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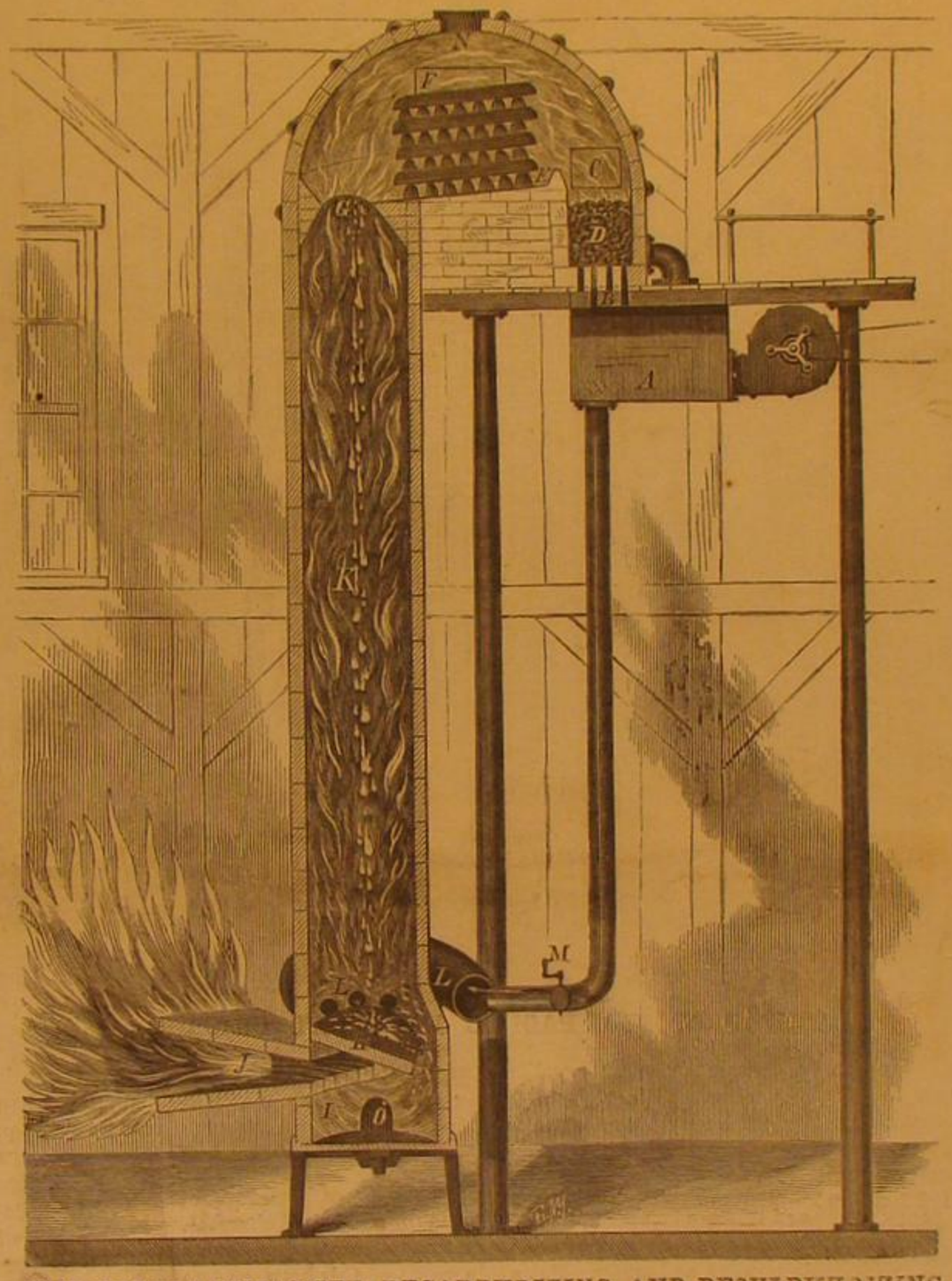
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

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The Peters Process of Manufacturing Steel from Pig Iron.

One of the fields in which great advancement has been made, and in which a great many are still earnestly striving to make improvements, is that of the production of refined iron and steel by new processes which do not involve the necessity of puddling by manual labor, as is the old practice.

The annexed engraving represents a vertical section of a furnace for decarburizing and desulphurizing iron in the manufacture of cast steel for rails, car wheels, guns, etc., it being a modification of the reverberatory and cupola furnaces combined. The blast enters the air chamber, A, under the scaffold, and passing upward through tweers, B, to the fuel—either anthracite or bituminous—which is supplied through the small door, C, into the fire-box, D, passes from thence to the dome of the furnace, the flame playing upon the pig iron which is piled upon the bed or hearth, E, and which is introduced through the large door, F. The vertical part of the furnace is contracted at the top, G, so as to retard the exit of the flame at that point, and the product of combustion passes down on to the platform, H, which may be supported from the bottom or from projecting brick from the sides. The platform, H, is composed of fire-brick or any incombustible material; and the products of combustion then pass on into and through the reservoir, I, and finally escape at J. The reservoir, I, having thus attained, after a time, intense heat, is now ready to receive the molten iron as it falls in globules, K, from the top of the furnace or stack, through the flame and on to the platform, H, previously described. The concussion causes them to burst upon the platform, liberating all the free carbon and all the gas or sulphur contained therein, and thereby increasing the density of the metal. A blast through the tweers, L, is caused to play upon the iron, while thus in a finely divided state, similar in form to scales. This supply of oxygen brought in contact with the particles of iron completely decarburizes it and also frees it from any remaining sulphur or other impurities. Also the unconsumed carbon from the fuel above is supplied with oxygen at this point, and consumed, producing intense heat. It will be observed that each particle of iron is, without coming in contact with the fuel exposed to the flame and blast, and undergoes a self-puddling process by falling from a hight of fifteen feet or more. Manganese and charcoal are placed in the reservoir, I, for the purpose of a final fluxing and recarburizing, as may be desired.



THE PETERS COMPOSITE DECARBURIZING AND DESULPHURIZING FURNACE.

By turning the blast off with the damper, M, in the lower tweers, L, all the advantages of the reverberatory furnace are secured, while purer and stronger iron is obtained for ordinary foundery purposes, where clean castings are essential, with the additional advantages of the puddling process. The escaping flame may be utilized by leading it under a boiler, or for other purposes. The opening at the top of the arch, N, is for letting off the smoke when starting the fire, and to be closed with a cover of fire brick while melting. The bottom of the reservoir, I, may be constructed with a drop bottom, like the ordinary cupola, for the purpose of repairs, etc. The metal is drawn off at O, into ingots. It will be seen that the area of the puddling platform, H, can be increased if desirable. If crucibles are used for pouring the metal, they can be heated to any degree by placing them in the flue at the escaping point, J, of the flame, by arranging a small door at that point in the side.

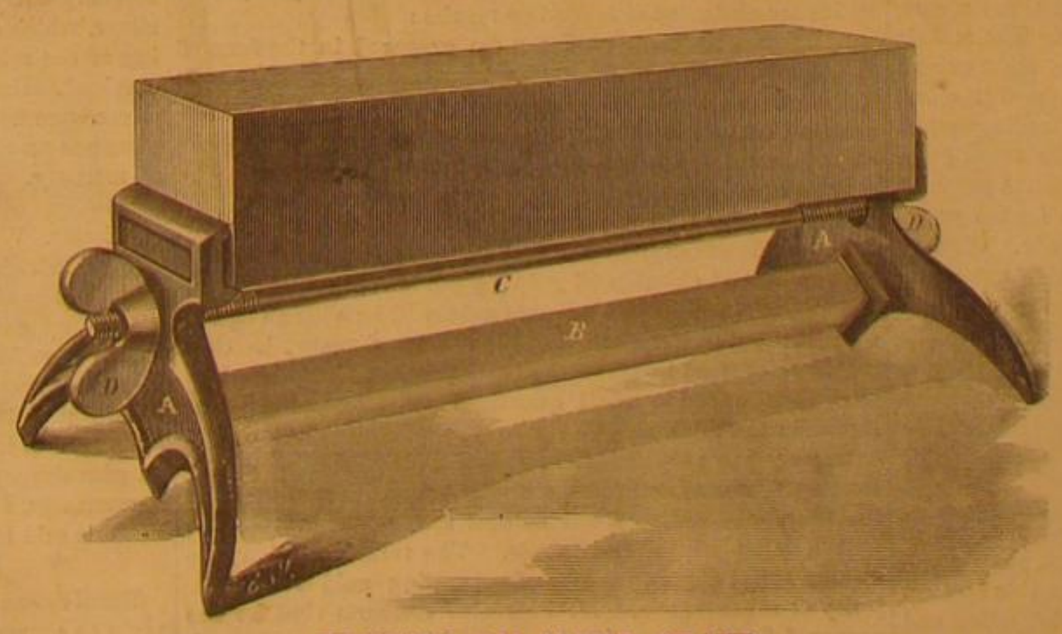
The inventor assures us that a very fine quality of steel can be produced by this method.

A striking feature is the cheapness of the required plant. The inventor estimates that he can put up a furnace that will melt and convert two tuns of metal per diem for $500, and one that will melt and convert five tuns twice a day for less than $3,000.

The inventor who is a practical iron master of long experience, would like to arrange with some capitalist to start and superintend the manufacture of steel by this process. The device was patented, through the Scientific American Patent Agency, Nov. 2, 1869, by Charles Peters, of Trenton, N. J., who may be addressed for further information at 122 Jackson street, as above.

Improved Oil-Stone Holder.

The old method of setting an oil-stone in a wooden box with a cover, is open to several objections. Only one side of the stone is available for use except when by considerable trouble it is taken out and reset, bottom side upwards. The vertical sides are never available. The sides of the wooden box are receptacles for grease and accumulated dirt, and also are in the way in sharpening many kinds of tools. The stone is so close down to the bench that the handles of some tools, draw-shaves, for instance, strike the bench when it is attempted to sharpen them, and an extra stone held in hand, or the stone set in the box inverted and held in the hand has to be employed. Each of these objections is entirely obviated by the neat little device shown in our engraving.



BROWN'S OIL-STONE STAND.

In this stand the stone rests upon narrow ledges at each end, the ledges being cast upon the end-plates, A. The lower parts of these plates are formed into legs. A square wooden rod, B, fits into sockets formed in the end plates and serves as a longitudinal brace. The whole is clamped firmly by means of a longitudinal rod, C, and thumb-nuts, D.

By loosening the thumb-nuts slightly the stone may be turned so as to bring either of its sides to the top, and these sides may be shaped differently, if desired, for various kinds of tools.

By placing a shelf of wood underneath the stone to strengthen it, it may be used till worn nearly or entirely through. The device is very simple and will, we think, be found a very useful one by all who use an oil-stone.

The inventor will negotiate for the manufacture of the implement on royalty, or for the sale of the entire right; preferring the former, however, as it is his desire to at once put it permanently into market as a staple article in the hardware trade. Patented, through the Scientific American Patent Agency, April 26, 1870, by Homer Brown, whom address at Hamilton, Ill.

Zinc as a Building Material.

Stone and stone only, says the *American Builder*, has always been deemed by architects and others, the appropriate material to be employed in the ornamentation of buildings, and doubtless there has existed, until a comparatively recent date, the best of reasons for this theory. First, stone is durable; there is nothing ordinarily entering into the composition of our building, that, in this respect, can compare with it, and again from its peculiar facilities, few other suitable substances can be worked into the required form, offering the means for such boldness and strength in the general effect or such correctness and delicacy of detail. On the other hand, however, stone can be employed only at a considerable expense, both in working and in transportation, and, in some localities, distant from quarries, this expense reaches a point when the employment of such material is practically precluded, save where its use is an absolute necessity. In ornamented fronts especially, where stone has heretofore been considered indispensable, its use is discarding, and metal imitations are taking its place.

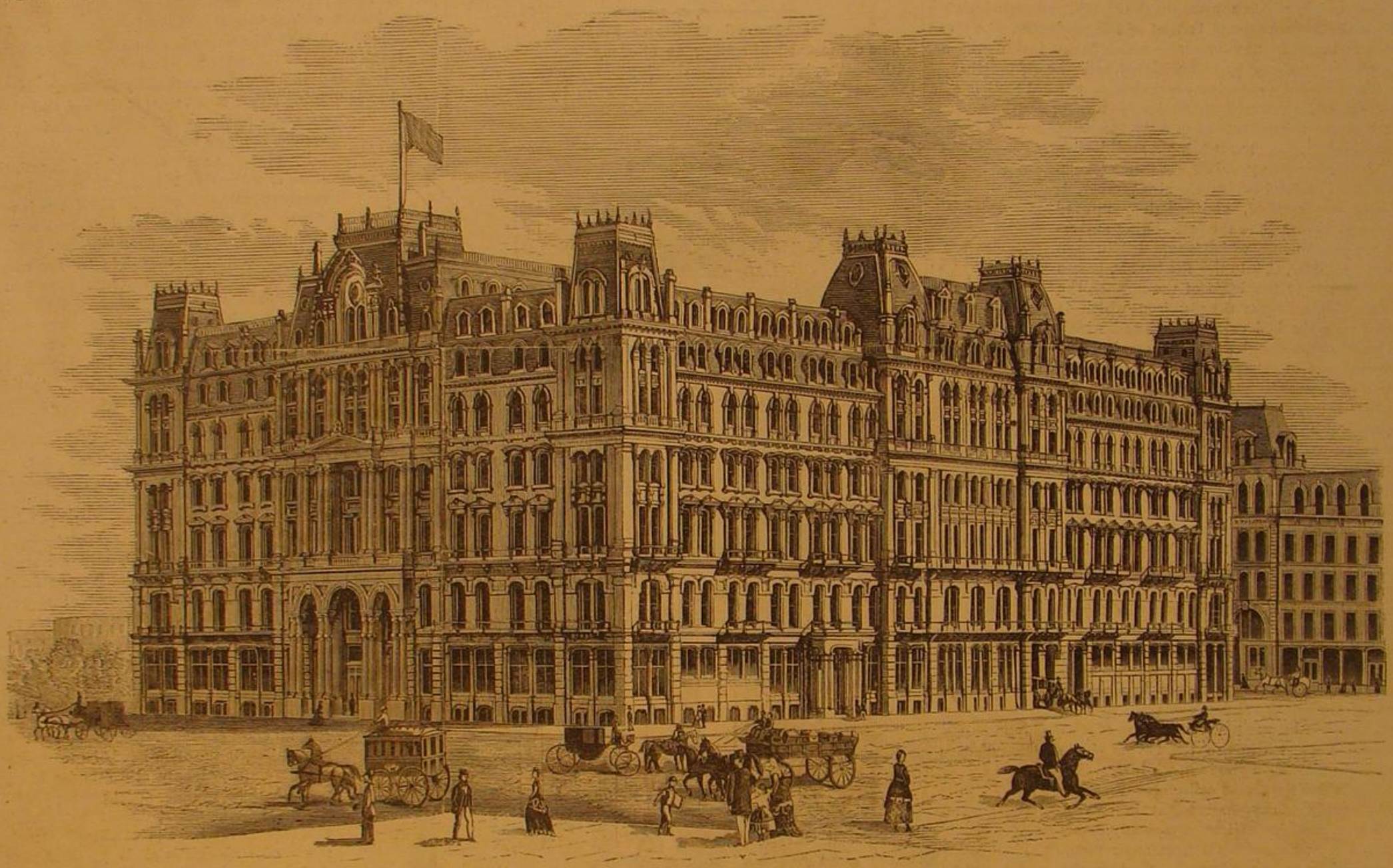
The principal objections raised against the use of metal, lie in the fact that it is untruthful, and therefore inappropriate, but certainly the use of an imitation in this particular is in no sense more inappropriate than the use of hollow iron columns in imitation of stone, and the employment of similar counterfeits in interior ornamentation. Prominent among the substitutes for stone is zinc, a material which has proved eminently adapted to the purpose, and is rapidly acquiring a place among the building materials from its adaptability to all form as well as from its lasting qualities. With the introduction of pressed ornaments of this material the expense of exterior decorations has been greatly reduced, and an additional advantage is gained in the fact that from the facility with which it is worked, there exists but little difference in the cost of the plainest and most elaborate patterns. The work when coated with paint suited to the purpose, may be made to resemble cut stone work so closely as to deceive the eye of any one not an expert, and in like manner the interior of buildings can be ornamented with zinc in imitation of stucco, or embellished with elaborate moldings at a small cost, which work may be cleaned at any time without fear of injury. In the ornamentation of old buildings, which if of cut stone, could only be accomplished by taking down the walls, zinc also plays a useful part, as decorations may be put on without displacing any portion of the structure. As a roofing material its value has become generally acknowledged in Europe, and, in this country, is rapidly acquiring an equally high reputation, particularly in the construction of large buildings. When exposed to the influence of the atmosphere, the oxidation that at once ensues instead of rapidly eating up the metal, soon forms a crust which hardens and effectually protects the body of the covering from further damage.

Henry Ford Hayden
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The points which we have presented above in regard to ornamentation are simply those which seem most important in demonstrating the value of zinc as a building material, and while we do not by any means advocate its use generally in the place of stone in ornamentation, where stone is plenty and cheap, yet we wish, if possible, to overcome the prejudice which appears to exist in many instances where the employment of zinc would be more economical and equally appropriate.

PACIFIC HOTEL, CHICAGO.

The Pacific Hotel Company are about to erect, at Chicago, the magnificent edifice of which we herewith give an engraving. The cost of the building is to be one million dollars and when completed it will be one of the largest and most complete hotels on the continent.



THE PROPOSED PACIFIC HOTEL AT CHICAGO.

