank or reservoir, which is nearly filled with water, a steam pipe leads from the steam space of the boiler. The horizontal portion of said pipe is perforated, and extends nearly or quite the length of the reservoir near the bottom. Another pipe leads from the dome to the superheater with which it is connected. An overflow pipe connects with the boiler at the surface of the water therein, and discharges into the first mentioned pipe. The reservoir is provided with an independent force pump for its own supply. The water to supply the boiler is taken therefrom. When steam is generated it will be discharged into the reservoir through the pipe, and will escape into the water through the perforations and be condensed. The heat thus generated will be absorbed by the water, which will soon become heated. As the pressure increases in the boiler it will increase in the reservoir, and the steam generated in the reservoir escapes into the dome and to the superheater, whence it is conducted into the engine. The steam pipe is always open, and consequently any great or sudden accumulation of steam in the boiler will be absorbed by the water in the reservoir. This large body of water will therefore store up such heat and power and act as a balance wheel to equalize the action of the boiler. From this arrangement it will be seen that a sudden evaporation in the boiler cannot cause a sudden increase of pressure, and also that a sudden demand for power will not suddenly reduce the pressure.

Improved Bed Bottom.

Peter Boesen and Michael Bedessem, Kenosha, Wis.—The upper bed bottom frame is supported on spiral springs and covered with canvas or other fabric, which also rests on springs. The springs at the ends of the bed rest upon a frame, but at the middle of the bed they rest upon a suspended frame which is hung by and moves loosely upon rods extending down from a frame above. Braces are arranged which form yielding crossed supports for the bed bottom, and serve to steady and equalize the downward and upward motion of the same, so that if, for example, one side of the bed is being depressed only, such depression will still leave the bed level, and not cause it to become inclined to the weighted side. When the bed is weighted in the middle the springs at rest in the frame will be less compressed, because they have no immovable support, as those springs which rest on main frame and will therefore make the middle of the bed softer and more perfectly elastic than the sides.

Improved Barber's Chair.

Adam Schwaab, New York city.—This invention has for its object to improve barbers' chairs. The chair operates easily, as the occupant adjusts the inclination of the back to suit his own comfort by pressing with the body on the upper part, the segment shape above the pivots giving a more extended rest for the body. As soon as the shaving process is completed and the person sits up, the barber lifts the levers from the ratchets and places the back in an upright position between the hind legs. The arms remain stationary, the back performing the same motion which in the old chairs is accomplished by the combined back and arms pivoted to the front egs.

Improved Car Ventilato

John J. Crowley, Whistler, Ala.—This invention consists of two ventilating pipes, a fan blower, a conducting pipe, a distributing pipe, and a system of valves, all combined in a car in such manner that the fan blower, which is driven by a belt from a pulley on one of the car axles, will force a blast of air into the car, no matter which way it runs, it being only necessary to shift the valves when the direction of the movement of the car is reversed.

Improved Iron Bridge.

William B. Cooper, Albany, N. Y.—The object of the invention is to enable bridge builders to construct the tubular arches of iron bridges in sections so that the arches can be transported and put in place without difficulty, and so that the parts can be put together and adjusted without previous boring or fitting. The block or connecting section is a shell, made in two parts, divided longitudinally and vertically in its center. This shell is open on the under side to admit the eyes on the ends of the braces, which eyes are secured to the shell by means of a bolt through the latter. On each end of the shell is a circular flange, a semicircular half being cast upon each half of the shell, which flanges enter the ends of the sections of the arch. The ends of those sections or tubes consequently bear against the ends of the shell or block, and the ends of both are beveled with reference to the curve of the arch. When the connection is made and the parts put in place the latter are expanded by means of one or more keys, a groove being cast in each of the parts to receive the keys. The flanges are thus made to bear against the insides of the tubes and make the connection firm and rigid.

Machine for Stiffening Netting for Bonnet Frames, etc.

Peter C. Ritchie, New York city.—The top bars of the frame are provided with small hooks, upon which the edges of the mosquito net or foundation are hooked. A box, in which the stiffening mixture is placed, slides back and forth in ways in a frame. A roller revolves in bearings attached to the middle part of the ends of the box and is covered with several thicknesses of a coarse cloth which takes up the stiffening mixture from the box or trough and transfers it to the mosquito net or foundation as the said box is drawn back and forth beneath it. The roller is revolved to apply the stiffening mixture to the mosquito net or foundation by the movement of the box or trough. A bar or scraper is arranged in such a position as to remove the surplus stiffening mixture that may be raised by the roller, and thus prevent more than the proper amount of said mixture from being applied to the mosquito net or foundation.

Improved Paddle Mechanism for Boats.

Charles Howard, New York city.—This invention relates to an improvement on the "improvement in paddle mechanism for boats," which was patented March 19, 1872, No. 124,746. The present improvement consists in attaching the upper end of the paddle directly to the pin or wrist of the upper or short crank instead of having an intervening arm or connecting rod extending from said short crank to the upper end of the paddle, as in the aforementioned letters patent. The lower or long crank is, as before, connected to the paddle near its middle. The paddle shank, provided with a slot or guide, by which the paddle is allowed to slide up and down on the pin or wrist of a crank in such a manner as to allow two cranks, of different lengths, to be attached to the paddle.

Improved Cultivator.