It will occupy an entire block, bounded by Clark, Jackson, Lasalle, and Quincy streets. The opposite façade to that shown on Clark street is the exact counterpart of that on Lasalle street, save that it has full retail-shop fronts, adapting it to the business character of Clark street. The hotel has the following dimensions: front, on Clark street, 190 feet; on Jackson, 325 feet; on Lasalle street, 180 feet. A characteristic feature of the hotel is the adoption, for the first time in this country, of the internal glass-sheltered court, for the arrival and departure of guests. From the carriage court, where all the passengers and baggage are received, the former pass to the grand arcade, which occupies the second interior court of the building, upon which the three entrances on Lasalle, Jackson, and Quincy streets directly open. All the business offices of the house are thus on the lower floor, and of dimension and finish that justify the promise of the noble exterior. The house has five hundred and fifty-three rooms, exclusive of the public apartments and offices. The rentals of the company are further essentially helped by eight superb stores and twenty-two elegant offices, each the best of its class, and suited to its respective locality, on the leading retail and office street of the city. The material of the three store fronts will probably be the yellow Ohio sandstone. A proposal for a lease of the hotel portion of the structure for ten years, at a rental of $75,000 per annum, has been made. Chicago has been long favored with good hotels, but this enterprise promises, by the opening of 1872, to place her in the front rank in this respect. W. W. Boyington, Esq., of Chicago, the architect of the structure, has, in his portion of the work, achieved a most noteworthy monument of professional skill.

SCIENTIFIC INTELLIGENCE.

PASTING PARCHMENT PAPER.

It is not an easy thing to join the stiff, smooth surfaces of parchment paper on to other paper, or on to wood, pasteboard, etc. The paste does not seem to hold, and on this account this paper has not been so generally used in book-binding and for similar purposes.

The difficulty can be overcome in a very simple way. The surface of the parchment must first be moistened with alcohol or brandy and then pressed while still moist upon the glue or paste. When two pieces of parchment are to be joined, both must be moistened in this way. It is said that the paper will sooner tear than separate where it has been thus fastened together.

Another way is to put a thin piece of paper between the surfaces of parchment and apply the paste. This forms a firm joint and can with difficulty be separated. Glue and flour paste are best adapted for uniting surfaces of parchment. Gum-arabic does not answer.

ALUMINATE OF SODA.

This article is now largely employed in the manufacture of milk glass, hot cast porcelain, etc. Hitherto cryolite was used, but this mineral attacked the furnaces and was not always free from iron and other foreign substances. It is now proposed to substitute one hundred-weight of natron aluminate for the 1¼ hundred-weight cryolite and $\frac{1}{10}$ hundred-weight of soda, formerly employed.

The aluminate of soda prepared in the process of the manufacture of soda from cryolite, is usually pure, and is capable of various applications, in dyeing calico, printing, manufacture of a very heavy white soap, for lakes, etc.

DISINFECTING PADS.

It is often desirable to disinfect the odor of perspiration, and this can be accomplished by means of pulverized charcoal. Take an ounce each of finely pulverized charcoal, gum-arabic in powder, and water. Put a thin paste of this between two sheets of paper or of cloth, and press by the hand or between weights, to smoothe wrinkles, and then allow it to dry in the air. It is then ready to be cut into soles for the feet or into pads as required.

FLUORIDE OF GOLD.

M. Prat, of Bordeaux, has published the results of extended researches into the properties and compounds of gold, from which we abstract the following results:

1. Chemically pure gold can be prepared in the form of sponge. 2. Gold can be oxidized by certain oxy-acids. 3. There exists a liquid chloride of gold superior to the sesquichloride, also a sesqui-iodide and a carbonate. 4. There are also two oxides, a suboxide, $Au_2 O_2$, and a binoxide, $Au O_2$, capable of yielding two series of new oxides.

The most important result was the preparation of spongy gold; this is accomplished by saturating a solution containing ten per cent of chloride of gold by pulverized carbonate of potash, and for each equivalent of gold salt, he adds an equivalent of a saturated solution of the same carbonate; he then treats the filtered liquid with five equivalents of pulverized oxalic acid, added in small quantities at a time, and boils the liquid for ten minutes. The gold is reduced to the state of an extremely fine powder—these grains, as if by mutual attraction, agglomerate and form a spongy mass without metallic luster and resembling a wet natural sponge, but convertible by the hammer into solid ingots. The transformation into spongy metal affords a means of separating gold from a majority of other metals. M. Prat also reasserts that he has prepared fluorine from fluoride of gold in the form of a yellowish gas similar to chlorine.

PREPARATION OF PURE NITROGEN.

Berthelot removes the oxygen from the air in the following ingenious manner: Clean copper turnings are placed in the bottom of a flask and half covered with ammonia. The flask is stopped by a cork provided with a safety tube and delivery tube, which latter can be closed with a rubber cap. After a few days the oxygen of the air is completely absorbed and can be displaced by water to which a little ammonia and copper have been added to deprive it of pure oxygen. Having been washed by concentrated sulphuric acid the gas can be preserved over mercury until required for use.

APPLICATION OF DIFFUSION IN SUGAR REFINERIES.

Abbé Moigno states that in the years 1869–1870 the number of sugar houses in which the principle of diffusion or dialysis was employed for refining sugar was 82, and that 31 additional works are in process of construction, so that in 1871 there will be 113 refineries in which practical application will be made on a large scale of Graham's important law The crystallizable sugar passes through membranes while the impurities being uncrystallizable are retained in the tank where the original solution was made. The fact that so many large houses employ this method would seem to indicate its entire practicability.

VOLUMETRIC DETERMINATION OF COPPER.

M. Weill dissolves the alloy or ore to be examined in excess of hydrochloric acid, and thus obtains the copper in the state of bichloride, which, even in minute quantities, will color the liquid bluish-green. If a solution of protochloride of tin be now added, it will transform the copper to protochloride, which is colorless. By employing a graduated solution of the tin salt the amount of copper thus transformed can be easily determined; the protochloride of tin is added until the color disappears.

CRYSTALS OF IODIDE, BROMIDE, AND CHLORIDE OF SILVER.

M. Debray has discovered that hot solutions of salts of mercury will dissolve the iodide, bromide, and chloride of silver, which salts will crystallize out beautifully on the cooling of the solution. Large and beautiful crystals were thus obtained. He also remarked that the crystals of chloride of silver were not acted upon by light, and explained the phenomenon on the principle that they probably contain traces of mercury.

OXYGENATED BREAD.

Messrs. Welton and Birch have recommended a new way of introducing oxygen into the stomach by means of bread. The air contained in the bread is extracted by means of a pump, and oxygen substituted in its stead. The bread is said to mold rapidly, which can be prevented by inclosing in cans covered with a small amount of carbolic acid. A mouthful of this bread is said to take away at once loss of appetite and to produce a pleasant sensation to persons afflicted with dyspepsia. It is also recommended in all cases of nervousness, scrofula, and defective digestion. Unleavened bread is said to be less liable to spoil than the ordinary kind.

SOLUBLE PRUSSIAN BLUE.

Dissolve one part, by weight, of iron wire in sufficient aqua regia to convert the whole of the metal into the chloride, and add 7½ parts of a concentrated solution ferrocyanide of potassium. Collect the precipitate into a filter, and wash out and allow to dry in the air. This form of Prussian blue is said to be soluble in distilled water, but if it be heated to 212° Fah. it loses its action of crystallization and becomes insoluble.

[For the Scientific American].

TUSSOCK-MOTHS.

[By Edward C.H. Day, of the School of Mines, Columbia College].

The group of Spinners or *Bombycidæ*, as it is scientifically termed, among the night-moths, is by far the most important to mankind of all the subdivisions of the Lepidopters. It is among these that we find caterpillars possessing preeminently the power of secreting silk, and of inclosing themselves, as they pass into the chrysalis stage, in a cocoon of silken fibers. In many of them, especially the larger forms—and some of the largest of Lepidopters occur in this group—the silk-secreting glands are immensely developed, and man reaps the benefit of this extraordinary provision of nature. But the greater number are unfortunately insects injurious to vegetation. Even the worm that strips the mulberry tree of its leaves would have to be accounted as a devastator, had not the ingenuity of man discovered its value as a most economic and inimitable manufacturer of raw material, producing an article otherwise unattainable. It is only in a very few of the spinners that the silk is secreted in sufficient quantities or is of a character fit for our purposes; and among those whose destructiveness is not in any way palliated by such a return of good for the evil done by them, is the insect that forms the subject of the present article. Every one with eyes for such things, must have often noticed on our shade trees in the summer "little slender caterpillars," such as here depicted, "of a bright-yellow color, sparingly clothed with long and fine yellow hairs on the sides of the body and having four short and thick brush-like, yellowish tufts on the back, that is, on the fourth and three following rings, two long black plumes or pencils extending forward from the first ring, and a single plume on the top of the eleventh ring. The head, and the two little retractile warts on the ninth and tenth rings, are coral-red; there is a narrow black or brownish stripe along the top of the back, and a wider, dusky stripe on each side of the body." (Harris). From the tufts on the back, these caterpillars obtain the name of Tusscoks, and the moths are called Tussock-moths. The scientific name for the genus is *Orgyia*, and the common indigenous American species, to the caterpillar of which the above description applies, is called *O. leucostigma*, or the "white-spot" Tussock-moth. The one here figured is the common European form, *O. antiqua*, which, however, according to Harris has been naturalized in this country, along with many other undesirable immigrants. Both species have a bad character for the damage they do to the trees they infest.



METAMORPHOSES OF THE "STARRED TUSSOCK-MOTH"—*Orgyia antiqua.*

The male moth is the insect on the wing in the center of the picture, but the female—we hear you ask—where is she? Here on the tree on the left hand, depositing her eggs. "That! why that is a wingless creature?" In effect, she is so; though on close examination of the actual insect, you would discover little scale-like rudiments of wings. She not merely cannot fly, but she exemplifies, in the fullest degree, the law that the perfect insect is but the reproductive stage of its entire life; she escapes from the cocoon on the tree side, she there receives the attentions of the males, lays her eggs upon the very cocoon from which she has but now emerged, and dies! But the males, as we see, are gay flutterers—"Vaporers" is one name by which they are known—free to rove at will, to make love to as many of these very stay-at-home ladies as they can, or to visit their clubs, if they have any, just as much as they please. So much for female rights among the Tussock-moths! But the lady moths have no reason to complain, if they cannot go in search of their husbands, they do as well by attracting their husbands to themselves. In fact all the female spinsters exert some attraction so subtile yet so far-reaching that we fear that the idea of Mormonism must exist reversed among them. What this attraction is, or how the males perceive it, we gross mortals can scarcely conjecture. The attraction is generally supposed to be a scent, and the sense of smell in moths has been supposed to reside in the antennæ. These are in the male spinners, generally speaking, very large and plumelike, and from experiments seem to be essential as guides to the progress of the insect. Others, however, consider the antennæ as organs of hearing, and place the organs of smell elsewhere. Be this as it may, it certainly is, as Professor Blanchard remarks, a wonderful fact that a scent so subtile that we cannot perceive a trace of it when close at hand, should be perceptible to the insects, at the distance of several kilometers; from the center of a city, to the woods and fields of the suburbs; nor will the supposition that a sound and not a scent be the attraction, at all diminish the incomprehensible nature of the phenomenon. It was only a short time since that a cocoon in the house of the writer gave forth a female of the Polyphemus moth, one of our largest native spinners—frequently measuring six inches across the wings. The wings being but imperfectly expanded, she was left in a tray covered by another tray. At night we were agreeably surprised, for somehow in this instance we had forgotten the probability of such consequences, by the visits of twelve fine male moths which came flapping in through the open windows during the course of the evening, and several followed on subsequent evenings. A friend informed us some time since that under similar circumstances, ninety-six male moths, of one of our largest species, were (we speak from memory) captured in one house, attracted by one female in the course of twenty-four hours. We should have hesitated to quote the above number from memory without verification, had not Professor Blanchard supplied us with an instance that throws even these figures altogether into the shade. He tells us that M. Jules Verreaux having one day, in Australia, captured the female of a small spinner and placed it in a box, and the box in his pocket, was accompanied home by a gradually increasing flight of males, until, when he entered his house, two hundred moths followed him in!

Verily wives must be at a premium among moths as well as men at the Antipodes! From a scientific point of view, however, it would be most interesting to know whether the female exercises any preference among such a choice of suitors, or whether the most vigorous males are always the successful ones. In fact, the whole history is most suggestive of thought to the inquiring naturalist.

Singular Phenomenon in Heating Diamonds.

"A jeweler of Marseilles," says the *Scientific Review*, "having to enamel a piece of work, thought that he could without inconvenience bring it to the temperature of his muffle without taking out the valuable diamonds which were set in it. The operation succeeded perfectly several times, and then an accident occurred—the diamonds became perfectly black. M. Morren, the dean of the faculty of Marseilles, was called in to investigate the cause, and he ascertained that the successful operations had all been made with coke, while when the diamonds were blackened coal had been used, and he concluded that the black color was due to the fixation of carbon by the action of the diamond on the hydrocarbon gas. He repeated the experiment on a small scale, and found the result answer his expectations, and that by repolishing the diamonds recovered their normal appearance. He then tried the effect of oxidizing gases. A diamond heated in oxygen by means of the blow-pipe did not swell at all. But at a not very elevated temperature it took fire, and the flame could then be withdrawn without interfering with the combustion, which continued by itself. It will be seen that the result differs considerably from that noticed when a diamond is heated by voltaic electricity, and that here the first action of the heat is to transform the diamond into graphite."

Liliputian Firemen.

A writer of an intensely interesting article in *All the Year Round*, upon the habitations of ants, thus describes the extinguishment of a fire in an ant city of the *Formica rufa*, or wood ants:

"It was composed mainly of twigs, straw, and pine spiculæ, and swarmed with insect life. Poking our walking-sticks into the top of the mound, and laying bare the upper surface, the formicans, who up till then had been wholly unaware of our presence, began to understand that calamity had come upon them. Betaking themselves, as is their wont, to the care of the young, countless thousands of them suddenly appeared, each carrying a cocoon much bigger than itself, which it was evidently anxious to deposit in some place out of the reach of a danger which, although they could not comprehend, they knew to be both formidable and imminent. Such a hurry skurry, such a running to and fro, such a getting up and down stairs, as the song says, such a commotion could scarcely have been known even at Brussels on the memorable night of the ball, on the eve of the great battle of Waterloo, when it was suddenly announced to the officers of the allied armies that the French were advancing upon the city—

> When thronged the citizens with terror dumb,
> Or whispering with white lips, 'The foe—they come! they come!'

"We all looked on with interested curiosity, and one of my companions having finished his first cigar, drew a box of lucifers from his pocket, and leisurely proceeded to light a second. This done, he carelessly threw the burning match upon the ant-hill. It was an act as cruel as it would have been in Lemuel Gulliver, had that mountainous traveler willfully set fire to the city of Liliput. The formicans were for an instant confused, and appeared not to know what to do. But their perplexity was of short duration. In less than half a minute scores and hundreds of ants rushed upon the blazing beam—for such it must have appeared in their eyes—and exerting their strength simultaneously upon it, endeavored to thrust it from their city. Many of them were burned to death in the gallant endeavor, but the survivors, nothing daunted, pressed forward over their dead or writhing bodies, as if conscious that there was no safety for those who still lived as long as the awful combustible was permitted to blaze and crackle in the midst of them. I was apprehensive that the whole mound, built as it was of dry twigs, would take fire; but the mists had lain upon the mountain and the valley, the air was moist, and the flame of the match burnt upwards. Onwards rushed the resolute firemen, score upon score, hundred upon hundred, till at last they rolled the match over and over, and out of their precincts, charred and blackened, and incapable of further mischief. We all, more or less, mistrusted our eyes, and the youngest, most thoughtless, and therefore the most cruel, of our company suggested that if there were intelligence and design on the part of the ants in acting as we supposed they had done, there would be no harm in making a second experiment. No sooner said than done. Another match was ignited and thrown upon the heap, and again, precisely as on the first occasion, the ants rushed pell-mell upon the blazing intruder, to prevent a conflagration, which, had it taken firm hold, it would have been impossible for them to extinguish. Again, some of the foremost champions of the public safety lost their limbs, and many more of them their lives; and again by the mere force and pressure of numbers acting with a common purpose, the match was extruded before much harm had been done. I opposed myself to a third renewal of the experiment and succeeded in persuading my companions, although not without difficulty, that enough had been done for curiosity and natural history; that the truly merciful man was as merciful to the smallest as to the largest of God's creatures; and that we had no right, in the mere wantonness of scientific observation, to take away the life which it was impossible for us to bestow."

Floriculture at Erfurt in Germany.

A correspondent of the *Evening Post* thus speaks of the immense horticultural establishments in Erfurt, Germany:

Erfurt has been given the name of the "Garden City of Germany," and, according to recently published statistics in Upper Consistorial Councilor von Tettau's "Erfurt, Past and Present," she well deserves the title. The area devoted to horticultural purposes in and around the city is over 2,000 Prussian morgens (0·65 of an acre). About 600 morgens of this are devoted to market horticulture; 220 morgens of the latter again are devoted to the production of flower seeds; and 210 morgens to vegetable seeds. The houses for the culture of exotic plants, and the hot and cold beds, possess glass covering to the extent of 250,000 square feet.

There are 36 independent horticulturists, of whom 27 do only a wholesale trade, besides 120 market gardeners, altogether employing over 500 assistants. The vegetable and seed trade depends almost entirely upon the larger cities of Germany. Over 300,000 catalogues and price lists are annually printed for the wholesale producers, at a cost of $10,000; 50,000 of these are wholesale catalogues, and half of the latter are prepared for England and America. The amount of postage paid on these catalogues, some of which are pamphlets, and on the letters containing seeds, is very great.

For the transmission of these seeds a vast number of linen and paper bags and paper, are required, involving an annual outlay of over seven thousand dollars. Both these articles are manufactured in the surrounding villages, giving employment to a great many poor people. As all these bags must be provided with the name of the dealer, a great amount of printing is also required. An incredible number of boxes and baskets are needed for packing purposes; the latter are made by the poor people in the neighboring villages; the former are made in the Thuringian Forest. Many poor families do

nothing else during winter but make wooden tickets and stocks for the flowers.

A number of little Thuringian villages are almost upheld by the manufacture of flower pots for Erfurt alone. About 600,000 are planted yearly with about 3,600,000 stock-gilly-flowers. These placed in a single row would reach nearly fifty miles! In the year 1863, 150,000 pots were planted with 1,550,000 gillyflowers for seed, and these brought in an income of nearly fifty thousand thalers. The production of the gillyflower in sixteen varieties and over two hundred colors established the horticultural fame of Erfurt ever since 1810.

The cultivation of vegetables for the market is chiefly carried on in the so-called "Dreienbrunn," an area of nearly two hundred acres, which was formerly a great swamp, and used only for the production of watercress. In the fifteenth century the market gardens were all within the city walls; in the last century the watercourses in the "Dreienbrunn" were regulated, and the whole swamp changed into an immense vegetable garden. About twenty acres are still reserved for the production of cress. Before the era of railroads the Erfurt market was limited to the surrounding cities; but now the Thuringian Railroad takes the produce to Cassel, Leipsic, Halle, Nuremburg, Weimer, Gotha, and other places. Of the seeds, fifty-eight per cent is sent to Austria, twenty-four per cent to Germany, and eighteen per cent to other lands of Europe, to England and America. A large trade in dried flowers is also carried on. In some of the gardens it is very difficult to get even a single bouquet. Agriculture is also prosperous in and around Erfurt, the farmers also devoting their attention to the production of field vegetables.

THE FRICTION OF STEAM ENGINES.

[From The Engineer].

If we did not believe that it is easy to say something new on a subject which has been in a very peculiar sense worn threadbare by the inventors of cylinder lubricators and steam greasers, this article would never have been written. So far as we are aware, all the information regarding the resistance of steam engines due to friction is to be found in the circulars of inventors, one or two papers read before engineering societies by the advocates of particular methods of lubricating engines, certain theoretical disquisitions contained in text-books of mechanical science, and perhaps a report or two in the *Journal of the Royal Agricultural Society*. It is almost needless to say that the subject is one of very considerable importance; but it may be worth while to bring this importance home in a tangible form to the employer of steam power. It may be stated, in pursuance of this object, that it by no means follows that an engine giving a very high indicated duty per pound of coal is really the most economical that a manufacturer can use, for the simple reason that the power required merely to drive the engine may be so great as to render the saving in fuel valueless. A case in point suggests itself. An experiment was made some time since with a compound engine, the general particulars of which are before us. This engine was of the annular type; the large cylinder about 35 inches diameter, the inner cylinder about 15 inches, the stroke of both pistons was the same, about 5 feet, the piston rods both laying hold of the same crosshead, which was connected with an overhead beam. The experiment consisted in shutting the steam off from the inner cylinder and driving with the outer annular piston alone. It was found that the engine, then indicating the same horse-power as before, failed to drive the machinery at the proper speed; and it was not till the indicated horse-power was augmented nearly 40 per cent that the engine would do the work. On permitting the steam to find its way to the inner cylinder as before, the indicated horse-power fell to the original point, the machinery being driven at the proper speed. We shall not pretend to explain why this was the case. It is indeed difficult to understand why the fact that the inner cylinder, though open to the atmosphere, took no steam, should so enormously reduce the effective power of the engine. The facts are as we have broadly stated them, and there is no reason to think they would now want explanation if engineers had in times past devoted a little attention to the study of the phenomena of friction in the steam engine. We have no doubt whatever that many so-called economical engines are doing very bad work indeed; nor that many so-called wasteful engines as far as coal is concerned, are giving out a far higher duty than is generally believed. The entire subject is wrapped up in mist—a mist which can only be dispelled by careful experiments, extending over long periods, and properly and fairly analyzed. That a few engineers have conducted experiments on the friction of steam engines and other machines is certain; but it remains to accumulate in a single volume the statistics which these gentlemen possess, and to put them into a form which may render them generally useful. In pursuance of this object we have for some time past been accumulating data, as yet infinitely far from being complete. But these data have, at all events, done this much—they have satisfied us that ordinary theories regarding friction in steam engines based on investigations concerning the coefficients of friction between lubricated surfaces, apply most irregularly and imperfectly. In other words, there is no theory at present in existence which will enable us even approximately to predicate with certainty what the loss of effect by friction in any given engine may be. In certain cases, calculations made with this object will correspond, with surprising exactitude, with the results obtained through the indicator and dynamometer. But the engineer, resting satisfied with such occasional coincidences, is mistaken in his views. In scores of other instances enormous discrepancies will be found to exist between theory and practice—the almost total absence of frictional resistance in some engines contrasting strangely with the expenditure of power absolutely wasted, in others. It is not the mere loss of fuel alone—although that is bad enough—that has to be considered in dealing with this subject. We find engines unable to do their work overloaded and worn out; boilers burned and overtaxed; grease and oil wasted; indeed, we go so far as to hold that every horse power unnecessarily spent in overcoming the frictional resistance of a steam engine costs three times as much as if it were spent in doing useful work, and this without taking at all into account the fact that useful work returns money, while what we may term the internal work of the steam engine returns none.

The difficulties which lie in the way of ascertaining by actual experiment what the frictional resistance of an engine is are very great, and to this cause no doubt is to be attributed the greater portion of the existing ignorance of the subject. The obstacles in the way are of two kinds. In the first place, it is very difficult to put a dynamometer or brake, on large engines, whereby to ascertain their duty; and, in the second place, the amount of friction varies not only in different engines, but in the same engines in a very extraordinary way. As regards the first difficulty, we can, in the case of pumping engines, ascertain precisely how many foot-pounds of work an engine actually gives out in the shape of useful effect, while the indicator shows the work done on the piston; but from these data it is impossible to calculate engine friction exactly, because our calculations are complicated by the greater or less efficiency of the pumps. It is possible that nothing can be more deceptive than the results obtained from pumping engines, and therefore we have no hesitation in rejecting their aid in dealing with questions of engine friction. Practically speaking, the only generally available test is the indicator, used with the engine light and the engine loaded; but diagrams taken thus do not account for the extra friction due to the performance of work, though useful to some extent in their way; but no investigation of the qualities of an engine can be regarded as complete unless the dynamometer is used as well as the indicator.

As regards the variation in the loss by friction in the steam engine, a very great deal might be said which we shall not attempt to say now. It may induce others to experiment for themselves, however, if we place a few facts curiously illustrative of the peculiar phenomena of engine friction before our readers. In one case we conducted the experiment personally; for the results of the other we are indebted to a gentleman who, in superintending the replacement of ordinary boilers by the now well-known Howard boiler, has occasion to indicate a very large number of engines and on whose accuracy we can rely with certainty. In the first experiment which we shall cite we found the full power exerted by a rolling mill engine in the north of England—where, it is unnecessary to specify—to be 291·5-horse. This included the resistance due to a fly weighing thirty tuns, a bar mill with two pairs of rolls working on heavy orders, and the requisite gearing. Engine and mill empty required, according to one set of diagrams, 74·8-horse power to run them at the working speed; but according to another set of diagrams, the frictional resistance of engine and mill is less than 35-horse power, and all the diagrams were taken within a few hours. We cite this case only to illustrate the difficulties engineers have to contend with in endeavoring to estimate the friction of engines under ordinary circumstances

The other experiment is very interesting and curious as regards results. The engine was a double cylinder traction engine, built by Messrs. Howard, of Bedford. The cylinders are 8 inches diameter and 12¾ inches stroke. The engine shaft can be disconnected from all the rest of the machinery, so that the whole work done by the steam consists in turning the crank shaft and overcoming the friction of the bearings, pistons, etc. With 60 lbs. of steam in the boiler, the engine, making 190 revolutions, indicated unloaded 2·64-horse power. The engine was then set to drive a brake loaded to 16-horse power, the link being put in full gear; under these conditions the engine indicated 22·55-horse power. The frictional resistance was therefore increased, by the fact that the engine was now doing work, to 6·55-horse power, or to nearly three times that of the unloaded engine. This is all plain sailing, but now comes a most remarkable fact. The throttle valve was thrown full open, or nearly so, and the engines linked up—that is, worked expansively at the same velocity, 190 revolutions per minute. The load on the brake, etc., remaining absolutely unaltered; any engineer would predict that, under these circumstances, the result would be the same; far from this being the case, however, it was now found that the effective work or duty of the engine being unaltered, the indicated power *was only* 19·86-*horse power*, so that the friction of the engine when linked up was only 3·86-horse power, or little more than one-half that of the engine working in full gear. Lest there should be any mistake about this, the brake was then loaded with 504 lbs. With the link in full gear the engine indicated 44·88-horse power; the link was then put in the first notch, and the throttle valve fully opened, everything else remaining unchanged, when the power fell to 40·92-horse, the frictional or internal resistance of the engine in the latter case thus being 3·86-horse power less than in the immediately preceding experiment. How are these facts to be accounted for? Is it that the varying strain on moving surfaces in contact, due to the action of expanding steam, is attended with less frictional resistance than is present when the metals are under the steadier strain of non-expanding steam? We shall not pretend to answer these questions. There are the facts for the consideration of those interested.

Is it too much to hope that engineers who have the opportunity, will take up this subject, and endeavor to throw light into what is at present a very dark and unexplored region of mechanical engineering? We are convinced that the results would, when time and perseverance had multiplied data, be found of very great value to those who desire to see the steam engine undergo the real improvement of which it is still capable. We venture to suggest that the general practice of indicating the engines tested by the Royal Agricultural Society while running against the brake, and the publication of those diagrams, would be productive of much good. Suppose the Society begin at Oxford?

A Curious Exhibition.

A singular idea is that of a public exhibition of fans; yet such an exhibition has been held at the South Kensington Museum in London. The object of the exhibition was to promote the employment of women in a branch of industry peculiarly adapted to them, though how such an exhibition could further this good object one fails at this distance to perceive clearly. Nevertheless the exhibition brought out some wonders of mechanism and art, according to the *Building News*, which gives a column and a half to its description.

That journal says the present collection opens with a number of Chinese and Japanese fans, just brought over by one Mr. Mitford. They are, as a rule, very tasteful and curiously inexpensive. There are also some excellent specimens of Indian fans, lent by the Indian Museum, but the object of this exhibition is not so much to show us the different materials out of which a fan may be manufactured—such as carved in sandal wood, made from palm leaves, scented grasses, pheasants' feathers, or even beetlewings—as to set before us the fan as a work of art; and works of art most of the painted fans unquestionably are. Their subjects vary in an infinite number of ways. In this collection can be seen a geographical fan from Japan, with the route between Yeddo and Kiöto marked out upon it; a Spanish fan, containing an almanac and a globe; French fans, with revolutionary subjects; Italian fans, ornamented with paintings of Scriptural stories; and historical fans of all periods, from Rebekah and Eleazer down to the fan painted by Tjichy, a Hungarian artist, and presented to the Prince of Wales on the marriage of the Princess Dagmar with the heir of all the Russias. Here, too, are fans interesting to the public as relics—Nos. 262 and 272 were once used by the ill-fated Marie Antoinette; the Queen exhibits one which belonged to the Princess Charlotte; and a very curious fan, with imitation lace cut in paper and medallions in water color, was once possessed by Madame de Pompadour. It is not possible in this journal to devote much space to an object so apparently remote from its usual province as an exhibition of fans—nevertheless, there are points of common interest which claim our attention. Many of the French fans of the highest character, many Spanish fans, and some of the Italian ones, are of the class we will call pictorial. Thus the mounts of such fans are composed principally of pictures, no doubt designed to fill the peculiar space, but still pictures such as Gay describes as subjects for decoration:

> Paint Dido there, amidst her last distress,
> Pale cheeks and bloodshot eyes her grief express.

or—

> Here draw Œnone in the lonely grove,
> Where Paris first betrayed her into love.

Such fans have, at various times, been the work of the best artists of the day. Thus No. 224 is by Peter Oliver, the celebrated miniaturist of the time of Charles I. The subject of this fan, which has been painted out square and framed, is "The Triumph of Bacchus." Again, No. 348, a French fan, was painted about 1666, by Philippe de Champagne. It has a landscape on the reverse side, by PP. Valori. There are also one or two by Lancret, and No. 126 is a beautiful work by Boucher, while among those fans whose painters are unknown, we must call especial attention to "The Queen's Fan," No. 278, the subject of which is a highly-finished copy of Guido's Aurora. Some of the Italian fans of the pictorial class are enriched at the borders and near the sticks with delicate treatments of flowers and fruits so artfully arranged as to carry the color of the picture into the setting of the fan. No. 320 is a good specimen of such fans, while No. 82 is an excellent example of the same treatment of the mount, though the stick, which is of a subsequent date and quite plain, has been added to the fan without due regard to this artistic effect. Another class of fans may be described as a combination of ornament with pictures. A beautiful example of this is found in a modern fan belonging to the Empress of the French. In the center of the reverse side is a medallion, painted in grisaille by Moreau; while on each side some beautifully executed amorini, with arabesque ornaments, are supporting the imperial crown and her Majesty's initials. Of earlier examples Nos. 336 and 339, wherein vignettes are alternated with Pompeiian ornament, are very characteristic, and deserve study, because of the classic taste displayed in them. Many of the English fans of the last century belong to this class of treatment, sometimes consisting in vignettes and ornament, and sometimes in medallion portraits and ornaments. Of this character also is the fine French specimen by Boucher, to which we have already alluded. We cannot close without drawing attention to the fans decorated by Vernis Martin, that celebrated Frenchman, mentioned by Voltaire, who combined coach painting, when it still required the skill of an artist, with the decoration of furniture, snuff-boxes, and fans. He invented a varnish which has stuck to his name, and given character to the works of his hands. The labors of fan painting may be esteemed lightly by some, but we opine that when we find such French living artists as Eugene Lami, Moreau, and Hamon, not disdaining to devote their skill and time to such works, our countrywomen may well be proud to enter into the competition.

The first attempts to establish fire insurance were made during the reign of Charles II.

Jeddo.

Jeddo, the capital city of the Empire of Japan, is in the 36th degree of latitude, and is said to be one of the finest cities in the world. The streets are wide and clean, and the fine views of the Gulf of Jeddo, with the high hills beyond, and the picturesque gardens, trees, and temples nearer, make up many curious and beautiful views for a stranger to see.

The Emperor lives in the middle of the town, in the castle, surrounded with three walls or inclosures. The nobles and great people all have very fine houses, built principally of wood, carved, stuccoed, and ornamented. These houses are generally built in squares, the middle being the residence of the owner, the rest those of servants, dependents, etc. The gardens surrounding these places are laid out in good taste; every bit of ground taken advantage of, and mimic effects of scenery, such as tiny waterfalls, ponds, rock-work, etc., very well got up.

The Japanese bestow great care on the growth and culture of timber trees. The cedars grow to great hight; the oak tree, the mulberry tree—many towns live entirely upon the silk manufacture—then the urusi, or varnish tree, of which the people make the celebrated varnish known everywhere by the name of Japan; most of their furniture is coated with this, and all their plates, dishes and drinking vessels, as they do not appear to use glass or china ones; then the camphor tree, of which the puzzle boxes are made; the pepper tree, chestnut tree, walnut tree, and many others too numerous to mention.

They are the most curious people for dwarfing all manner of trees and plants. Growing things are twisted into all manner of shapes, and flowers and fruit of one sort growing on plants and trees of other sorts, outvying even Mother Nature herself. The love of flowers is strong among even the very poorest of the people, and few are without a pot or two, or some kind of tree or shrub grown against the back of the house, perhaps, reaching in through the windows, and loved and petted almost like children.

On account of the populousness of this country, every inch of ground is improved to the best advantage, and not only the flats but the hills and mountains are cultivated, and made to produce such things as they can. The rice fields are a beautiful sight—so well kept and drained, and irrigated so carefully. They are not unhealthy as in other places. Common vegetables are also grown in abundance; indeed, the poorer classes live principally on fish and rice, varied by vegetables or wild plants. Tobacco is also grown in quantities—the Japanese being great smokers. Their pipe has a very small bowl, and hangs by a button from the girdle or belt—the people having no pockets. These buttons are often highly ornamented and expensive, and the pipes themselves works of art. The tobacco is cut in fine shreds, a bag full of which hangs with the pipe at the waist.

Nagasaki is the principal trading port with foreigners, having been the longest open to them. Decima, a small island close to this town, which is entered by a bridge, is the famous Dutch station, where for many years the Dutch people had a monopoly of trade with the Japanese—submitting to all sorts of indignities and close confinement for its sake; until within the past few years no foreign women were allowed in the place, and so the Dutch merchants had to bear this tedious exile from their families. Most of these indignities, however, were brought upon themselves, and richly deserved by their dishonest attempts to smuggle, and overreach an honest and trusting people. The Japanese are not naturally a suspicious people, and we must lay at the door of intercourse with civilized nations their being so now. They have had a hatred and contempt for foreigners which it will take years of intercourse with some of the better class of English and Americans to do away with.—*New Dominion Monthly for June.*

Twist Drills, and Recent Improvements in their Manufacture.

We condense from a paper recently read by Mr. G. Lauder, C.E., before the Liverpool Polytechnic Society, the following remarks upon twist drills:

The last half century has witnessed many important improvements in engineers' tools. Self-acting machines have been introduced and improved in numbers too great to mention in this paper.

The leading idea which seems to have controlled in all these improvements, is what has been designated the "guide principle;" as examples, we may cite the slide rest, the planing machine, etc., the objects to be attained being, first, greater accuracy in the work performed, and, second, greater speed in performing it.