William Taylor, Mansfield, Mass.—This invention is an improvement in the class of cultivators for corn, potatoes, and analogous crops, which have hinged adjustable wings or sections. To the rear edge of the inclined sides of the hoe plow are hinged the forward ends of the wings or plates, the lower edges of which are concaved to give the desired form to the hills. To the inner sides of the rear parts of the wings are pivoted the outer ends of the two bars, the inner ends of which are pivoted to a block that slides back and forth in a longitudinal slot in the rear part of the plow beam, so that the wings may be spread apart or drawn toward each other by adjusting the position of the said block. To one of the rounds of the handles is pivoted a lever, the lower end of which is connected with the sliding block, and its upper end projects into such a position that it can be conveniently reached and operated by the plowman to expand and contract the wings, and by suitable mechanism it is held securely in any position into which it may be adjusted.

Improved Harvester.

Alexander Rickart, Schoharie, N. Y.—The invention consists in an improvement upon the usual means for throwing in and out of gear the mechanism which drives the cutter bar. The drive wheels are connected with the journals of the axle by pawls and ratchet wheels. To the axle, at the inner side of one of the drive wheels, is secured a large gear wheel, which meshes into the teeth of a small gear wheel attached to a shaft which revolves in bearings attached to the frame. To the forward end of the shaft is attached a small crank, to the crank pin of which is pivoted the end of the pitman, the other end of which is pivoted to a sickle bar that slides upon the finger bar in the ordinary manner. To the rear part of the platform or frame are attached bearings which receive the axle, and which are so formed as to slide longitudinally upon the said axle so that the gear wheel may be thrown into and out of gear with the other gear wheel by sliding the said frame or platform upon the said axle. A pin, having a hole through its base for the passage of the axle, is kept from sliding upon said axle by a collar secured to it, and to the pin is pivoted a lever, having a double cam formed upon it. The double cam works between studs formed upon or attached to the frame so that the said platform may be moved in one or the other direction to throw the gear wheel into and out of gear with the other gear wheel. The space between the shoulders or studs is made a little wider than the double cam, and in it, along one of said shoulders or studs is placed a bar or arm, the lower end of which is secured to the platform or frame, and its upper end is left free. The bar or arm is held forward against the double cam by a set screw, which screws through the shoulder or stud along which the bar or arm is placed, so that by turning the said screw forward the wear may be taken up.

Improved Railway Snow Plow.

Peter A. Smith, New York city.—This invention consists in a plow made V shaped, the rear parts of which are bent inward so as to be parallel with each other and directly over the rails of the track. The walls of the plow are made double to form chambers. With the chambers are pipes communicating with the steam drum, or with the exhaust of the engine, to enable steam to be introduced into the said chamber. In the outer plate of the plow are formed a number of small holes, through which the steam blows upon the snow. The rear or parallel parts of the plow have a number of small holes in their bottoms, through which the steam may blow upon the rails to remove any snow or ice that may adhere to said rails.

Improved Shoe Brush.

George Wale, Hoboken, N. J.—This invention has for its object to furnish an improved shoe brush which shall be so constructed that the blacking may be applied to the shoe, and the shoe polished, without its being necessary to touch the box of blacking, or anything but the handle of the brush. In the brush for applying the blacking is formed a channel, leading in through the rear edge and out through the center of the brush, side of its stock. This latter opening is closed by a valve attached to the end of a lever, which is pivoted to a plate attached to the edge of the stock of the brush over the hole in said edge. The plate has a hole formed through it directly opposite the hole in the brush stock, and of a less diameter than said hole. The box to contain liquid blacking is made close, and with a small tube in one end. The tube has several small holes formed in its sides, and its outer end is closed with a cork. Upon the tube is placed a piece of rubber pipe, which, when the tube is pushed into the hole through the plate, is pushed back by said plate so as to uncover the holes in the said tube and at the same time serve as a packing to prevent the blacking from leaking out between the tube and plate. The box is kept from slipping outward by a flange. A plate is placed at such a distance above the back of the brush that the box may be readily slipped into place beneath it. The ends of this plate are bent downward at right angles, and are attached to the side edges of the brush, and to it is fastened the handle. The plate and the forward part of the handle receive the rear part of a lever which is so formed as to press down upon the box or upon the spring when the said lever is operated, so that the valve will be opened and the box compressed by the same operation of the lever to eject the blacking into the brush.

Improved Sawing Machine.

Hugh A. Current, Clarksville, Tenn.—The saws are so placed in respect of the transverse direction of the machine as to divide the pieces of wood in about three pieces, and one is placed behind the other for dividing the labor. A wide endless carrier belt of leather is placed outside of each saw, and a couple of narrower carrier belts are arranged between the saws. These belts all work over rollers at the ends of the frame and carry a num- of long, curved clamp fingers, which are mounted on curved plates so shaped that they will pass over the rollers readily. The fingers project forward and are drawn down toward the belts when they are passing between the rollers, so as to clamp the sticks of wood and hold them firmly; but as they come up over the rollers from below they project upward so as to allow the wood to be placed immediately in front of them so that they will come down on, and clamp it fast. Rails or ways are made alongside of the belts, whereon the wood pieces are moved to and from the saws. Intermediate supporting rollers may be employed, as required to support the belts. The saws are arranged to be adjusted on the mandrels so they can be shifted to saw the pieces in different lengths.

Value of Patents,

AND HOW TO OBTAIN THEM.

Practical Hints to Inventors.

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

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Notes & Queries

J. B. asks: Is there anything poisonous from a cast iron furnace when wood is used for fuel?

J. W. J. says: How can I make a cheap calcium light to experiment with? What kind of gas shall I use?

E. T. C. asks: What kind of oil is best for a blacksmith's bellows? Is there anything not injurious to the leather or poisonous that can be used in the oil, that will prevent rats and mice from gnawing the leather?

R. H. D. asks: What advantage have turnbuckles over nuts and check nuts, for the shrouds, stays, etc., of small boats? The latter are so much cheaper, that I would prefer them if as good.

J. Q. asks: What is the difference in the crushing weights of a stamp that weighs 500 lbs., with a face six inches in diameter, and a wheel that is six feet in diameter and 18 inches face, and weighing eight tuns, rolling or twisting around on a circle of six feet in diameter.

A. Z. says: I have a portable steam engine, 120 lbs. power, 4 feet stroke, and 3½ inches bore; the length of the boiler is 6 feet, the diameter 38 inches, with 32 flues. In trying to run a 50 saw cotton gin, I hitched the piston to an ordinary wooden fly wheel with a drum of 5½ feet diameter. The gin runs perfectly well with 70 lbs. of steam, but soon the speed diminishes till it runs very slowly. What must be done to make it run? What is the reason it does not keep its speed? If I attach two small fly wheels to the main shaft of the gin, on one or both sides, do you think that it will help the steam to keep up a sufficient speed?

A. M. says: I am running a circular saw mill, making 500 revolutions per minute. The saw is 60 inch, friction feed; saw mandel is 3½ inches cast steel running in self oiling Babbitt lined boxes. The box next to the saw is hot all the time, but the box next to belt runs cool. I have refilled the box several times and in different ways without success. I use lard oil and have changed mandels twice in six months. It will get hot, whether the saw is on or not, if it runs one hour. Can any one explain?

H. C. D. says: I have an 18 × 75 foot open flat boat, which draws 4 inches: also have (and wish to apply to it as a power, by suitable cog gearing and pitman connections to a steam wheel) a 10 or 12 horse power portable engine of 150 revolutions per minute. I wish to know what are the best length and width of bucket, diameter of wheel, and speed of same. What size should the shaft be to drive said boat 3 miles an hour against a current of 3 miles an hour when the boat is loaded to draw 10 inches?

Answers to Correspondents

C. C. S. asks: How can I construct an ice boat? Answer: Read page 88 of our volume XXVI.

H. E. B. repeats B. W. C.'s query. Answer: See our reply on page 171 of this volume.

D. A. K. will find full directions for a bath for nickel plating on page 65 of our volume XXVI.

W. E. G. says: I received the Scientific American dated March 1st on February 22 containing "Index of inventions for which letters patent of the United States were granted for the week ending January 28, 1873, and each bearing that date;" how can this be when you publish your paper and subscribers receive it on February 22? Answer: The Scientific American for each date is issued in the preceding week, and contains the latest Index of Patents published by the Patent Office. Our correspondent's statement is perfectly correct.

J. A. & Co. say: We put a set of new tubes in a small upright boiler; and in eleven months they were corroded so that we had to put in another set. Will you please inform us what ingredients and what proportion we ought to put in our tank (which we pump from) to prevent the corrosion in the boiler? Would it be best to use copper tubes? Answer: We should require a knowledge of the character of the impurities of the feed water before we could give an intelligent reply.

A. H. M. says: In your paper of March 1, you inform A. B. S. that the back pressure on engine is about ½ lb. per foot of submerged end of exhaust pipe. If this is correct, please explain this phenomenon. I have a steam pump, and within about ten feet of it stands a cistern, the bottom of which is 6 feet above the exhaust pipe of the steam pump. I placed an upright wooden pipe, 3 inches bore, between the pump and cistern, of sufficient length to reach from the ground to above the top of the cistern. I took the exhaust pipe (1½ inch gas pipe) into the side of the wood pipe, level with the engine, ten feet above, at the top of the wooden pipe. I run a 2 inch pipe horizontally over the top of the cistern and turned it down into the cistern, which is 4 feet deep, within a foot of the bottom. The cistern is usually full, or nearly so, of cold water. The pipes were all airtight from end to end, except a hole, ¼ inch in diameter, bored into the perpendicular wood pipe 2 feet below the exhaust pipe, intended to let off the condensed steam. Result: Upon starting the engine (pump), a stream of cold water started from the small opening with the force of say about 10 feet head. I enlarged the hole until, finally, I made it 1½ inches in diameter, which had only the effect of increasing the discharge of water. In fact, it made and maintained a continual siphon whether the pump was running or not. The speed of the pump did not appear to be affected, but it occasionally pounded as from water in the steam cylinder. I finally overcame the difficulty by a valve in the top of the perpendicular pipe opening inwardly, but held closed by a slight spring. Now when it inclines to draw the water over by the vacuum found in the siphon, the valve admits air which the next exhaust forces down into the cistern, keeping up a commotion at intervals of say three to five strokes of the pump. If there had been the back pressure stated, could a vacuum have been formed sufficient to have made a siphon? Answer: The arrangement described forms a pretty effective condenser, as first made. As modified, our correspondent will find, we presume, should he measure it, a back pressure such as we stated, so long as the mingled steam and air are being forced down into the tank. With a steam engine exhausting into its own feed water tank, the first effect, on starting the engine, might be to produce a vacuum in a similar manner, but, as the exhaust is capable of heating several times the weight of the feed to the boiling point, condensation would soon cease, the vacuum would be destroyed, and the back pressure would become a load on the engine.