After improved machines, which have enabled us to attain the first object, we have to look to the forms of the tools used in these machines, to enable us to attain the second object—speed.

Tools for cutting metals are divided into two classes, viz., paring tools and scraping tools—these being distinguished by the edge they present to the metal being cut.

The data on which our knowledge of paring tools is founded are altogether derived from practice in the workshop—workmen, themselves, he believed, having been, in a great many cases, the leaders in improvement. The best cutting angle has been found, for iron and steel, to be from 60° to 70°, and the angle of relief, 3°.

Drills have been the last tools in common use by working engineers to come under the whip of improvement, a large proportion of those now in use being of the worst conceivable form to effect the object they are designed for.

The speaker referred to the common form of drill, and at the same time, exhibited a sheet of drawings on which a number of different forms of drills were marked. Some of them depend for cutting action on—to use a homely phrase—"strength and stupidness," no attempt, whatever, being made to form a propper cutting angle. Others are more advanced in form, and have a proper cutting angle provided; sometimes a small portion of the bottom end, he said, is turned, and forms in this condition, a very excellent working tool indeed. A twist drill was next spoken of, which was the real object of bringing this paper under the notice of the society.

These drills have been known for a considerable length of time, but have not been much used in this country until recent years, Americans having been ahead in their use, and in manufacturing them as well. Strange as it may appear, it is still true, that all the drills of this class were, until within a recent period, imported from the United States.

Due consideration being given to the principles already explained, the advantages arising from the use of twist drills will be apparent at a glance:—first, they serve as a common drill, to bore a hole; second, they serve as a guide, while boring, to keep the hole true; and, third, they are so formed as to provide the proper cutting angle throughout their whole working length; fourth, they are tempered throughout their entire working length; fifth, they are ground up true to standard sizes, thus obviating any necessity for dressing. This last advantage will doubtless be highly appreciated by all who have had practical experience of the continual trouble and loss incidental to the wearing out of size of common drills.

The speaker then said, until the recent improvements which I am about to lay before you were perfected, twist drills were formed entirely by the clumsy method of cutting them out of a solid round bar, by means of milling tools, then turning, tempering, and straightening; it is but justice, however, to the parties who have been hitherto engaged in the manufacture, to say that their arrangements and machines for that purpose were admirable of their kind.

The method now pursued successfully in this country differs entirely from that just mentioned. First, the bar of steel which is destined to form the drill is rolled into a special shape, it is then cut into lengths and again rolled in cam rolls, which form a straight groove, after which the shank is formed by cresses. Next the blank, as it is now called, is passed to the twisting machine, which consists essentially of a hollow spindle having a perforated nut in the end to receive the blank. This spindle, when the machine is started, has a motion of rotation on its own axis, and, also, a motion of translation in the direction of its axis, being thus adapted to twist the blank, then held firmly at the outer end by vise clamps. Other clamps, worked by suitable gearing, close on the blank as the central spindles clear them: these serve to hold the twist given to the blank. After a blank is twisted, the clamps open, the blank is withdrawn, and the twisting spindle returns to its starting point.

After twisting, the drills are centered and rough ground, then hardened by heating in a lead bath and cooling in cold water, next tempered in an oil bath, and finally finished by grinding to a standard gage.

The main features in this method, to which it was desired to direct attention, are the forging and twisting, in contrast to cutting from the solid bar. One of the principal difficulties in carrying out the new system, just described, was getting the blanks forged—accuracy being essential; this difficulty overcome, the benefits became manifest. Recent experiments have shown, that in shaping metals, nothing is of greater importance than attending to the "flow of the metal." Every particular shape into which a bar of iron or steel is forged, having an arrangement of the particles which compose it, peculiar to itself, any departure from this natural arrangement is prejudicial. By forging and twisting these drills, this law is paid the fullest attention to, each drill being finished, so far as shape goes, before a single particle of metal is cut from it.

By way of reward for attention to this natural law, the number of drills lost from water cracks, in hardening, is inappreciable as affecting the cost of production.

Dead Weight.

The first subject on the list for discussion at the coming Master Mechanics' Convention in September, is: Can the dead weight in rolling stock be materially reduced? An ordinary freight engine with tender containing fuel and water, weighs from 50 to 55 tuns, while the weight available for traction is about 20 tuns. In cars the proportion of dead weight to load carried, either freight or passengers, is very great.

Some idea can be formed of the extent of the evil by reckoning up the dead weight in an ordinary passenger train, which we give below:

	Pounds.
Weight of locomotive and tender	104,000
One baggage car	25,000
Three 56-seat passenger cars	84,000
One sleeping car	40,000
	253,000

These cars, if filled, will carry about 194 passengers, which will give 1,304 pounds of dead weight for each person carried. This estimate is a very moderate one, and we are satisfied that practically the dead weight per passenger will be nearer 1,500 pounds with a well filled train. It must be remembered, too, that trains are usually only about two thirds full, which of course would make the relative amount of dead weight per passenger considerably more.

If we deduct the weight of water and fuel, say 20,000 or 22,000 pounds, from the total weight of a locomotive and tender of the usual American plan, and of the size we have named—that is, weighing 104,000 pounds, we will have a permanent weight of 82,000 pounds left, of which only about 40,000, or less than half, is usually carried on the drivers and used for creating "adhesion." As practical experience has indicated that 10,000 pounds weight on each driving wheel is necessary for "adhesion" with a 30-tun locomotive, we must be careful not to lessen the weight on the drivers if we attempt to reduce the dead weight.

It would not, we think, be very difficult for an experienced and skillful engineer, in designing a locomotive, to reduce materially the weight of all the parts, without impairing their strength or efficiency, especially if steel was liberally used in the construction. If the dead weight should be thus reduced, some plan of locomotive must be adopted which will still leave 10,000 pounds weight on each driving wheel. The problem is to make all the parts of the locomotive lighter, and, at the same time, arrange their weight so that a larger proportion of it shall be on the drivers; that is, if the 82,000 pounds of permanent load should be reduced to, say 60,000, 40,000 of the 60,000 must still be retained on the driving wheels.

In the construction of cars, the paramount consideration should be safety to human life. Almost any amount of dead weight would be justified, if travel were made safer thereby, and the risk of injury to passengers lessened. The comfort of travelers is also a consideration which begins to influence the weight of cars.

Seats and frames are often made unnecessarily heavy, and the fittings and moldings, ornamentally, are frequently heavy enough to depress one's spirits. It is difficult to condense in any general statements the errors which are so very common, but it is evident that in very many cases reduction in weight was not a consideration which the car builder had in his mind at all. Elaborate carving in cars always seems out of place. The impossibility of keep it free from dust seems sufficient reason for discarding it.

The proper length of cars would be an interesting subject for discussion at the Master Car-builders' Convention, now in session. The weight of a bridge increases in a proportion approximating to the square of the span, and it seems reasonable to suppose that the strength of a car would be in a somewhat similar ratio. At any rate the most economical length for a passenger car seems as yet undetermined.

Of the weight of sleeping cars we have no accurate data to figure from. We have heard the most extravagant estimates of the weight of some of them, which, if true, would make it seem extremely probable that smaller cars, giving fully as much room and comfort to each passenger, would be more economical than many of the present "palace cars."

The evil of dead weight—as, alas! all evils do—multiplies itself. Often, too, the roots of it can be found in some other vicious practice. For example, a railroad company will insist on buying cheap axles; in due course of time several of them break on account of the poor material of which they are made; immediately some one jumps to the conclusion that they are too small; so a half inch is added to their diameter, and forms a perpetual incubus of dead weight which the railroad company literally must carry fourfold on each car they run. So with castings: some badly proportioned part breaks; the pattern maker at once adds 20 per cent to the weight, instead of exercising his brain in making the broken part in some better proportion. Heavier cars necessitate heavier engines, which implies greater wear of track and machinery and increased cost of transportation.

A great part of the cure of the evil, we are satisfied, must come from the use of a better quality and more skillful disposition of material. A young artist once inquired of Sir Joshua Reynolds how he mixed his colors; the reply was, "*With brains.*" So of railroad machinery, it must be built with more skill, and by the exercise of more thought, if dead weight is to be reduced.—*Railroad Gazette.*

The Volcano Fish.

A paper having appeared some time since in a cotemporary, from the pen of the Rev. W. W. Spicer, in which the phenomenon of the expulsion of fish from volcanoes was spoken of as strange and astounding, and the idea being conveyed that the fish must have lived "in the line of fire" before being expelled. Mr. Scrope, F. R. S., writes to *Scientific Opinion*, February 23, as follows: This sensational version of a very simple fact is one only of several which, on the authority of "the great Prussian traveler," have been repeated by compilers of treatises on volcanic phenomena. The simple fact, I conceive, is that the fish in question lived in the open air in crater-lakes, such as are frequently found at the summit of trachytic volcanoes—for the reason that the fine ash, which is usually the last product of their eruptions, and therefore forms the lining of their craters, is very retentive of moisture, and consequently occasions the production of lakes at the bottoms of these hollows. Of course in these lakes the same kind of fish will probably be found as, by Mr. Spicer's own statement, are met with in other lakes at an almost equal elevation on the outer sides of these very volcanoes."

SOME time ago Piazzi Smyth went on a scientific expedition to Teneriffe, and on his return published a series of very interesting papers. In consequence of the favorable report made by him of the fitness of such high situations for astronomical and meteorological purposes, the Russian Government has resolved to establish an observatory on Mount Ararat.

IN some localities large quantities of beer yeast are run off into sewers and wasted. It contains from 7 to 11 per cent of nitrogen. M. Bernier mixes about 100 kilogrammes of the yeast with about 30 kilogrammes of quicklime and 10 of gypsum, and thus obtains a manure which may be used instead of guano.

Machine for Manufacturing Finished Screw Bolts, Nuts, and Shafting.

So difficult is it to finish up a six-sided or an eight-sided nut, in a truly workmanlike manner that to do this has become a sort of test of skill with the file among mechanics. It is somewhat remarkable that the possibilities of doing this kind of work by simple machinery in a quicker and more accurate manner than can be done by manual labor did not earlier suggest themselves to mechanical minds. Certain it is, however, that such applications are of comparatively recent date, and that even at the present time there are many shops in which nuts and bolts are finished in the vise, by the use of the file.

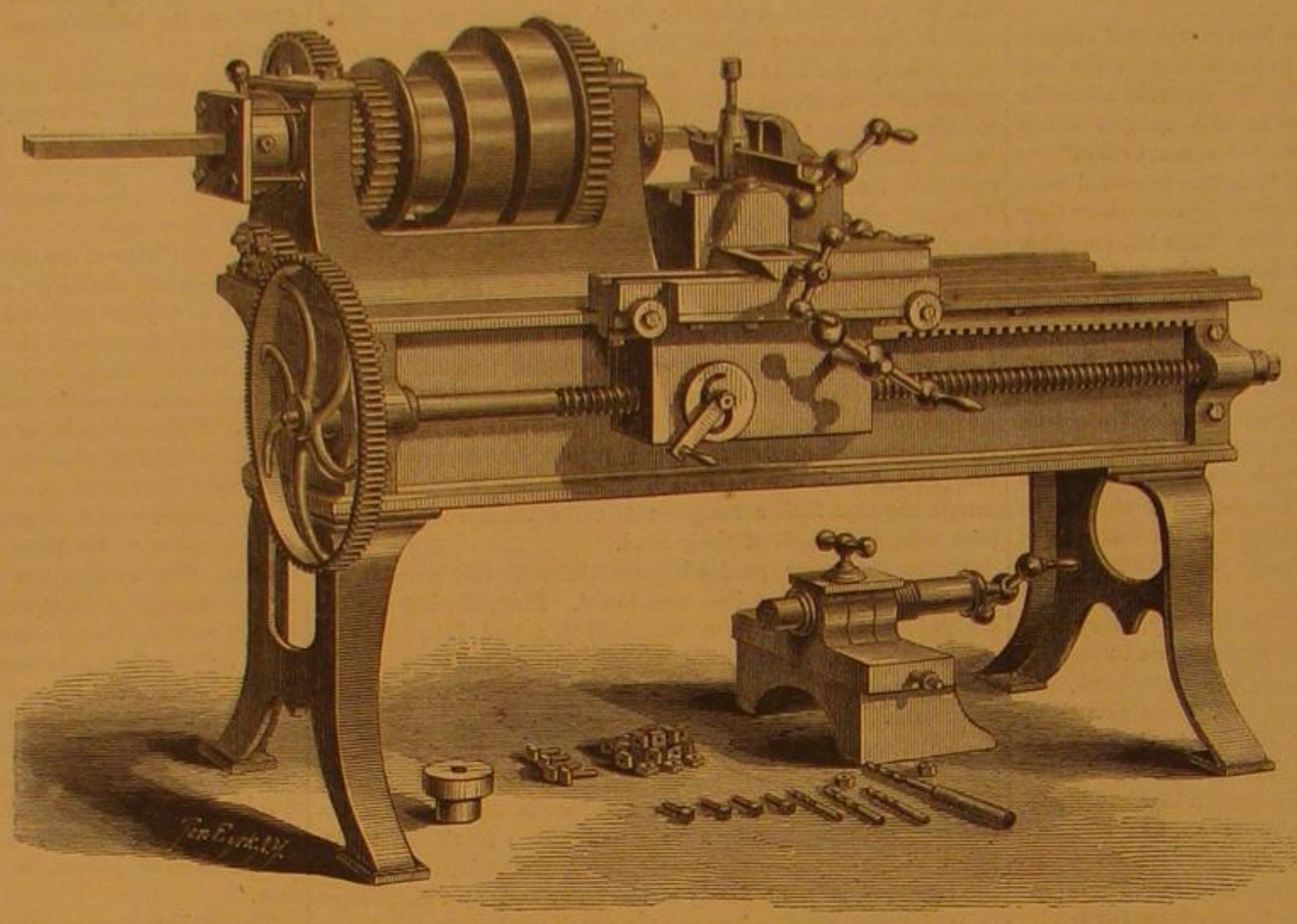
The machine we herewith illustrate is capable of finishing all sorts of screw bolts and nuts of any usual or desired size, and also turns shafting of any length and of any diameter used for most ordinary purposes.

It will be seen also, when we come to describe the principle of the machine, that a very great degree of exactness and uniformity is attainable, which specially adapts the machine for the use of locomotive works, as the extra bolt can be relied upon as being of uniform size, and therefore certain to fit.

It is also claimed by the inventor that a stronger head and thread are obtained in making the bolts in the manner he employs, and that a finished bolt can be produced by this machine cheaper than those made by forging and subsequent finishing in lathe and vise.

Fig. 1 is a perspective view of the machine, and Fig. 2 shows the form of the annular rose-cutters employed, and also a sectional view of them, showing them applied to the shaft of a bolt, as hereinafter to be described.

The general construction is that of an ordinary engine lathe. The spindle which carries the cone pulley is hollow, and through it the bar, from which the nuts or bolts are intended to be formed, or the shaft to be finished is passed. These bars, when nuts or bolts are to be made, are prismatic, having a cross section like that of the head of the bolt or the nut to be made. The cone pulleys are loose on the spindle, and by a system of gearing impart motion to the spindle itself. The bar, Fig. 1, being chucked properly to the center turns with the spindle.



RHEYDT'S MACHINE FOR MANUFACTURING SCREW BOLTS, NUTS, AND SHAFTING.

If nuts are to be formed the bar is drilled lengthwise, and a cutting tool cuts off the nut of the proper thickness. Both the drill and the tool which cuts off the nut may act simultaneously, so that the work proceeds rapidly; the cutting tool finishing one side of each of two consecutive nuts at a single cutting. In this way very accurate nut blanks may be produced with great facility.

When bolts are to be made, two sizes of rose-cutters, A and B, Fig. 2, are used. The drill is removed, and these cutters are chucked and firmly held by suitable jaws at a proper distance from each other, as shown on the shaft, C, of the bolt, Fig. 2. The bar revolving enters these cutters, as shown in the section, Fig. 2, and cuts the shafts in the form shown, leaving the shafts of the blank above the thread, and the part upon which the thread is to be subsequently cut, of proper length and size. A cutting tool, similar to that used for separating the nut blanks from the bar, serves to give the finished form to the top of the head of the bolt, shown at D, Fig. 2.

The rose cutters are also employed for finishing shafting, which can thus be turned to uniform size without employing calipers. These cutters are formed with a depression at E into which a corresponding projection upon the jaw fits, or they may be held in any other efficient manner deemed most convenient. The machine may be used as a common lathe by the use of suitable appliances which accompany it.

This machine was patented, December 29, 1868, through the Scientific American Patent Agency, by Ferdinand Rheydt, and an application for a patent or further improvements is now pending. Address at No. 224 North Franklin street, Chicago, Ill., for further information.

How to Prepare Mortar.