W. S. B. says: I was with Mr. LeVan when he examined the boiler at Conshohocken, Pa. Mr. LeVan found the iron reduced to three sixteenths in one place, which was not where the boiler burst from the strain upon it, but where the mud drum was torn off. His statement that the steam gage ten minutes before showed a pressure of 53 pounds is incorrect, because there was but one gage in the mill, and the boiler was shut off from that one. There are today worse boilers in this mill working at from 60 to 125 pounds pressure. I saw one, this week, taken from the next furnace to the exploded one, with 18 patches on the fire sheets. I heard the proprietor say last summer, in reply to the engineer's opinion that they were carrying too much pressure, namely 100 to 110 pounds, that it was all nonsense, that those boilers were able to stand 150 pounds pressure. The trouble was that they wanted one man to do three men's work, and one man was doing it for less than one good man's wages, and he forgot to open the connection with the other boilers. The loss of 17 human lives was the result, with many more persons crippled for life. Please state at what pressure the safety valve, as described last week, would blow off. Answer: Such an arrangement of steam gage has been a cause of quite a number of explosions of old and worn out boilers. The effort to obtain the labor of three good men by paying a low price for the time of one man is another cause, which, perhaps, operates quite as often in producing explosions as almost any cause appertaining to the boiler itself. We fear it may be a long time yet before it shall have become a well recognized fact that nothing is ever saved in the long run by attempting to obtain service of any kind without giving the proper equivalent. Should other explosions occur, as apprehended by W. S. B., he will have the satisfaction of knowing that he has done a duty in the premises by giving fair warning through the Scientific American to those interested. We do not know to what safety valve the last paragraph refers.

J. W. S. says: I am firing a twenty-five horse portable tubular boiler with soft coal. How much more fuel will it take to fire with the furnace door open than with it closed? I run steam down hill to one 12 horse engine through 850 feet of 1¼ inches pipe, boxed in and packed with sawdust. Thinking that some of the power was lost in carrying steam so far, we fitted on a steam gage on steam pipe at engine and found 2½ pounds more pressure than the gage showed on the boiler. We then placed our gages together on the boiler and found them both alike, both standing at 80 lbs. How does this occur? I have seen it stated in your paper that steam loses one pound in passing through each ten feet of pipe. We also run steam up hill 300 feet, in 1¼ inches pipe to a 12 horse engine. Placing the gage there, it indicated 5 lbs. less than gage on boiler. But the pipe runs under a road, and the dampness may condense the steam there. Does it take more steam to run up hill than it does down? What is the difference (if any) in the pressure on top of a boiler and on the bottom? Take a very light carriage, something like a velocipede only three wheeled with one person on it. How many pounds of force is required to propel it one thousand yards, on level ground, in one minute, and how much on an iron track? The power is to be applied in the form of a weight.

C. E. G. says: I want to know how the black glove finish is put on to such articles as harness buckles. Answer: Dissolve three sticks of black sealing wax in half a pint of alcohol. Apply with a sponge.

J. L. J. asks: What do you mean by excessive priming? Answer: Priming is water carried into the cylinder of an engine by the steam, and it causes pounding of the piston and wears away both piston and cylinder. Dry steam alone should be admitted to an engine. In answer to your other question: Yes, very creditable. Persevere.

J. B. F. asks: Why is there a star marked in the constellation *Leo* (second star from point of the Sickle) called *Ras-al-Asad*, of the third magnitude, while it is not to be seen there? Answer: This star (called *Rasalas* in Procter's atlas) is to be seen at any time in the designated place.

Several correspondents have called our attention to an omission in the paragraph relating to the cone pulley on page 123 of the current volume of the Scientific American. The length of line B C is not given. It should be made equal to the difference between the least and the greatest radii of the cone.

N. C. M. says: On October 15, 1872, a short time before sunset, I saw a spot upon the sun with my naked eye. Viewed through a field glass of good power, it was resolved into two spots, very close together, and several other smaller spots were visible. The atmosphere at that time was quite hazy. Were the sun spots at that time remarkable for their size? Answer: November 10, 1872, and thereabouts was a period remarkable for the size and number of the spots on the sun; one double spot was to be seen as single with the naked eye. Taking into consideration the time of the sun's revolution on its axis (about 25 days) the same group would have been visible on October 15.

C. W. W. asks: When did the vernal equinox fall back from March 21 to March 20? Answer: The answer to the question in regard to the vernal equinox involves the whole theory of the construction of the calendar; it may be found in any encyclopædia and almost every work on popular astronomy. Lockyer's "Elementary Lessons in Astronomy" well discusses the subject, in the chapter on the measurement of time. Our correspondent falls into error in supposing that there is or ever has been any positive fixed date for the occurrence of the equinoxes. It is impossible to avoid some variations, as the time of the sun's revolution from one equinox to the same equinox again is not an exact number of days. It has been the object of all calendars to so correct the resulting errors that the variations are kept within as small a limit as possible. By the system now in use, instituted by Pope Gregory XIII in 1582, the vernal equinox is always reckoned on or near March 21. This year it happens on March 20.

J. W. P. requests us to publish information about how to make good hard soap, and the chemistry thereof. Answer: To make soap, boil fatty or oleaginous matter with a weak alkaline lye rendered caustic by quicklime, and add portions of stronger lye from time and time, the ebullition being still continued until these substances, acting on each other, combine to form a tenacious compound, which begins to separate from the water; to promote this separation and the granulation of the newly formed soap, some common salt is added and, the fire being withdrawn, the contents of the boiler are allowed to repose for some hours in order that the soap may collect into one stratum, and solidify. When this happens, it is pressed into molds or cakes and, when quite solid, cut into bars. If the soap be made from the cheaper kinds of fat, it will hardly acquire firmness to satisfy the thrifty washerwoman; but it can be prevented from melting too rapidly in hot water by the introduction of 5 per cent of fused sulphate of soda. Ure says that this addition not only hardens the soap, but improves its color.

W. R. J., Jr., asks at what rate and to what extent mercury expands on the application of heat. Answer: Dulong and Petit found that mercury expands $\frac{1}{5550}$ of its volume for each additional degree (centigrade) of heat up to 100° C. From 100° to 200°, the average expansion for each degree is $\frac{1}{5425}$, and from 200° to 300° $\frac{1}{5300}$.