Though many of the accidents which are constantly taking place from the weakness in construction of our buildings, are rightly attributed to faults in the original plan, and the incompetency of the architect, it not unfrequently happens that a large portion of the blame should be placed upon the builder having the immediate charge of the work, and under whose supervision are conducted those minor details in construction upon which depend to so great an extent the stability of the whole. Walls may be made of insufficient thickness and yet stand for a long time if the masonry be good; and, again, they may be heavy enough in the plan and fall when built, if the mason does not thoroughly understand his business. In such a case, blame is often attached to the architect when an accident occurs, which should in reality hang upon the skirts of the builder. Upon the quality of the mortar used in construction depends, in no slight degree, the strength of the walls; and regarding the best method of mixing mortar, it is proposed in this article to offer a few suggestions

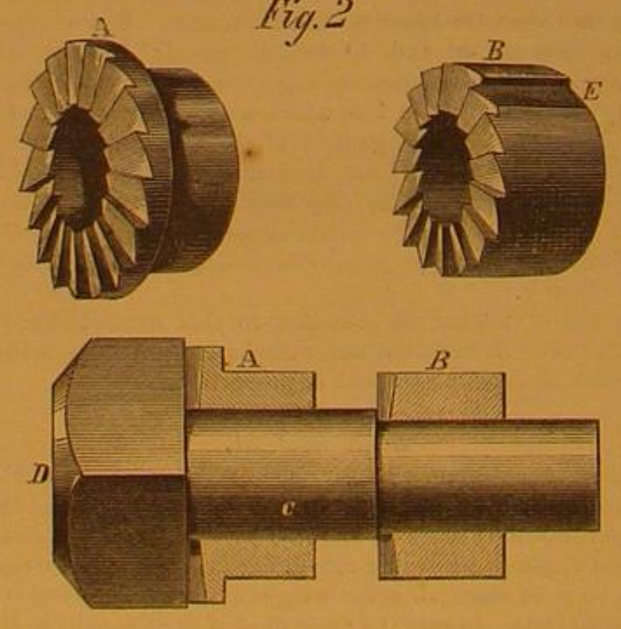
The common mode of making mortar is to first put the lime to slack in a box prepared for the purpose, and, after the slacking has continued for a time, to mix with it, in the same box, sand which has been previously screened. The mixture thus compounded is afterwards shoveled out of the box into a heap; and as mortar is required for use, a portion of this heap is drawn out and tempered to the proper consistency. In mortar prepared in this manner the mass is rarely homogeneous, lumps of unslacked lime and portions of gravel occurring promiscuously throughout the whole.

The proposed improvement in mortar-making provides an entirely different mode of operations, and, it is believed, obviates all the evils attending the present system.

The plan to be adopted which, in the estimation of the writer, is at once the most thorough and the most economical, is as follows:

Three boxes are first constructed, the first box being higher than the second, and the second box higher than the third. These boxes are connected by passages, at which are placed screens, such as are ordinarily used in mortar-making. Into the first box is put lime for slacking, and there mixed with water and manipulated until it is about the consistency of cream; after which it is allowed to run through the screen

Fig. 2



into the second box. It should be premised that, while the process is conducting, boards are placed over the screens and removed only when it is desired to unite the contents of different boxes. After the lime has been admitted to the second box, unscreened sand is thrown into the box in quantity deemed sufficient to make the mortar. The sand and lime, thus mixed, are then run through the screen into the third box or mortar bed, and there allowed to stand for twenty-four hours, when the mortar becomes fit for use, and requires no further tempering or mixing before its application.

The advantages of the above method are very apparent. In the first place, about one-fourth less lime is required than in mortar made in the usual way, and the mortar is more thoroughly mixed—and, therefore, much better—than that dealt with by the common process. Again, since the different boxes are separated by screens, the preliminary labor of screening is entirely avoided, all the lumps of unslacked lime being retained in the first box, and all gravel and foreign matter in the sand are retained, in a similar manner, in the second box. After the mixture is finally run into the mortar bed, all the refuse matter remaining in the first and second box can be shoveled out, and the boxes made ready for a repetition of the process. While the mortar is running into the third box, lime can again be slacking in the first box, without loss of time until the mortar-bed is filled. The bed can be made of any dimensions to hold the mortar required in the construction of a large building. In regard to the quality of the mortar made by the above process there can exist little doubt. It is more easily applied, more durable, and better adapted for all kinds of work than that made in the usual way. The writer has followed the system for many years, and has continually greater reason to be satisfied with its decided superiority.—*Condensed from the American Builder.*

Fog Signals.

In some places there is a curious natural provision for fog-warning, in the fact that the spots in question, generally islands, are the habitation of large numbers of sea-birds, which make a noise that can be heard far away. The South Stack, near Holyhead, is a well-known example; and in these places the birds are generally preserved and fostered as benefactors to mankind. But such cases are rare, and artificial expedients have to be resorted to. Bells have been tried—we all know the story of the Inchcape Bell, and have heard of the Bell Rock on the Scotch coast; and every yachtsman has passed the Bell Buoy at the entrance of Southampton Water—but the sound of both bells and gongs has been found to be so damped by fog as to be heard only a short distance away. Guns are troublesome, and not always suitable; and there has been, until lately, much difficulty in finding anything that would do. A short time ago, however, an invention by an American, Mr. Daboll, was brought to the notice of the Trinity House authorities; and, as it appeared promising, it was tried with so good a result that it may probably come more extensively into use as a fog-signal. We have been allowed, by the courtesy of the authorities, an inspection of the apparatus, and will endeavor to explain its construction and action to our readers. It is a very powerful horn or trumpet, blown by highly-compressed air, the sound being produced, however, not on the principle of either of these instruments, as ordinarily used in military bands, but on that of the clarionet or the brilliant trumpet-pipes of an organ. The sound of a clarionet is due to the vibration of what is called a *reed*—*i. e.*, a thin tongue of elastic material, which is placed so as to cover a long opening or slit leading into the pipe of the instrument. The reed is fixed at one end, the part over the opening being left free to vibrate. When the player covers the reed with his mouth and attempts to blow into the tube, the reed, by its flexibility and elasticity, alternately closes the opening and leaves it again, allowing a jet of air to enter the tube every time the opening is free. By this action the reed is set into quick vibration; and the puffs of entering air, following each other in regular succession and with great rapidity, give rise, on well-known acoustical principles, to a musical tone. This tone is further modified in quality by reverberation in the tube of the instrument, and is greatly strengthened by the bell-shape given to its extremity. The pipes of what are called the *reed-stops* of an organ are on the same principle as the clarionet; but the vibrating reed is in this case a thin plate of brass, varying in size according to the pitch of the note; but, for the middle tones, an inch or two long, a quarter to half an inch wide, and the substance of a thin card. The mouth of the player is represented by a box, inclosing the whole of the reed apparatus, and the pipe is generally of metal, conical in shape, or with a bell-mouth some inches in diameter. The fog-horn is essentially of the same construction as the reed-pipe of an organ, but with all its parts magnified to colossal dimensions. The reed, instead of being a thin leaf of brass, is a thick plate of hard steel, five inches long, two inches wide, and a quarter of an inch thick at the root, tapering down to an eighth of an inch at the loose end. The tube is of brass, eight or ten feet long, gradually expanding in diameter till it finishes in a bell-mouth two feet across. The pipe is placed vertically, its upper part projecting through the roof of the building, and being bent into an elbow, so as to make the bell part horizontal, delivering its sound straight out to sea. The compressed air for sounding the horn is supplied from a reservoir, into which it is forced by pumps worked with mechanical power. In the experimental apparatus a hot-air engine, of American contrivance, is used for the purpose; but a small steam-engine would probably be a more simple and trustworthy machine. A duplicate engine is required in case of any part getting out of order. The pressure of air required to sound the pipe is on the same magnified scale as the pipe itself; in an organ it amounts only to an ounce or two on every square inch; for a fog-horn it is from five to ten pounds, and the quantity of air required at this pressure is very large, but the volume of sound is immense.—*Cornhill Magazine.*

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE MANAGEMENT OF RAILWAYS.

It has often been said that it is easy to discover that a man is sick, but not so easy to tell what will cure him. It is easy to see that our railroad system is giving birth to enormous monopolies, but it is not easy to say how this can be helped now. Yet we find editors who think themselves able at a single sitting to concoct a plan which shall meet all the exigencies of the case. We confess we are unable to do this. The subject appears to us beset with difficulties; difficulties only to be discovered by long and able thinking, and which render the application of the proper remedies a task only to be accomplished by experienced and careful legislators.

We have been led to these remarks by the perusal of an editorial in *Hunt's Merchants' Magazine*, wherein the evils of the present system are pointed out and a remedy, which the author confidently pronounces adequate, is suggested.

That journal says justly: "The temptations to fraud on the part of railway directors are now enormous, and the checks upon them are trifling. For instance, a secret compact is made between the boards of two competing or connecting roads, by which one is sold or leased to the other at an enormous price; the directors and their friends at once buy up the one stock, and perhaps sell immensely of the other, and then publish the contract which changes the value of the stocks, and close their speculations in the market with large profits. Or, a secret arrangement is made for an unusual stock dividend out of profits which have been carefully concealed from the public, and even denied on oath by the officers of the road, and the stock bought at low prices by the 'ring' is, after the dividend, sold at a vast advance to the public. In many such instances the value of their own property has been depressed by the secret compacts of the directors who hold it in trust, or immense issues of new shares have been privately sold to an unsuspecting public; and when the exposure was made, the stock has suddenly fallen, and the conspirators, by their breach of trust, have enriched themselves with the spoils of those they pretended to represent."

This picture is not in the least overdrawn, but the question is, what are we going to do about it?

The author of the article referred to, says: "The one condition of success in such intrigues is secrecy. Secure to the public at large the opportunity of knowing all that a director can know of the value and prospects of his own stock, and the occupation of the 'speculative director' is gone."

To meet these difficulties he proposes that railway companies shall be compelled to publish all their financial statistics in a clear and intelligible form as soon as they can make them up. But how compel them? Surely this must be done by legislation, and we have seen in this State how extremely easy it is to legislate power into the hands of these corporations, but how hard it is to get the power away from them.

Is not the fault somewhat further back than corporations? and is it not rather in our own vicious system of legislation upon private interests? Limit the power of the legislature to bills of an entirely public character, and open the way to free competition, and would not the corporations find themselves powerless to injure public interests?

As to the stockholders, each man knew or ought to have known, when he bought his stock, the conditions under which he holds such property, and expected, or ought to have expected, that the larger stock-holders would control their own shares as well as those of the smaller. Therefore they who thus willingly or ignorantly entered into such a copartnership cannot complain if its terms are carried out to their full extent.

The writer referred to also suggests the prohibition of "every form of railway sale or consolidation by the companies," and thinks that only by this means can swindling be prevented. How this suggestion is to be carried out he does not tell us. It certainly seems to us not only impracticable, but contrary to all the fundamental principles upon which property is now held under the control of its legal possessors. Once let it be granted that those who own property may be legislated out of the power to control or sell it, and where will the end be? Clearly in the setting of limits beyond which neither individuals nor associations can acquire and hold property. For to lose the power to control and sell is, in effect, to cease ownership.

The solution of this question, if it ever reach a solution, will never be arrived at by any such loose and ill-considered propositions as this.

Monopolies can hardly endanger the right of the public so long as they encounter free competition. We do not pretend to set forth any plan by which this free competition can be secured, we leave that for those who are more competent to deal with it.

RECENT PROGRESS IN CHEMISTRY.

The past year has witnessed the introduction of a large number of new compounds into daily use, and the consequent increase of our knowledge of the best methods of manufacture, and the properties of bodies about which we could hitherto obtain very little information, even in the most complete works on chemistry. A recent bulletin, published by the extensive chemical manufactory of E. Schering, in Berlin, affords matter not to be found in any books, and hence we propose to condense the information for the benefit of our readers.

The hydrate of bromal, to which the formula of $C_2 Br_3 HO + 2 H_2 O$ is given, crystallizes in white needles, or by slow crystallization in the same form as blue vitriol, though colorless. It has a similar taste and smell to the hydrate of chloral, and is easily soluble in water and alcohol. Salts of silver ought not to produce a precipitate with these solutions.

The hydrate of bromal has hitherto been confined to scientific investigations, as experiments upon animals have shown that its effects are more anæsthetic than hypnotic. Chloral, originally discovered by Liebig nearly forty years ago, was not fully studied until recently. It is a perfectly colorless liquid, having the same boiling point as water, with a specific gravity of 1·5, and a sharp, biting taste, and undergoes spontaneous decomposition, so that it cannot be kept for any length of time. If one equivalent of water be added to it, it forms a dry crystalline mass known as the hydrate of chloral, and one equivalent of alcohol produces similar crystals of an alcoholate of chloral; the chloral has at present merely a scientific interest.

The alcoholate of chloral yields white, transparent, hygroscopic crystals, closely resembling the hydrate of chloral in taste and smell, but less soluble than the latter in water—a reaction that will enable chemists to detect a mixture of the two compounds. If we heat the alcoholate of chloral in twice its volume of water, it melts without dissolving and immediately crystallizes out under the water on cooling, while the hydrate of chloral at once goes into solution and remains dissolved. Sulphuric acid heated with the alcoholate becomes brown, but with hydrate of chloral remains colorless. Nitric acid of 1·2 specific gravity gives ruddy fumes of nitrous acid when heated with the alcoholate, but no fumes are produced under similar circumstances with the hydrate of chloral. It is of the utmost importance to know these reactions as the close resemblance between the alcoholate and hydrate may lead to serious mistakes, as the properties are unlike and the alcoholate ultimately acts like alcohol itself. The hydrate of chloral has been pretty fully described in our columns, but some practical details remain to be recorded. Its manufacture has assumed enormous dimensions, especially in England and America, but no establishment is able to make large contracts on account of the difficulties which still arise in its preparation. The workmen are so much affected by the fumes of chlorine and hydrochloric acid that they require to be constantly relieved, and this occasions delay and annoyance. It is difficult for the American manufacturer to compete with the German, owing to the high price of alcohol in this country and the revenue tax imposed upon it. The contradictory properties ascribed to the hydrate of chloral by different experimenters may be accounted for on the ground of the presence of the alcoholate in consequence of defective preparation. It is an agent not to be tampered with, and only to be trusted when coming from perfectly reliable sources. If it should be substantiated that in the hydrate of chloral we have a sure remedy for sea-sickness, as well as for the most obstinate cases of sleeplessness, it will prove one of the most important and beneficent contributions made by chemical science during the present century. In Germany the retail of this article is prohibited without the prescription of a physician.

A number of new and important compounds of carbolic acid have been discovered, which are prescribed in cases of putrid wounds for injections, and generally as disinfectants. Among those may be mentioned the sulpho-carbolate of zinc, which is inodorous, crystalline, and easily soluble in water and alcohol; the sulpho-carbolate of soda, a white crystalline powder; and the sulpho-carbolate of copper, resembling blue vitriol in color. A great objection to the employment of carbolic acid as a disinfectant is the persistent odor it has as usually sold for this purpose. This difficulty seems to be obviated in the case of the compounds mentioned above, and it is to be hoped that they will come into general use. Chlorathyliden is a new anæsthetic, the properties of which have only partially been studied, but which promises to be valuable.

The above are a few of the most important of the recent contributions of chemistry to the every-day wants of man.

A few months ago they were utterly unknown, now they afford investment for a large amount of capital, and give employment to many skilled workmen, besides conferring untold blessings upon suffering humanity.

OTHER WORLDS THAN OURS.

Our readers are well aware that we do not regard mere speculation of any sort as likely to either add to man's knowledge or happiness. The question as to whatever other planets in the solar system besides our own are, or may be inhabited, is one which must be classed among fruitless and profitless speculations. We find on this earth enough of evil to surmount, enough of solid fact to discover, and enough recorded learning to acquire, to tax all our energies without wandering off to other planets in vain guesses that they are or may be inhabited.

If we grant that they are full to overflowing with all sorts of living things, and that creatures as highly organized as men are, or as angels are supposed to be, dwell thereon, what application of this assumption can be made that will better the condition of mankind in the least, or give him the slightest insight into anything it is desirable for us to know.

Wild speculations have been indulged in about the possibility of establishing communication with these suppositious inhabitants, and perhaps deriving from them knowledge beyond anything that science has yet dreamed of, or hath entered into the heart of philosopher to conceive. Nay, Emanuel Swedenborg claimed to communicate with the inhabitants of Jupiter, but so far as we know the world has never got any good from the communication.

In some respects the present is an age of strange incongruities. On the one hand we have a class of men who profess to walk solely by faith; on the other hand, there is a class who profess to walk solely by the light of demonstrated facts or logical inferences from the results of experience. Between these two classes lies another, to which we may apply the commercial term, "middle-men," who profess to be scientific yet who are willing to indulge in speculations which certainly exact as large a degree of faith, as the dogmas of those who would make faith the sole rule of action.

Mr. Richard A. Proctor, F.R.A.S., is one of this class. Having attained some reputation as an astronomer, he has of late been indulging in speculations upon the old never-to-be-settled question of the plurality of worlds, and Longmans, London, has published in a book entitled "Other Worlds than Ours," what might as well have been styled "The Visions of Proctor"—a work from his pen in which the subject is stated to have been studied (?) under the light of present scientific researches.

Our knowledge of the book is at present confined to what the English *Reviews* have said about it. These *Reviews*, so far as we have seen them, are very favorable to the work. Taking, therefore, what they have set forth as a fair index of the line of argument pursued by the author, we find that very few of the facts upon which he bases his speculations are new, and further, that all he says or can say upon the subject may be summarized thus:

It is not impossible, so far as we can ascertain the conditions which exist upon the surfaces of some of the planets, that living creatures may exist upon them, therefore it is quite probable they do exist there. It is possible that peculiarly organized beings may have a high degree of intelligence, and it is further possible that the probable beings which may exist upon—say Mars for instance—may be highly enough organized to possess a high degree of intelligence; therefore it is quite probable that some of the living beings upon that planet are highly intelligent.

This is, we think, a full and fair showing of the argument.

In the statement of facts from which the possibility of animated existence is inferred, we find very little that is new, and the claim that present astronomical science possesses facts warranting such an inference, that were not possessed fifty years since has very little to support it.

Such new facts as have been obtained, and which are available for the purpose of such speculations, are confined principally to the planet Mars. There is little doubt that, on that planet, the conditions of climate and atmosphere are very analogous to that of our globe; but this admitted, the question again resolves itself into one of probabilities.

We grant the probabilities, and find that we get very little satisfaction from our liberality. We cannot send ships to Mars, and open up a commerce with its inhabitants. We do not know how they stand upon the Women's Rights question, or whether a jury of twelve intelligent sons of Mars would have convicted or acquitted McFarland. We cannot even send missionaries to convert the—in all probability—teeming population of that planet, or get up societies for the amelioration of his—it may be—oppressed multitudes.

We do not know whether all the people who dwell upon his face are suffering because the first man and woman would eat forbidden apples, or whether they are all in some huge garden of Eden, enjoying themselves in the most beatific manner.

Perhaps, however, it would be possible to get a word or two with them by making use of one of our vast prairies and adopting Dr. Dick's plan of drawing thereon huge geometrical figures.

Finding it thus possible to communicate we suggest the

first question be, "Are you happy?" With what breathless suspense shall we await the answer, and if it should be—as it is quite probable it might be—"NO!" how gratified we shall all feel that the benevolence of the Creator has not left this world alone in its misery. It would almost make this planet explode with envy should the reply be "Yes."

MACFIE THE IRREPRESSIBLE UPON PATENT LAW.

Even the London *Spectator*, which supports Mr. Macfie in his opposition to the patent laws, gives that irrepressible gentleman little credit for skill in argument, and acknowledges that very much of what he has said only tends to show defects in the present English system of patents, rather than any good reason for its abolition.

Not content with making absurd arguments and illogical speeches, Mr. Macfie has collected into a volume, speeches, papers, and expressions of opinion, which he no doubt considers as "*squelchers*," but which sensible, sober thinkers are prone to denominate as the most unmitigated bosh.

The only logical conclusion to which this gentleman's arguments tend, is one which he is too short-sighted himself to see, namely, the utter renunciation of individual rights to the possession of property, be the same patent rights, copyrights, or anything else that men are now able to procure for themselves by virtue of genius, tact, and industry.

In that Utopian state of society for which some long, and fewer hope, when every man shall live solely for the good of all men, when land, chattels, wives, and children shall become common property; when all selfishness shall be done away, and each shall prefer to see his neighbor enjoy, rather than to enjoy the fruit of his labor himself, Mr. Macfie would find the principles he advocates precisely the thing.

To suppose, however, that in the existing state of human society men will consent to relinquish their rights to property in thought, or the results of their mental toil, and allow a distinction to be made between these rights, and those by which they hold the results of physical toil, is to suppose them on the average, to be as incapable of drawing a logical conclusion as Mr. Macfie himself; a state of general imbecility we are unprepared to admit. Of course everybody would be free if there were no laws of any kind. We should then have free trade, free stealing, free murder, free starvation, and a host of other freedoms which men have thought it wise to resign for another kind of freedom, *i. e.*, freedom to go and come unmolested, to accumulate wealth, and to improve their bodily and moral condition.

In Mr. Macfie's code carried out logically to its conclusion, A may plant and cultivate a hill of potatoes, which, as soon as he has dug them, all the other letters of the alphabet may seize and appropriate, provided there is enough to go around. True, A is compensated for his loss by the right to invade the onion patch of any other letter, and devour turnips wherever he finds them growing. Thus we get back to the old original savage game of grab. It will not take long for B to find out that he is stronger than A or C; nor long for A and C to find that their chances for either potatoes, onions, or turnips, are small and slim when B is around

No man would get pay for anything he might do, but would live, if he lived at all, by stealing, unless, as we said above, each would work for all, and uniform distribution were secured, a thing which even the early Christians found difficult, as we learn from "Acts," the widows were neglected in the daily distribution.

We believe in neither Mr. Macfie nor his logic, and the logic of the *Spectator* is little better when it says:

"One of the most serious considerations with regard to the Patent Laws is that they are already being removed in other countries, and that the competition to which our manufacturers will thus be exposed must embarrass them in their business, while reducing the value of patented inventions. Mr. Macfie gives us a message from Count Bismarck to the North German Parliament, recommending the total abolition of patents throughout the new Confederation. The Second Chamber in the Netherlands passed a similar resolution by 49 ayes to 8 noes. It has already been found in some remarkable instances that countries restricted by patents cannot hold their own against others in which manufacture is unimpeded. M. Chevalier tells us that France cannot export Bessemer steel to Prussia, and that the French makers of velvet suffer in like manner from Prussian competition. The history of the aniline dyes discovered by Professor Hofman, but patented by others, teaches the same lesson. French manufacturers who had to pay £40 a kilogramme for what cost only £12 out of France, flocked by shoals from their own country and set up new factories in Switzerland and Belgium. The danger to every trade which is weighted by patent restrictions becomes the more formidable as those restrictions are removed in other States."

Let England adopt a wise protective system, and the policy of other European nations in regard to patents need not trouble her.

Uses of Mica.

Recently scales of mica have been used for spectacles and in optical instruments. The chief use in this country is in connection with stoves, and it is now quite an article of commerce, especially in New England. Many furnace doors are now supplied with small holes closed with mica, which serve as windows to enable the engineer to see the state of the fire without letting in a blast of cold air by opening the door. Many varieties of mica abound in curious markings, which have attracted the attention of microscopists as affording some clue to the true origin of this stone. Mica is one of the constituents of granite, and contains potash, and sometimes lithia and other alkalies. Stove dealers are the chief consumers of this article.

PATENT RIGHTS IN CONGRESS.

Our readers will probably recollect—as we noticed it at the time—that President Grant's first veto was that of a bill to extend the patent of Rollin White, the inventor of the Smith & Wesson revolver. We have never had a doubt that the veto was a righteous one.

In the House of Representatives on Wednesday, June 22, the bill was reconsidered, General Butler supporting its passage over the veto of the President; whereupon Mr. Farnsworth accused General Butler of having received $2,000 for his support of the measure. General Butler retorted that the charge was false, malicious, and infamous, and stated that the $2,000 received by him were counsel fees, received in a case tried before the Supreme Court, the brief in which cost him four weeks' work. He considered the money honestly earned, and doubtless so will the public.

The Joint Committee on Retrenchment lately directed to investigate settlements by the Navy Department of contracts made by Isherwood, Chief of the Bureau of Steam Engineering under the last administration, for steam machinery, held a meeting on the evening of the 22d June. No witnesses were examined, but the Hon. William E. Chandler was present by invitation, and in reply to a question he stated that he knew nothing personally of the settlements, but acted as the counsel of Henry W. Gardiner and others, in their efforts to defeat an extension of the Corliss patent and in the preparation of papers placed before the House Appropriation Committe, to defeat an appropriation to pay Corliss' certificate, given by G. W. King, the present head of the Steam Engineering Bureau, in settlement of contracts with the Corliss Steam Engine Company, of Providence, R. I. This Company had contracts unfinished when the present administration came into power. A settlement was made, by which engines began were left unfished, the Department agreeing to pay some $250,000.

USES OF FLUOR SPAR.

In an article on fluor spar as a flux, Vol. XXII., page 288, we stated that in the manufacture of iron, "the proper proportion is about 50 pounds to 100 pounds pig iron, or 40 pounds to 100 pounds spiegel iron." In both of these cases for 100 pounds read 100 *centners*—this makes the proper proportion 50 pounds fluor spar to 11,000 pounds pig iron, or 40 pounds to 11,000 pounds spiegel iron.

FLUOR SPAR IN GLASS MANUFACTURE.

E. Richters, in Waldenburg, Germany, states that the substitution of fluor spar for lime in the manufacture of glass allows of a great reduction in the amount of glauber salt, and greatly promotes the melting of the frit.

As the result of numerous experiments conducted on a large scale, he found that with the same consumption of fuel and similar length of time, the amount of glauber salt required could be diminished one half by substituting fluor spar which had previously been pulverized and calcined for the lime usually employed.

In countries where fluor spar can be had in abundance, its introduction into glass manufacture would appear to offer many important advantages. The following are the proportions taken:

With fluor spar.		With lime.	
Sand	115·44 lbs.		116·40 lbs.
Fluor spar	27·69 "	Lime	15·55 "
Glauber salts	4·90 "		8·00 "
Manganese	4·00 "		3·00 "
Charcoal	2·00 "		2·00 "
Glass frit	299·00 "		248·00 "

A Warning to Thieves.

The *Journal of Commerce* notices with astonishment that bank officers, who pay such large sums for safety vaults, burglar-proof locks, steel-lined chests, and all the other very proper protections against robbery, neglect to add one of Holmes' Electric Alarms. With this, well arranged, a gong might be set ringing on the first opening of the door or window of a banking house, making sufficient noise to waken a whole village. Mr. E. Holmes, whose office is at No. 7 Murray street, showed us recently a large gong that he had arranged especially for bank alarms. Some banks in this city are protected in this manner. It is well worth the attention of those interested, and we write solely for their benefit from our own knowledge and experience, without any solicitation from the owners of that invention.

A New Use for Oxygen.

We are informed by M. Widemann, who is connected with the works of the New York Oxygen Gas Company, that the use of oxygen in renewing and increasing the flow of oil in petroleum wells, has been so successful that a regular trade has sprung up in oxygen gas for this purpose. The gas is injected into the wells through tubes, and mingling with the hydrocarbon vapors, forms an explosive mixture which, when ignited, completely opens seams which have become clogged, and thus renews the flow.

COMPRESSED FISH OFFAL FOR MANURE.—In a recent article upon the uses of codfish the compressed offal was spoken highly of as a manure. Mr. W. F. Rickard, F. C. S., formerly of London, writes us from Leviathan Mine, Cal., that he is the inventor of the process therein described as French. He further writes that the compressed offal does not decompose by exposure to the air. Samples which had been lying about his London office four years have been found perfectly hard and sweet, proving thereby that the article may be exposed in bulk without the cost of packages.

COCKROACHES can be destroyed by using smooth-glazed china bowls, partially filled with molasses and water. Set the bowls against something by which the insects can get in; they will not be able to get out.

PATENT OFFICE AFFAIRS.

The business of the Patent Office is now in a flourishing condition, and the present is a favorable time to enter applications. Inventors will find the SCIENTIFIC AMERICAN PATENT AGENCY ready to attend to the prosecution of claims with the greatest dispatch. By reference to our register, we find that we have made upwards of twenty-four thousand preliminary examinations into the novelty of alleged new inventions. This great experience, together with the fact that a large proportion of all the business with the Patent Office, for the past twenty years, has been conducted through this Agency, suggests to inventors the surest and best means to secure their rights.

We give opinions free, and all we require is a rough sketch and description of the invention.

Inventions patented through this Agency receive notice in the SCIENTIFIC AMERICAN.

MODELS.—In order to apply for a patent the law requires that a model shall be furnished, not over a foot in any of its dimensions, neatly and substantially made. Send the model by express, prepaid, addressed to Munn & Co., 37 Park Row, New York, together with a description of the operation and merits of the invention.

CAVEATS.—Whenever an inventor is engaged in working out a new improvement, and is fearful that some other party may anticipate him in applying for a patent, it is desirable, under such circumstances, to file a caveat, which is good for one year, and, during that time, will operate to prevent the issue of a patent to other parties for the same invention. The nature of a caveat is fully explained in our pamphlet, which we mail free of charge.

EUROPEAN PATENTS.—Probably three-fourths of all the patents taken by American citizens in Europe have been secured through the SCIENTIFIC AMERICAN PATENT AGENCY. Inventors should be careful to put their cases in the hands of responsible agents, as in England, for example, the first introducer can take the patent, and the rightful inventor has no remedy. We have recently issued a new edition of our Synopsis of European Patent Laws.

All communications and inquiries addressed to Munn & Co., respecting patent business, are considered as strictly confidential.

THE REPORT OF COL. W. A. ROEBLING, CHIEF ENGINEER OF THE N. Y. BRIDGE CO.

The Superintendent and the Chief Engineer of the N. Y. Bridge Company, who have in charge the erection of the great suspension bridge over the East River between New York and Brooklyn, have made their reports. That of the Superintendent, Mr. W. C. Kingsley, pertaining chiefly to the financial matters, we shall pass without special notice. That of Col. Roebling, however, is so interesting and instructive, and the work is of such importance, that we make room for nearly the whole of his report, omitting only some introductory matter.

SURVEYS.

The general line, known as the Park route, had before been determined, but no actual line had ever been located upon the ground, the bridge line having been simply traced upon the largest and best maps procurable of both cities.

WORK WAS COMMENCED

in June, 1869. One single air line run through over the tops of the houses from the City Hall, in New York, to St. Ann's church, in Brooklyn, at once showed a discrepancy of more than fifteen feet between it and the line laid down on the maps. Several center lines were run on trial, each a little further to the east on the Brooklyn side and more to the west on the Chatham street, New York side, until one was found that was satisfactory.

In the location of bridges some attention is paid to the difficulties likely to be incurred in getting foundations for piers, in making approaches, etc., but here such consideration had to be ignored, and the towers and anchorages placed wherever the exigencies of the case brought them. The charter fixed the terminus on the Brooklyn side in the square on the corner of Sands and Fulton streets, etc., and on the New York side it was desirable to bring it as nearly as possible to the corner of Nassau and Chatham streets. The foundations of the Brooklyn tower threatened to encroach upon one of the main slips of the Fulton Ferry unless kept far enough to the east, but by doing so the New York tower unavoidably occupied one of the slips of the Roosevelt street ferry. Any further movement to the east would bring the approach over Prospect street to a point where no head room was left between the grade of the street and the bridge crossing it. The same was true in regard to North William street.

Other difficulties summed up showed that no change from a straight line was admissible. The center timbering established a minute and detailed survey. Since then the Brooklyn foundation has been placed in its proper position on this line, and any change is impossible.

In August, 1869, I was appointed Chief Engineer. At the first meeting of the Board of Directors, in September, 1869, the Executive Committee were empowered to proceed with the foundation of the Brooklyn Tower, and to complete the same up to high-water mark. Mr. Horatio Allen was appointed Consulting Engineer, and Mr. Wm. C. Kingsley, General Superintendent. To Messrs. Webb and Bell the contract to built the caisson was given.

THE BROOKLYN FOUNDATION.

In the meantime a boring made in 1867 showed gneiss rock at a depth of 96 feet below high water. The strata penetrated consisted in the first place of surface filling through alternate layers of hard pan and boulders of trap embedded in sand and clay. Below 50 and 60 feet depth the material was so compact that the bore hole stood without tubing for weeks. No necessity existed, therefore, for going down to rock; a depth of about 50 feet would suffice. But the great desideratum to be attained was a uniform character of the soil over the whole space of the foundation whatever the depth might be. It is well known that the drift formation of Long Island presents a great variety of strata in comparatively short diagonal distances Within a hundred or two feet on either side of this foundation, there is no bottom so to speak, and piles are driven a great depth into mud; whereas in the center of our foundation the depth of water was only a few feet

the existing ferry slip had been blasted out at a great expense, and to drive an iron-shod pile even two feet into that material was the work of hours. This hard material, however, occupied only a part of the foundation, which comprises an area of 17,000 square feet. One third of the area towards the east was much softer in character; to meet the requirements of the case a heavy solid timber foundation was decided upon, of sufficient thickness to act as a beam, and having the requisite mass to insure a uniform settling. The importance of a uniform foundation becomes evident at a glance when we consider the size of the tower, weighing 35,000 tuns, with a hight of three hundred feet above the foundation upon which the permanent pressure is 4½ tuns per square foot. In addition, the buoyancy of the timber enables us to dispense with the screws ordinarily used in towing a caisson.

In regard to durability, it is well known that timber immersed in salt water is imperishable, and to protect it against worms it is merely necessary to sink it beneath the river bed. It at once suggested itself to make the timber platform as far as possible a part of the

CAISSON.

This has been done by making the roof of the caisson a solid mass of timber, of fifteen feet in thickness. The object and purposes of a caisson in sinking a pneumatic foundation is too well known to need any description here; it is merely a diving-bell on a vast scale. It may well be said that, since the unparalleled achievement of Captain Eads, at St. Louis, the word caisson has become a household word among American engineers.

The caisson of the East River Bridge is a large inverted vessel or pan, resting bottom upwards, with strong sides. Into this air is forced, under a sufficient pressure to drive out the water. Entrance is had to the large working chamber, thus formed underneath, through suitable shafts and air-locks. The material is taken out through water shafts, open above and below, and two supply shafts send down the material subsequently needed for filling up the air chamber.

The dimensions of the caisson are rectangular; length, 163 feet, width, 102 feet, hight 9 feet 6 inches. Thickness of roof, 5 feet. The sides form a V, and are 9 feet thick where they join the roof, sloping down to a round edge. The inner slope of the V has an angle of 45 degrees. The lowest part of the slope is formed by a semi-circular section casting, protected by a sheet of boiler plate, which extends up three feet each side. A heavy oak sill rests on the casting, and it consists of a stick nearly two feet square. The three succeeding courses are laid lengthwise, after that the alternate courses are heading courses. The whole mass is thoroughly bolted together by drift bolts, screw bolts, and wood-screw bolts. In addition there are heavy angle irons uniting the V to the roof. At the corners the courses of timber are halved into each other, and strapped together for further security. The roof is composed of five courses of twelve-inch square yellow pine sticks, laid close together, bolted sideways and vertically, and having a set of heavy bolts running through the five courses. The outer edge of the caisson has a batter inward of one in ten to facilitate its descent into the ground.

To make the caisson air tight, the seams were all thoroughly caulked for a depth of six inches, inside and out, and in addition a vast sheet of tin unbroken throughout, extends over the whole caisson, between the fourth and fifth course, and down the four sides to the shoe. The tin on the outside is further protected by a sheeting of yellow pine. The space between the timbers was filled with hot pitch. As air under pressure of forty or fifty pounds will penetrate wood with ease, the inside of the air chamber was coated with an air-tight varnish, made of resin, minhaden oil, and Spanish brown. The air-tightness up to the present time is quite satisfactory, and only one fifth of the air pump on hand is sufficient to keep the water out.

The yellow pine timber was selected specially for the purpose. It came principally from Georgia and Florida, and much of it was so pitchy that the sticks would not float. The average specific gravity of all the timber was 48 degrees per cubic foot. Every bolt hole is bored with a large drift to insure the hold of the bolts. As the construction of the caisson proceeded, the iron work of the water-shafts, air-lock shafts, and supply shafts was put in. This work was done under contract by Messrs. Hubbard & Whitaker, of Brooklyn.