E. C. H. takes exception to our reply to a correspondent that the rotundity of the earth is 8 inches per mile. By the rotundity of the earth, expressed in inches, we mean the distance of the surface of the planet from the extremity of a line whose other end is tangential to the curve. The common formula is: ⅔ of the square of the distance in miles will give the rotundity in feet. Square of 1 mile is 1; ⅔ of 1 foot is 8 inches.

P. L. D. asks: Can any of your readers give any information as to the best method of making paper transparent, but the substance used must not prevent the use of mucilage on the paper? Answer: Canada balsam and turpentine make a good preparation for tracing paper.

L. E. H. asks: What regions of the world produce gutta percha, and India rubber or caoutchouc? Answer: Gutta percha comes chiefly from Borneo and other islands of the East Indian archipelago, and caoutchouc from South America and the East Indies.

W. F. C. S. asks: 1. What proportion ought the tooth of a gear wheel to bear to the space between it and the next tooth? 2. We have a six wheeled switch engine with four equalizers, two on each side. The engine when started with a train of cars would cock up her front and duck her rear, as far as the vertical play of the jaws would allow. The fault was discovered to be caused by the front equalizer. How is this? 3. What is meant by the point of suspension being above the center of gravity? Is it as seen in a scale beam? Answer: 1. The side clearance in gear wheels will properly vary with circumstances. We have seen but a sixteenth allowed in a well cut mortise gear of 4½ inches pitch, and, on the other hand, that amount of clearance is none too great, in a rough cast gear of an inch pitch. 2. With the second arrangement, the engine was tied down forward, while, with the first, as we understand the two arrangements, the equalizers allowed the main frames to take a position in line of draft. 3. Precisely.

H. P. & C. asks: In the construction of a hydraulic ram should the pipe that conducts the water from the ram to the place required be larger at the axle end or *vice versa*? Is tin lined lead pipe preferable to ordinary gas pipe for that purpose? Answer: A pipe of the same size all through will do. Tin lined pipe unnecessary.

J. B. J. says: You replied to P. R. S. who wanted to know how much water it takes to run a ten horse power steam engine per hour; your answer is from 50 to 200 gallons per hour, according to quality of boiler and machine. Is the answer correct? Should it not be per day? Answer: Our reply reads as we intended it should. A good 10 horse power engine with equally good boiler should require about 30 gallons of water per hour. This is something over 200 pounds, and it would be evaporated by 30 pounds of coal. Three pounds of coal per horse power per hour is extraordinarily good work for such small power. About 1,700 pounds, or 200 gallons of water requires frequently 200 pounds of coal for its evaporation, and a ten horse engine has been known to reach this figure on many occasions.

W. H. W. asks: How is petroleum applied to boilers to remove scales, I mean such as locomotive boilers, that cannot be got into? Is it not apt to make the boilers prime? Answer: When the boiler is empty, and just before filling it, put in the petroleum. Then turn on the feed, and as the boiler fills, the oil, floating on the water, reaches every part and saturates every square inch of incrustation.

M. J. D. asks: Will you give me the rule for finding pressure per square inch on slide valve? Answer: We know of no recorded experiments on this point. If our readers can give the information, we shall be pleased to receive it. We think that some of our friends of the Engineer Corps of the navy can enlighten us.

T. P. says: My friend argues that a chain wound around a log and fastened to a pin in the log will roll up the skid poles on to a wagon more easily than it will by simply running the chain once around the log and fastening to the wagon. I contend that it makes no difference where the end of the chain is secured; the draft to the horses is the same, as the pulling point is always on the top of the log. He contends that winding the chain around the log helps to roll it, as part of the chain is pulling down on the side of log next to wagon. Answer: T. P. is right.

M. D. asks: 1. How long is a knot, used in estimating the run of a steamboat? 2. What is the area of a sphere or globe four feet in diameter? Please give a rule for the same. 3. How much more water will a forty horse power boiler evaporate with one pound on the safety valve than if there were ninety pounds, other things remaining equal? Answers: 1. The knot or nautical mile is about one sixth longer than the common statute mile. It is given by various authorities as 6,079·4 6,086, 6,120 and 6,139·75 feet. Bowditch gives 6120. The United States standard and most generally accepted value is 6080·27 feet. 2. The surface of a sphere is calculated by multiplying the square of its diameter by 3⅐ or more exactly, by 3·1416. The solid contents is measured by the product of the cube of its diameter by ⅙, or, to be precise, 0·5236. For a sphere 4 feet in diameter, these values are 50·265 square feet and 33·510 cubic feet. 3. In the inverse proportion of their total heats. If in both cases the boiler was fed with water at a temperature of 32° Fahr., the proportion would be as 1.148 to 1,123, about 2 per cent.

"Anxiety" says: I have a brother fourteen years of age who appears to be deficient in capacity and inclination for books. I am without sufficient patience to teach him, and I have found after schooling him two years that he cannot spell the simplest words, neither can he parse, or work out the easiest sum in arithmetic. Evidently the schools should share equally the blame; but I write for your advice regarding a trade for him. He can make a good pigeon house, ladder, and chicken house, appears to be fond of lending a hand to everybody about the house, and centers every interest in pigeons and chickens. What must I do with him, I mean, to have him out of my sight? Can I apprentice him? Answer: In the first place make up your mind to be really a brother to the poor boy; that is, be to him a loving and devoted friend. Bear with his infirmities, encourage the development in him of a good character by the exercise of the most patient kindness on your part. Take an interest in what interests him, and kindly endeavor to help him therein. Poultry breeding, especially of improved varieties, is not a bad occupation and requires the exercise of considerable intelligence. Supply him with pictures upon the subject, tools, materials and specimens of poultry, that is if you have the means. He will thus insensibly acquire a taste for that kind of information and ability to make use of what he knows; and thus a stepping stone to improvement in other directions, mental and practical, will be insensibly gained. Do not undertake to drive him out of your sight because he is a nuisance; on the contrary, strive to see how much you can improve and lift him up. But if there is any body in the world who can be a better friend to him than yourself, it might be your duty to encourage him to enjoy such influences.