The water shafts, two in number, are square shafts, three eighths boiler plate, properly stiffened by angle irons, and well secured to the caisson. They are seven feet by six feet six inches, and are open above and below, the lower edge extending twenty inches below the edge of the shoe. The water inside of them rises and falls with the state of the tide outside. The material to be taken out is shoved under the edge into the water shaft by the laborers inside, and is then taken out by the so-called clamshell dredge of Morris & Cummings, of New York—the only known instrument which possesses the precise action of the human hand in picking up things. Any other arrangement for excavating in the shape of a revolving dredge or a sand pump was out of the question. The air shafts are 3'6 feet in diameter, and extend simply through the timber on top of which the air locks are placed. The supply shafts are two inches timber, twenty-one inches diameter, and of indefinite length—they have a door at the bottom and one on the top with an equalizing pipe. They are filled full of made air, and the whole contents fall into the air chamber below.

It was the original intention to have made the air chamber under the caisson one entire space without any divisions into compartments, thus facilitating the excavation of the material. Various considerations led to the abandonment of that view. Since the caisson was to be launched like a ship, a certain number of launching ways were required, and these required a stiff frame from the launching way up to the roof. Again, in the boulder soil, only a few points of the edge would have rested and supported the weight at any one time. But the chief point was the rise and fall of the tides and their effect on the caisson. The extreme rise and fall is 7½ feet. If the inflated caisson is just barely touching the ground at high water, it will press upon the base with a force of 4,000 tuns at low tide, all of which has to be met by the strength of the shoe and the frames. And it is not until the caisson is permanently righted down that the continuous excavation can take place inside. The frames are proportioned somewhat to the strains in launching, and form a heavy truss of pine posts and stringers with three-inch sheathing on each side, and side braces to the roof every six feet. The ends of the frames are secured to the sides of the V by knees.

It was concluded to limit the pressure of the caisson during the launch to 2¾ tuns per square foot of launching surface. This required seven ways in all, two under the edges and five under the frames. The total launching weight of the caisson was 3,000 tuns, containing 111,000 cubic feet of timber and 250 tuns of iron. It was launched sideways—that is, with the long face of 168 feet by 14 feet 6 inches high facing the water. The ground-ways were laid at an angle of one inch per foot, the caisson standing fifty feet back from the end of the ways. To buoy up the forward end of the caisson as it entered the water, and thus prevent its entire immersion, a temporary water-tight compartment of two-inch plank was put in, one third the distance across. It served its purpose admirably. A full complement of wheel barrows, crabs, and winches were likewise stowed away in it. The ground-ways consisted of two timbers of eleven inches square each, bolted together sideways. They were grooved like the guide of a planer, and the upper launching way fitted their grooves correspondingly. The great danger of launching so large a mass on seven ways consists in the liability one end going faster than the other, and thus wedging the caisson fast on the ways. Only the outer ways were provided with ribbands. They, however, proved superfluous to accelerate the motion of the caisson as it entered the water, and thus overcome the increasing resistance. The ways were laid crowning to the amount of eighteen inches in their length. The launching ways were likewise continued ten feet back of the caisson, and provided with shoes against the sides, it was desirable that the rear edge of the caisson should leave the end of the ground ways uniformly, and not stick fast on one—a thing likely to occur, since the ways stopped at the low-water line, and the rear edge would fall at once into deep water. The above arrangement answered the purpose.

On the 19th of March, 1870, the launch took place; in every respect a success. As soon as the last block was split out, the caisson commenced to move. The impetus it had acquired in the first part of its course proved sufficient to overcome the immense resistance offered by the water. It would seem that if the ways had been about twenty feet longer, the caisson would have lost its headway. The air caught inside the air chamber aided materially in buoying up during the launch. Neither the battering rams provided to start her, nor the checks and levers intended to hold her back until the proper time, were needed. The deck of the caisson was not submerged, nor was there any wave of translation in front, as might have been expected. An air pump and boiler had been placed on the caisson before landing. This was at once set in motion, and in a few hours the water was all displaced from the air chamber, the air blowing out at one corner, thus proving a satisfactory state of tightness. When the air was afterwards allowed to escape entirely, the top of the caisson settled within seventeen inches of the water, which happened to agree with previous calculations.

The launching arrangements, as well as the entire responsibility of the launch rested with the builders, and they accomplished their results by simple common sense arrangements, no money being wasted on elaborate precautions or preparations.

PREPARATIONS OF SITE.

It had been estimated that the same length of time would be required to prepare the bed for the caisson as to build it. Owing to unforeseen difficulties, possession of the ground was not obtained until Jan. 1st, 1870. The winter had hitherto been mild, and continued so, much to our advantage; and during most winters it would have been impossible to do anything. The preparation of the site consisted in establishing a rectangular basin open towards the water side, surrounded on three sides by a wall of sheet piling leveled off to a uniform depth of eighteen feet at high water. This depth was decided upon because one corner of the side had that depth of water already, and because a certain depth was necessary to float in the caisson at all stages of the tide. The dismantling of the space—the ferry slip—drawing a hundred piles, tearing out 350 feet of fender sheathing, removing of 350 feet of heavy cribbing, filled with stone and dredging of the loose material on top, required in all about a month. The dredging was done by Mr. Tebo by day's work, two machines of the Osgood patent being used. The drawing of the piles was done partly by pile drawers and in part by the "ox," a steam crane-boat well adapted for the purpose. At the same time it became necessary to cut away half of the pier separating the foundation from the main slip of the Fulton ferry which was accomplished without interfering with the ferry. All the timber and piles taken out were found to be infested with thousands of sea worms; the ravages, however, were confined to the space between low water and the mud line. A pile which was sixteen inches in diameter below the mud, perfectly sound and free from worms, would be found eaten away to a thin stem of three inches just above the mud, and all timber was affected alike. This shows the necessity of going below the top of the river bed with our timber foundation, and also proves its entire safety in that position.

MATERIAL REMOVED.

In all, there were 10,700 yards of material removed, the bulk of it in the course of a month, comprising the filling in and surface mud. A line of soundings then taken showed 3,000 yards yet to be removed before the level of eighteen feet was reached. The character of this material was next to solid work, some of the dredges could make but the slightest impression upon it, neither the Osgood nor the powerful grapnel of Morris & Cummings. All of the old charts of the harbor showed this point to be a reef of rocks or boulders, and these had been covered by filling in from the shore. Recourse was necessarily had to powder. Surface blasts were not used at all because the locality forbade the use of heavy charges which are essential for success. A surface charge of less than three hundred pounds would have been of no effect. It was determined to make holes in the bottom by means of an iron pile driven in and afterwards withdrawn. Into the bottom of this hole say, four or five feet deep, a canister containing fifteen to twenty pounds was inserted by a diver when the pile driver was hauled back and the charge exploded by electricity. The result was a small crater and the loosening of contiguous boulders from their bed. Three iron piles were used, two of five inches and one of six inches, twenty-two feet long and shod with steel at the point and head. Two pile drivers were coupled together for this work and a double gang of laborers employed day and night under charge of Captain Scott. A A week's practice reduced the matter to a system and developed the kind of canister to be used, the exploders and the battery. From the ordinary tin canister we passed to second-hand, lap-welded, wrought-iron tubes, cut in lengths of two feet and plugged at each end, which proved effective, but the supply getting scarce, recourse was had to cast-iron shell with sides one half an inch thick. They possessed the additional advantage of dropping to the bottom of the hole of their own weight. The average number of blasts made by one gang in ten hours was thirty-five. The greatest delay was experienced in withdrawing the pile which frequently resisted the united efforts of both pile drivers hauling on treble blocks with their engines, and a thorough shaking did more good than any amount of steady strain.

THE BATTERY

used was a small frictional machine, inclosed in a light rubber case, and was supplied from the Oriental Foundery, of Boston, as were the exploders. This machine was instantaneous in its effects and never out of order, and with it any number of charges could be set off at the same time. After a thorough blasting the Osgood dredge could work to advantage for a short time. Many of the boulders were too large to be picked up by a dredge, and a few were taken out by the Morris & Cummings grapnel, while others were slung under water by divers, having first been loosened by blasting and then lifted by the divers.

Those that were too heavy were floated along under water to a space back of the foundation and there dropped. The whole process was expensive, but still very effective. The casual observer, to whom the surface of the water appeared the same day by day would think that nothing was done, but the diver who slung boulder upon boulder night after night, had a different story to tell.

This driving of iron piles afforded a thorough knowledge of the entire ground. On the side towards Marston and Power a dozen blows would drive the pile down forty feet through soft clay, where it was brought up by a harder stratum. But in the center there is a ridge-shaped layer of hardpan, varying from two feet to eight feet in thickness. Frequently 100 blows of the 1,500-pound hammer were required to drive the pile three feet into this material. Towards the ferry the clay again disappeared, giving way to boulders of all sizes, packed close together, a coarse sand filling up the spaces between. On the river side all sand or clay was washed away, leaving the bare stone.

As the time passed along, all work was confined to the lines of the frames and edges of the caisson, leaving the ridges between, to be removed afterwards, from under the caisson. Three fourths of the boulders consisted of the trap rock of the Palisades, the rest gneiss, with a few sporadic boulders of red sandstone. Holes of extra depth were blasted for the location of the water shafts. In the south shaft the pile finally penetrated through eight feet of hard pan, and there struck into loose sand.

None of the dredges were adapted for such work. The bucket should have been discarded entirely and replaced by one long plow-shaped tooth, fastened to the dipper handle, solely with a view of rooting up the material The ordinary dipper presents too much surface for penetration.

The cost of dredging out the soft material on top was about sixty cents per yard, and of the hard material below, including the blasting $3·62 per yard.

1,173 blasts were fired consuming 13,000 pounds of powder.

While the dredging was going on the inclosure also proceeded—an outer row of piles was first driven and fastened back to anchors and logs, in order to resist the pressure of twenty-two feet of earth—five feet inside of this a line of close sheet piling was placed with sufficient marginal space for towing in the caisson.

During April, six air-compressing machines were placed in their foundations, and satisfactorily tested. They were manufactured by the Burleigh Rock Drill Co., of Fitchburgh, Mass. Each engine is twenty-horse power, and drives two single acting air cylinders of fourteen-inch stroke and fifteen-inch diameter. Every engine has its own boiler, and they are all so connected that the stoppage of no one boiler or engine will affect the rest.

A large condensing vessel serves to precipitate the moisture in the compressed air and deliver dry air into the caisson. A ten-inch main leads the air underground a distance of 150 feet to the caisson, where it branches, and two rubber hose of six inches diameter lead the air to the supply shafts and thus into the caisson. Self-acting clock valves prevent the escape of the air in case anything should happen to the hose. All the air conductors have been tested to a safe limit. A blacksmith and carpenter's shop have been erected, the fires being blown by compressed air. One compressor has been set apart to compress air to 65 degrees for the purpose of working two Burleigh rock drills in the caisson.

Two double engines have been set up by Morris & Cummings to work the dredges in the water shaft, and two more engines are ready to hoist and set stone on the caisson by means of three large derricks with horizontal booms, yet to be placed on the caisson.

On the first of May the leveling off had proceeded far enough to bring down the caisson from Greenpoint. A contract had been entered into in the mean time with Webb & Bell to lay the ten additional courses of yellow pine timber, and advantage was taken by them of the delay to put on two of the courses at Greenpoint, where the caisson was lying afloat.

THE CAISSON WAS TOWED DOWN

by six tug boats, under charge of Capt. Maginn. The pump was kept in operation and the air chamber fully inflated, the great buoyancy possessed by the V-shaped sides prevented any tilting or loss of air. This inflation was essential, as in one part of the river there was only a foot space between the bottom and the lower edge of the caisson. At the turn of the tide the following day, the caisson was easily hauled into place.

A double row of piles incloses it on the outside, and also supports the track and turntables for the stone cars.

By June 20th all the courses of timber were laid. The courses cross each other at right angles, with space between of actually four and five inches—every two feet four inches the stick is fastened down by a one-inch drift bolt. The whole mass is thus bound together into one solid unyielding platform. Each course was properly adzed off, and the original course of two piles with which the frames were laid is still preserved—the amount of timber laid in five weeks amounts to over 100,000 cubic feet. The space between the timbers is filled in with concrete, which serves to add to the necessary weight, as well as to harden and preserve the timber.

It is composed of four parts of clean washed beach gravel from the Sound, two of sand, and one of cement. The gravel is small, uniform in size, and perfectly free from impurities. Various brands of cements have been used so far, comprising in addition to the Rosendale cements, the yellow cements from Coplay, Pa., Akron and Fayetteville, N. Y. The latter are all quick setting, but do not attain the ultimate hardness of the slower setting Rosendale cement, especially where the latter has been ground of extra fineness by special agreement.

As the timber was built up the covers were slipped back and the outer spaces filled in with concrete, so that at its upper corner there is a mass of concrete from four to five feet thick, which serves to protect the timber.

The additional sections of water shaft as well as the air locks were put up, in the meantime permanent air connection was established. The air locks are seven feet high, and six feet six draw inside; the sides are half inch boiler plate and heads of cast iron, with oval doors eighteen by twenty-two inches; six bulls-eyes light up the interior.

These locks as well as the sections of water shaft were made by the Morgan Iron Works, and are very creditable specimens of workmanship.

To avoid the lengthening out of the air shafts the air locks are placed within water tight compartments, which occupy the spaces of the well holes in the Towers, and will keep out the water when the top of the timber is submerged.

The air chamber was first entered May 10th through the air locks, and gradually, as the caisson settled more, the force of laboring men has been increased.

The removal of the temporary wooden compartment and shoving out of the material under the edges was accomplished in due time, as well as the opening of two doorways through each of the frames.

For three weeks past a gang of 40 men has been at work in the caisson, for eight hours every day, under charge of Mr. Young, principally in leveling off and removing boulders which happened to lie under the frames and edges. A deposit of dock mud, from two to three feet deep, has made this work exceptionally unpleasant. The dredges, which are now beginning to work, will remove it in a short time. The removal of large stone from under the shoe, some of them containing 100 cubic feet, is a matter requiring considerable skill and perseverance. It has so far been accomplished by means of blocks and falls, crabs and winches, and hydraulic pulling jacks. In extreme cases blasting will be resorted to.

During this time the caisson has daily

BEEN RISING

with every high tide and resting on the ground again at low water, requiring most of the work inside to be done at low water, where the caisson is comparatively free from water. As the edge does not readily sink into the hard soil it is expected that there will always be some water. Since the edge of the shoe is rounding, it allows the air to blow off before the level of the water has reached the lowest limit; this is caused by any trifling agitation in the level of the water inside, which gives the escaping air a chance to establish an outgoing current before the head of water inside becomes sufficiently great inside to overcome it.

By constantly building up on top the center of gravity has been raised considerably, and the caisson is now in a condition of unstable equilibrium—that is, it does no longer rise uniformly with the rise of the tide. One end will remain on the ground and the other rises as much more in proportion, and the more it rises the more surface it presents to the upward pressure of the air on that side, the general level of the water inside being governed by the level of the highest point of the shore.

This rising of one end of the caisson is attended by another phenomenon of imposing appearance. As the tide rises, and the downward pressure of the caisson is about being overcome by the increased tension of the air inside, as well as the buoyancy of the water outside, one end of the caisson will suddenly rise six inches or more. The result is that for a few minutes the tension of the air inside exceeds the head of water outside, and a tremendous outward rush of air takes place under the shoe, carrying along a column of water of hundreds of tuns to a hight of sixty feet at times. This continues until a return wave inside of the caisson checks it. These blow-offs are not felt to any extent by the men inside, beyond the warning noise and momentary draft created.

The magazine of force contained in 170,000 cubic feet of compressed air is so large that the loss of a few hundred tuns is a trifle. A system of pipes is put in the air chamber for the purpose of illuminating the air chamber with calcium lights, a trial of which has resulted favorably: with moderate pressures candles answer very well.

THE FIRST COURSE OF STONE

is now being laid. Its weight, together with the concrete on top of the timber, will probably suffice to ground the caisson permanently, and thus permit the erection of setting derricks on the caisson. The stone setting will then keep uniform pace with the excavation, and by the time the desired point is reached the masonry is far above the water level.

The stone used for these land courses, which will be permanently under water, is the Kingston limestone, furnished by Noon and Madden. These stones have both beds cut, but the sides and builds left rough, with vertical quarry joints, the projections not exceeding two and a half inches. The beds are exceptionably wide. As the base of the masonry work resting on the timber is very much larger than the section of masonry at the water level, it is considered that this class of masonry is equally as good, and certainly far cheaper than regular dimension stone. All the stone in any one course are cut to a uniform size. Above low water granite will be used on the water face, and subsequently throughout as freestone.

The first or corner stone of the extensive pile of masonry to be raised above the caisson, unlike as it was to ordinary affairs of this kind, was a massive block of limestone from the quarry at Kingston, Ulster Co., and in extent was three feet wide by eight in length, weighing about 5,500 pounds, or 165 pounds to the cubic foot; and it is of this material that the foundation below low water mark will consist.

Additional borings are now being made for the N. Y. tower. The boring made two years since was 400 feet away from the actual site of the tower. This one is directly on it. The same stratum of thirty feet of the finest quicksand has been penetrated, but boulders have been encountered at a depth of eighty feet, and the indications are that rock will shortly be reached.

Plans have been perfected for the New York caisson. It is somewhat

larger than the Brooklyn caisson. Owing to the greater depth to which it is necessary to go, and the greater pressure of air to be encountered, it will be lined with boiler plate inside, otherwise it is constructed of wood.

Other means besides the water shaft will be provided for the removal of the fine quicksand. Successful experiments to that effect have been made by Mr. Allen and Mr. Collingwood, during the summer. The depth of water varying from thirty-five to forty feet at the site of that pier, the management of the caisson during its descent will be somewhat different, and a slight change in the frames and floor will be made.