M. A. H. says: I have in view the improvement of a small water power; the fall is about 28 feet. The hight of dam will be 10 feet. I propose to use a small turbine, and convey the water from dam to wheel in a penstock. The whole length of penstock will be about 300 feet; about 120 feet of it will be on a level with base of dam and the last 80 feet will be built down a steep incline, the lower end being 28 feet lower than the upper. The wheel is said to use under this head 156 cubic feet of water per minute. The diameter of penstock when attached to wheel is 12 inches. What I want to know is: Shall I get the benefit of the whole fall if I make the penstock the same size all the way? If not, would it do to construct the portion on a level with base of dam of 16 inches diameter and the remaining part 12 inches? Also which would be cheaper, water or steam power? Can the tables giving power and quantity of water for turbines be relied on? Answers: 1. Make the penstock of a section at least as great as the wheel and of uniform size. The effect will be that due the whole fall less the moderate friction of the pipe. 2. Where it is uniform and reliable throughout the year or that portion of the year during which it may be required, water power is cheapest. The advantage of steam power lies in its reliability and uniformity and the privilege which it permits of locating the manufactory where convenience of transportation and proximity to market may make it desirable. 3. The tables of power of turbines are often unreliable; consult only those which are known to be based upon actual tests of the wheels themselves. If a manufacturer will consent to allow a test of his wheel before purchase, he can evidently be trusted.

F. H. D. says: 1. How far is it practicable to carry steam from boiler to engine under about 60 lbs. pressure with pipe well protected? 2. How high vertically can water be raised with steam siphon through an inch pipe under same pressure? 3. Will coal tar do to paint tin roofs? 4. With 10 feet fall of water, what per cent of same could be raised 50 feet with hydraulic ram? Answers: 1. By very carefully protecting the pipe with non-conducting and non-radiating covering, and providing for the trapping off of water of condensation, steam can be conveyed almost any distance without great loss. Always make a steam pipe as short as possible, nevertheless. We have seen steam conveyed several hundred feet in well covered pipe, but the most economical steam engines which have come under our observation have had short steam pipes. 2. We know of no experiments on this point directly. The Giffard injector has been made to force water into a steam boiler while supplied with its own steam from a separate boiler carrying but half the pressure of the first. We should, from this fact, judge it possible for a well proportioned steam siphon to lift water to a hight of nearly 120 feet, with 60 lbs. steam. We should make the pipe large in proportion to the size of the instrument. The friction of water in pipes is often a serious retarding force. 3. Yes. 4. The hydraulic ram, if well designed, should force, with a fall of 10 feet, about five per cent of the water supplied to it to a hight of 50 feet.

A. W. asks: Did you ever know of an instance of the water leaving a steam boiler and going into the main steam pipe, so as to fill the pipe and stop the steam pump? If so, what was the cause and what is the remedy? There has been a case of the sort brought to my notice, and I know of no cause unless it was because it was a new boiler, and that there was animal grease enough about it to make it foam badly. The boiler is connected with seven others, six of which are old boilers and never known to foam. It has always happened in the night time, when the rest were making little or no steam. The water used is river water. If this boiler be cleaned so that there is not much fire under it before cleaning the others, it has ceased to trouble. Answer: Cases have occurred in which steam has gradually filled a pipe as described, by condensation, where little or no current was passing through. Other cases are often met with in which so great a velocity has occurred as to take over sufficient water mechanically—by foaming—to choke a pipe. Our correspondent can judge for himself to which class of phenomena the case which he gives belongs.

E. R. D. says: I have charge of a 20x48 Corliss engine, making 56 revolutions per minute. On the side of the cylinder, there are two ½ inch globe valves for attaching an indicator. Can you tell me why I get strong electric shocks when I open either of these valves? Is it owing to the friction of the escaping steam, or to superheated steam let in from the superheater? Let me ask, as to my letter, published on page 164 of this volume: Were the fires caused by electricity or superheated steam? I will add a little more information: About 20 minutes before stopping, the last fire is put on, consisting of shavings and coke screenings mixed. Five minutes before stopping, full feed is put on and kept on till the water is six inches above the top gage cock. Twenty minutes after stopping and shutting off all valves, steam rises from 40 to 100 lbs., and will continue to rise if more cold water is not let into the boiler. Answer: The discharges are produced by electricity generated by the friction of particles of water, mingled with the escaping steam, against the sides of the orifice. Faraday proved that perfectly dry steam would not produce this effect. Superheated steam therefore, is not the cause, in this case. It is very probable that the fire referred to may have been due to electrical sparks, which are quite capable of igniting very inflammable substances.

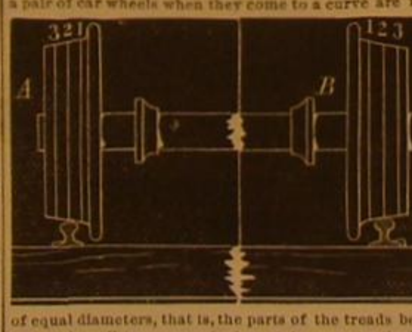
C. asks: If it is 14 feet from the rim of one driving wheel of a locomotive to the rim of the other, how wide should the tire of the driver be to remain on the track going around a 14 degree curve? 2. Is it, or is it not, atmospheric pressure which causes water to rise in a pump to fill the vacuum caused by the valve? Answers: 1. Lay it down on paper and determine it for yourself. You will be better satisfied than with a mere estimate. 2. It is.

W. S. H. asks: Which is the best form of punch for this hammered iron? Should it be straight, with parallel sides, as at A, or conical, as at B, or hollowed, as at C?

Answer: The straight punch will be preferable, as the others will be more easily broken.

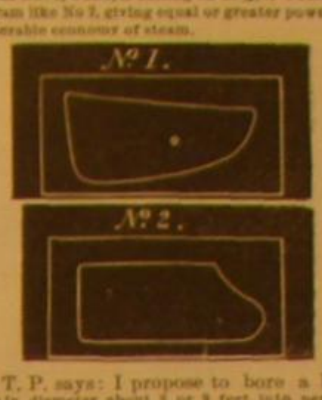
F. says: There are two lines of heavy shafting upon the same plane, but they are at an angle with each other of 22°. I wish to communicate 100 horse power from one to the other. The common mode, I am aware, is with gears, but in this case the noise is a serious objection. The driving shaft runs at a speed of 100 revolutions. Hooke's universal joint can be used successfully up to 15°. Can you inform me whether it is practicable to use three of Hooke's universal joints of 11° each, and in this way make the angle of 22°, communicating 100 horse power, and driving the second line of shafting? Will it work? Will the percentage of loss of power be greater than it would be if gears are used? Will the motion of the shaft driven be irregular? The size of shaft used is 3¼ inches diameter. Answer: Three Hooke's joints would be likely to give trouble by the difficulty and expense of hanging and wear while driving them. The motion would be slightly irregular. There are patented modifications of Hooke's joints which are claimed to work well at any angle. If practicable, a belt led around guide pulleys would probably give most satisfaction, if it is impossible to use gearing. A double Hooke joint will give regular motion. In this form, an intermediate shaft is connected with each main line by a Hooke joint at each of its ends.

J. C. C. says that our answer to J. H., as to sliding of wheels on curves, was correct. Without coning, the flanges would last but a short time. The proposition of J. J. C. will not convince any railroad man that coning is an injury, from the simple fact that a pair of car wheels when they come to a curve are not



of equal diameters, that is, the parts of the treads bearing on the rail (see engraving) as at A, curve to the left and at B to the right. The wheel, being largest at or near the flange, travels a greater distance in the same number of revolutions than it does at figure 3, allowing it to curve without grinding the flanges, that is, if the curve is not too sharp; but the instant the wheel comes to a straight track, the bearings on the rail become of equal diameters, and the least tendency to vary from the center of the track is regulated by the cone. If J. J. C. will examine a pair of driving wheels with the coning worn off, he will find the flanges half ground off also, that is if the drivers are run very long after they become cylindrical or nearly so.

W. T. asks: Will you please give me the calculation for horse power practically in use under the following conditions: 10 inch cylinder, 2 feet stroke, cut off at end of stroke. Steam enters through about 10 feet of 2½ inch pipe. Pressure on boiler, 100 lbs., number of revolutions, 90. I do not know what to allow for friction and loss of pressure of steam in transmission; and the calculation without allowances gives so much that it would seem to require a considerable deduction to accord with our ideas of what we are using. Answer: A ten inch cylinder has 78½ inches area of piston; steam entering through 10 feet of 2½ inch pipe from a boiler carrying 100 pounds steam should reach the cylinder with a pressure of, probably, not less than 90 pounds, the engine making 90 revolutions per minute. The mean pressure will be reduced somewhat in the steam ports and, it may be, very greatly. We can tell nothing about it without seeing an indicator card. We can only guess that the average pressure on the piston in such an engine, under such circumstances, will not exceed 60 pounds per square inch. The horse power would, in such a case, be $78\frac{1}{2} \times 60 \times 90 \times 4 \div 33000 = 51$]. This, our correspondent must remember, is merely an estimate. An engineer accustomed to the use of the indicator can settle the matter at once. The steam pipe is large enough. The valve should not be allowed to follow full stroke. It would save fuel and give more power if cutting off at ½. An engine following full stroke usually gives an indicator card like No. 1, while, if cutting off at ½, it would make a diagram like No 2, giving equal or greater power with considerable economy of steam.

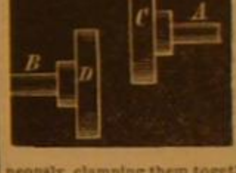


N. T. P. says: I propose to bore a hole 8 inches in diameter about 8 or 9 feet into permanent moisture, insert a lightning rod into this hole to the bottom, and then fill the hole nearly to the top with small scrap iron. Will this give sufficient dissipating surface? Answer: The ground connection which you propose is much better than the common practice of merely sticking the extremity of the rod into the ground for a short distance. The value of a ground connection depends on the quantity of conducting material which is introduced between the extremity of the rod and the earth. The greater the quantity of the conducting material, the better. Scrap iron is good for the purpose. Coke and charcoal are also excellent.

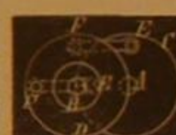
J. M. M. asks: Is there any liquid that can be prepared to black stoves with and not burn off, different from common blacking? Answer: There is nothing better than first quality plumbago for blacking stoves.

W. McC. asks: Can you tell me whether pine stumps can be blasted by any known process that will be cheaper than extracting them with a machine? What would be the cheapest and safest mode of blasting? Answer: Removal by the machine would be more effective than blasting, probably also cheaper. We have seen it stated that a good method is to bore the stumps and pour in petroleum. In a few days the oil will have penetrated the stump, which is then set on fire and will burn until consumed.

J. E. W. says: I have two shafts parallel to each other, distance from center to center three inches. I desire to transmit positive motion from one to the other, both to run at the rate of from 3,000 to 3,500 revolutions per minute and with as little noise as possible. Please tell me the most practical, durable and economical way to accomplish it. Answer: Will not this do?



A and B are the two shafts, two inches from center to center. Fit on end of each a face plate, C D, and connect with links, E F, each three inches from center to center, making both links of same length by drilling the holes for pins simultaneously, clamping them together during the operation, and drilling in face plates, with equal precision, holes to take the pins. Then assemble as in the next figure. The face plates must be of such size that the distances E E and F F shall exceed the length of links over all, as otherwise they could not pass each other while revolving. Grind the pins to fit. If this will not do, try friction gearing, if the work is light and it can be worked in.



T. A. claims that January 1st, 1901, is the first day of the twentieth century. H. claims that January 1, 1900 is the first day of the twentieth century. Which is right? Answer: T. A.

Wm. H. Seaman, Lecturer on Botany, Howard University, Washington, D. C., says in reply to E. S. who asked how to preserve the morning glory pollen as a microscopic object: By mounting it in a cell filled with a mixture of glycerin, distilled water and alcohol, you can keep it in a natural condition. The proportions of the ingredients must be varied according to the nature of the object. The density should be that of the sap of the plant and this is arranged by altering the proportion of glycerin. If it is required to preserve color, but very little alcohol must be used, and a drop of carbolic acid to a dram of fluid is a useful addition. Verrill's solution is also very suitable.

COMMUNICATIONS RECEIVED.

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

On the Million Dollar Telescope. By S.V.C., and by S. L. D.

On the Creeping Rail Problem. By M. S. M.

On Small Pox and its Remedies. By A. B.

On Steam Launches. By J. T. B. S.

On the Atmosphere and the Milky Way. By H. A. C.

On the Motions of the Sun. By C. H. B.

Also enquiries from the following:

J. D. N.—C. W. H.—W. I. L.—J. F. E.—F. C. J.—W. C.—R. C. L.—H. B. M.—F. B. M.—D. D. E.—J. E. R.—J. A.—S. D. N.—G. R.—J. N. B.—C. W. J.—W. D. P.—S. & Co.—W. B.—H. W. A.—H. G.—F. H. L.—R. H. B.—R. A. D.—R. C.—A. C. B.—J. C.—J. C. H.—H. A. V.—W. H. T.—J. S. T.—N. M. L.—J. S.—A. B. & Co.—W. H. O.—W. F. D.—A. D. H.—R. H.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

March 4, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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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:

21,391.—Iron Moving Machine.—C. Hewitt. May 21.
21,402.—Steam Regulator.—A. P. Pitkin. May 28.
21,432.—Rolling Metal.—J. S. Palmer. May 28.
21,456.—Railroad Bar.—H. Webb. May 28.
21,478.—Stone Saw Machine.—A. M. Merriman. June 4.
21,481.—Loom Brake.—B. & G. B. Reynolds. June 4.
21,512.—Car Bolster.—A. Ward. June 4.
21,513.—Steam Drying Cylinder.—A. P. Pitkin. July 2.
20,415.—Winding Thread.—H. Conant. June 4.

EXTENSIONS GRANTED.

20,153.—Ruling Machine.—J. B. Blair.
20,172.—Ticket Printing Machine.—R. M. Hoe.
20,246.—Meat Mincer.—A. W. Hale.
20,163.—Bottle Stopper Fastening.—H. W. Putnam.

DESIGNS PATENTED.

6,460 to 6,472.—Carpets.—H. R. Campbell, Lowell, Mass.
6,473 to 6,479.—Carpets.—J. M. Christie, Brooklyn, N. Y.
6,480 & 6,481.—Carpets.—H. F. Geotze, Boston, Mass.
6,482 & 6,483.—Carpets.—J. Hamer, Lowell, Mass.
6,484 & 6,485.—Carpets.—C. S. Lilley, Lowell, Mass.
6,486.—Carpets.—D. McNair, Lowell, Mass.
6,487.—Carpets.—T. J. Stearns, Natick, Mass.
6,488.—Ornamentation.—G. R. Fagan, Philadelphia, Pa.
6,5269.—Bottle.—H. Sawyer, Chelsea, Mass.

TRADE MARKS REGISTERED.

1,153.—Coffee.—W. H. Crawford & Co., Baltimore, Md.
1,154.—Shirts, etc.—L. Sternberger, Philadelphia, Pa.
1,155.—Tobacco.—J. W. Stone, Lynchburg, Va.
1,156.—Medical Compound.—H. A. Tilden, New Lebanon,
1,157.—Chemical Compound.—J. W. Chisholm, N. Y. city.
1,158.—Bread.—MacWilliams & Pieper, Baltimore, Md.
1,159.—Tobacco.—J. W. Stone, Lynchburg, Va.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On an application for Design (7 years)	$15
On an application for Design (14 years)	$30

CANADIAN PATENTS.

Official List of Patents Granted in Canada from January 22, 1873, up to and including February 14, 1873.

Patents taken by citizens of the United States are marked U. S.

[Note.—Under the new patent law, now in vogue, American citizens may patent their inventions in Canada on favorable terms. For full particulars, address Munn & Co., Office Scientific American, 37 Park Row, N. Y.]

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Bracket sheave, W. Murphy, Feb. 12	2,045
Lap board, S. Mahan, U. S. Feb. 12	2,046
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