To Mr. C. C. Martin, formerly chief engineer of Prospect Park, and now engineer of construction on the caisson, as well as to Col. Paine in superintending the building of the caisson and the excavation inside, I am under continued obligations. Also to Mr. Collingwood, in charge of the designing room, and to Messrs. Van der Bosch and Hildenbrand, draftsmen.

Respectfully submitted, W. A. ROEBLING, Chief Eng. N. Y. Bridge Co.

CONTRACTS.

We learn from Mr. Kingsley's report all of the work thus far which could well be done by contract has been let—after advertising for proposals—to the lowest responsible bidder.

The following are the principal contracts awarded.

The contract for making the caisson was awarded to Messrs. Webb & Bell, shipbuilders, of Green Point, L. I., and they have received for its construction one hundred thousand, two hundred and seventy-four dollars and fifty-one cents ($100,274·51). This contract was awarded on the 30th day of October, 1869, and the work was prosecuted with such energy, and with such fidelity to the plans furnished as entitle them to very great credit. A contract was entered into with Messrs. Mayhew & Co. for 1,800,000 feet, board measure, of yellow pine timber, at thirty-two dollars per thousand. This contract was promptly filled, and the timber was of superior quality.

On October 29, 1869, a contract was made with Messrs. Wilder, Son, & Co. for 1,800,000 feet, board measure, of yellow pine timber, at thirty-one dollars and fifty cents per thousand. This was delivered in time for the caisson, and was in all respects satisfactory.

On November 10th, 1869, a contract was made with Messrs. Hubbard & Whitaker, of Brooklyn, for the construction of the air, water, and supply shafts, shoes, shoe plates, etc., for the caisson, they being the lowest bidders.

On January 22, 1870, a contract was made with Messrs. Morris & Cummings, of New York, to furnish, and put in position complete, and ready for use, two of their machines for dredging, including the engines, hoisting gear, and buckets, for the sum of $9,000. These are in position and nearly ready for use.

On March 21, 1870, a contract was made with Messrs. Noon & Madden, of Kingston, N. Y., to furnish 5,000 cubic yards of limestone for the foundation of the Brooklyn tower of the bridge. The delivery of the stone has been promptly commenced, and the indications are that it will be supplied as fast as required for the work.

On April 11, 1870, a contract was entered into with Messrs. W. Taylor & Son, of Brooklyn, to furnish two engines for hoisting stone from the scows to the tower, for the sum of $2,250 each. The time for the delivery of these has not yet expired, but the work on them is well advanced.

NOTE.—The laying of the stone upon the top of the caisson was commenced the 15th of June, the day the above report was made public. One of the dredges spoken of in the report commenced working on Wednesday, the 22d. The caisson ceased rising with the tide on Saturday, the 18th, the tide being low, and a considerable weight of stone having been placed upon the structure. It is now thought that the weight will be added as fast, or faster than the tide increases, so that the caisson has probably risen for the last time.—[EDS.

ICE PITCHER CASE.---IN THE U. S. CIRCUIT COURT, EASTERN DISTICT OF PENNSYLVANIA.

Colburn, Executrix of James Stimpson, vs. George B. Garrett & Co.—This was an action brought by the administratrix of James Stimpson to restrain the defendants from manufacturing and selling ice pitchers.

The claims of the patent are:

1. *A pitcher for preserving ice water cool, combined with double walls inclosing between them air or equivalent non-conducting material, so arranged as not to impair the portability of the pitcher, and its capability of discharging its contents by pouring, nor its capacity for holding water.*

2. *In combination with a double-wall ice pitcher, a nose, lip, or spout, through which the water is discharged, and a movable cover across the discharge-way, which prevents access of air into the pitcher thereat except during the act of pouring.*

The defendants, Garrett & Co., manufactured and sold ice pitchers having both the features claimed, except that the cover over the spout was hinged so as to hang vertically. They denied the validity of the patent, and relied mainly upon old teapots and coffeepots manufactured by Isaac S. Williams, of Philadelphia, forty years ago, having, as it was alleged, double walls; also upon an old teapot which has been in the family of Mrs. Fine, in Philadelphia, for many years, having double walls.

The court decided that the teapots referred to as the "Fine" teapot and the "Williams" teapot are not the same invention as the ice pitcher of James Stimpson, and that the first and second claims of the plaintiff 's reissued patent are valid, and that the defendants have infringed the same, and that a decree be entered for plaintiff with costs, and that the case be referred to John Cadwalader, Jr., Esq., as master.

Harding for plaintiff; Diedrick for defendant.

NEW BOOKS AND PUBLICATIONS.

LIFE AT HOME; or the Family and its Members. Including Husbands and Wives, Parents, Children, Brothers, Sisters, Employers and Employed, the Altar in the House, etc. By Rev. William Aikman, D.D. 1 vol., 12mo. Nearly 300 pp., tinted paper, muslin, beveled boards. Price, plain, $1·50; extra gilt, $2·00. S. R. Wells, publisher, 389 Broadway, New York.

This is a very excellent and timely book, one that should be read by parents and children alike. The counsel is wholesome—the criticisms none too severe.

LIPPINCOTT'S MAGAZINE, for July,

contains an article from the pen of Justin McCarthy on "The Petticoat in the Politics of England," which contains much to instruct and something to amuse. A paper on "The Hypothesis of Evolution, Physical and Metaphysical," by Edward D. Cope, states arguments and facts in support of this doctrine, and at the same time suggests some "consequent necessary modification of our metaphysical and theological views" resulting from its acceptance. "A Week among the Mormons" adds but little to our knowledge of Young and his followers, but will interest readers who are not tired of the subject. "Negro Superstitions," by Thaddeus Norris, is a very readable and entertaining article. The usual amount of lighter reading is supplied, and is of good quality.

THE ATLANTIC MONTHLY, for July,

opens with a poem by Longfellow, "The Alarm Bell of Atri," which will be read with delight by all lovers of poetry. "Equal, yet Divine," by Burt G. Wilder, touches upon that absorbing question of the time the future status of woman in society. "Criminal Law at Home and Abroad," by Francis Wharton, and "The Shipping of the United States," together with Mr. Burt's contribution, are the solid dishes of the feast. The usual side dishes and dessert are added.

Inventions Patented in England by Americans.

(Compiled from the "Journal of the Commissioners of Patents.")

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,429.—AUTOMATIC BARREL-FILLING APPARATUS.—S. C. Catlin, Cleveland, Ohio. May 18, 1870.

1,454.—ROLLING METALLIC RODS OR WIRE.—J. P. Blake, Medway, Mass. May 19, 1870.

1,487.—MACHINERY FOR GRINDING HAND SAWS.—W. F. Semple, Mount Vernon, Ohio. May 23, 1870.

1,499.—TREATING LEATHER.—Ed. Fitzhenry, Boston, Mass. May 23, 1870.

1,500.—EARTH CLOSETS, ETC.—C. A. Wakefield, Pittsfield, Mass. May 4, 1870.

1,503.—MAKING METAL COP TUBES.—James Eaton, Boston, Mass. May 24, 1870.

1,508.—CONNECTIONS FOR FIRE ENGINE HOSES, ETC.—Loftus Perkins, London, England, and M. Gibs, Washington, D. C. May 24, 1870.

1,512.—WASHING MACHINE.—J. T. Owen Philadelphia, Pa. May 25, 1870.

MACHINERY FOR FORMING BATS OF WOOL FOR FELTING PURPOSES.—L. Robinson, Matteawan, N. Y. May 25, 1870.

☞ **A number of Moore's Rural New Yorker** (the Great National Illustrated Rural, Literary, and Family Newspaper,) will be sent free to every reader of the Scientific American, who sends address to D. D. T. MOORE, 41 Park Row, New York.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Pictures for the Parlor—Prang's latest Chromos, Hart's Seasons. Sold in all Art Stores throughout the world.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

Wanted.—A man of thorough knowledge or practical experience in casting white metal, buffing, burnishing, and silver plating, to go West. Address, with references, P. O. Box 5302, New York city.

For sale at a Bargain—10-Horse Boiler—a good one. For particulars, address A. H. Walker, Oswego Center, N. Y.

Carpenter Planes, the best quality, made by Tucker & Appleton, Boston. Send for list.

Of Washing Machines, there is nothing to be compared with Doty's.—Weekly Tribune, Dec. 15, 1869.

For Sale—The Right for the six New England States of L. Bertsche's self-fastening caster, the best caster ever used. Address L. Bertsche, 8th Ward, Allegheny City, Pa.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

A Superintendent wanted in a large wood-working and machine shop, in the State of New York. Address, in own handwriting, stating references, past experience, salary expected, etc. An interest in the business will be offered to the right person, if it is desired. Address "Superintendent," P. O. Box 773, New York city. The Editor of this paper will vouch for the responsible character of the establishment needing the above service.

Wanted—A good second-hand Stationary Engine, from 12 to 15-H. P., built within the past two years. Send full description, with name of maker and lowest price. Address P. O. Box 159, Bridgeport, Conn.

The "Patent Steam Gong," in use for Fire Alarms, Fog Signals on steamboats, factories, etc. Have a musical tone, and have been heard thirty miles. Manufactured by the Union Water Meter Co., Worcester, Mass.

West's Great American Tire-Setting Machine sets tire without removal from the wheel, saving ninety per cent over the old method. West & Fish, Geneseo, N. Y.

To Brick Makers.—A new style of Brick, for Paving Sidewalks, just patented. Warranted to lie solid and never to rock when trod upon. Rights for sale cheap by the inventors, Moffat & Thomson, 121 Otter st., Philadelphia, Pa.

Wanted.—Situation as Superintendent or foreman in Machine Works. Fifteen years' experience. Address P.O. Box 1016, Worcester, Mass.

Wanted.—A good second-hand Roper 4-horse Engine. Address, with price, Wm. J. Mack, East Norwich, L. I.

Wanted.—A good Patent Salesman. Box 115, Cuba, N. Y.

The best boiler-tube cleaner is Morse's. See cut inside page.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 61 Nassau st., N. Y.

Direct-acting Steam Circular Saw Mill—Mill and engine combined in one machine. The power of the engine applied directly to the saw without belts. They are now in successful operation. Patent applied for. E. H. Bellows, Worcester, Mass.

For foot-power engine lathes address Bradner & Co., Newark, N.J.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 12 years in use. Beware of Imitations.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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

All reference to back numbers should be by volume and page.

J. H. P., of Ark., asks, will a 100-pound weight drive light machinery, sewing machines, etc. We answer that a 100-lb weight falling through a sufficient space in a given time would drive the Great Eastern, were the power thus developed applied to the propulsion of that monster. This correspondent is evidently laboring under a very common misapprehension; the confounding of statical pressure with mechanical power. Statical pressure is not mechanical power. It never did and never will do work in the sense in which the term work is used in mechanics. It takes on an average about one tenth of a horse power to drive a sewing machine. To yield this power a 100-pound weight would need to fall through a space of three and three tenths feet in one minute of time, and continue moving at that rate.

J. H. P., of N. Y.—This correspondent writes in regard to the use of hellebore to kill currant worms. He says the white hellebore is as good as the black. This weed is also known as poke, or itch weed. It is not so expensive as the other. He makes a strong decoction of the leaves and stems, pours off the liquor, and applies it cold, with a watering pot. He says that a single application made at the night time, that is, when the eggs are all hatched, will be effectual in destroying the worms. He asks for something to kill maggots which destroy onions. Can any of our correspondents inform him?

W. & B., of Tenn.—Petroleum products, such as gasoline, are tested for their specific gravity by an instrument called an hydrometer. The lighter the fluid the deeper this instrument will sink into it. Gasoline or benzine spoken of as being 85° allows the instrument to sink to that number marked upon the stem.

M. H. S., of N. Y.—We cannot at this distance say what makes the bearings you describe heat; there are many things that might do it. The belts may be too tight, the bearing surfaces too small for the weight they support, or the lubricator used may be of a kind which evaporates as soon as the bearings become warm. We think it likely that the bearing surfaces are too small.

J. K., of Pa.—We should regard a scale of three eighths of an inch in thickness as dangerous in any steam boiler. To drive any engine at greater speed while performing an increased amount of work will require more steam, and consequently more fuel. Your question cannot be answered more definitely without more complete data.

S. K., of Mo.—Your solution of the 2d mechanical problem given out some weeks since is correct; it was also given by another correspondent. See article entitled "New Mechanical Movements" in last issue.

L. R. P., of N. H.—There are various methods of making solid emery wheels, mostly patented, and therefore not available to you except by purchase. We cannot describe any of them in this column.

J. G. S., of Vt.—What is meant by the pitch of saw teeth is the inclination of the face of the tooth up which the shaving ascends, and not the intervals from tooth to tooth as in wheels.

N. F. E., of Vt., wants a size that will cause bronze to adhere to paper, linen, etc., and which will not stain or color. Do any of our correspondents know what will do the business?

J. W., of L. I.—The plan of compressing air into receptacles to be afterwards used as motive power is old. It has many elements of impracticability which we cannot specify here.

T. A., of Mass.—Medals when dipped into the "bronze dips" described on page 265, are to be subsequently washed in water, and brushed. That is the whole of the process.

C. G., of Ohio.—Carbolic acid in weak solution is recommended as a preservative of awnings from mildew. Chloride of zinc has also been used.

A. A. E., of Mich.—A cement called marine glue is kept for sale pretty generally in drug stores, which unites wood and resists moisture.

G. E. R., of Mass., wants to know what will exterminate black ants from beams and flooring which they have bored into.

D. L. B., of Pa.—We published a rule for the computation of the sizes of cone pulleys on page 137, last volume.

W. W. W., of Ohio.—The expression "groin arch" is a misnomer; "groined arch" would be a correct term.

S. M. C., of Ohio.—The true length of the old measure called a digit is three fourths of an inch.

Recent American and Foreign Patents.

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

MACHINE FOR BORING POSTS AND POINTING RAILS.—Rudolph Martin and Matthew Harner, Taneytown, Maryland.—This invention has for its object to bore fence posts in order to the making of mortises therein, and to sharpen fence rails in order to the insertion of their pointed ends in such mortises.

STREET AND STATION INDICATOR FOR RAILWAY CARS.—Edward L. Dean Newburgh, Ohio.—This invention has for its object to cause the index finger of a dial plate affixed to the inside of a street car to travel over its surface and point out the names of streets and stations as they are successively reached.

SADDLE.—George Horter, New Orleans, La.—The object had in view in making this invention was the production of a very cheap, and, at the same time, a very durable saddle, mainly for use in districts like the Southern and South-western parts of the United States where horse-back riding is the chief means of locomotion, and where most of the inhabitants are very poor.

WATER WHEEL ATTACHMENT.—W. A. Cobb, Orange, Mass.—This invention has for its object to prevent water wheels from being stopped by the "back water" of floods. To this end the invention consists in providing a casing extending from the floor of the flume on which the wheel rests to the bed of the river, which casing receives the water flowing from the wheels through the floor of the flume, and discharges it through one of two pipes, a short one for ordinary use and a very long one for flood seasons, which discharges at a point not affected by the high water of the stream, and consequently renders the casing and flume impervious to the surrounding water, the gate to the short pipe being, in the mean time closed.

HONEY-BEE PALACE.—Nathaniel F. White, Mount Pleasant, Iowa.—This invention relates to a new and useful improvement in a house or palace for honey bees, in which their hives are placed and where they are protected from moths and from the weather.

FRUIT DRYER.—Newton C. Cooley, Wyoming, Del.—The invention consists in a fruit-drying case, provided with partitions that divide it into separate chambers which communicate at one end with a hot-air flue, and at the other end with an escape passage leading to a chimney, and which are furnished with screens for holding fruit, malt, hops, or other article to be dried in the current of hot air that sweeps through the chambers, the moisture drawn from the fruit in each chamber being carried off therefrom directly to the chimney without rising through the other chambers and damaging the fruit therein.

FRUIT JAR.—Thomas P. Gibbons, Philadelphia, Pa.—This invention consists in a metallic collar provided with an inwardly projecting flange at its lower end, in combination with an outwardly-projecting flange on the head of a fruit jar, in such manner that, by the two flanges, the collar is prevented from being removed from the jar, while there is no obtrusion to slipping the collar down on the neck of the jar for convenience in filling.

PADLOCK.—Edward L. Gaylord, Terryville, Conn.—This invention consists in an inclosing case for a padlock struck in two plates with a lap, or tongue and groove joint at their edges; also in a spring coiled in a recess in the butt of the shackle, and operating so as to automatically throw the shackle open when released from the tumblers, and hold it open until it is shut by direct pressure.

MUCILAGE OR INK STAND.—Franklin T. Grimes, Liberty, Mo.—This invention relates to that class of inkstands in which the space, if any, in the reservoir above the ink is a vacuum; and the invention also consists in partitions placed in the ink reservoir so as to divide the latter into separate compartments, in order that, if the vacuum be destroyed in one part of the reservoir by an irruption of air, it may still be preserved in the remaining portions.

RAKING ATTACHMENT FOR HARVESTERS.—William W. Miller, Zionsville, Ind.—This invention has for its object to furnish an improved raking attachment for harvesters, which shall be so constructed as to sweep the grain from the platform of the harvester by a slight movement of the driver's foot whenever a sufficient amount of grain has been cut to form a gavel, depositing the grain at the rear of the drive wheels so as to be entirely out of the way of the machine at its next passage.

FARM GATE.—Howard Piper, Haskins, Ohio.—This invention relates to improvements in that class of gates which are arranged to slide back and forth in opening and closing, and consists in arranging the post on which the gate slides, so that it may be raised up to admit of sliding the gate above the snow, or for other purposes. The invention also consists in a peculiar arrangement of the gate with the said post for sliding therein, and for arms for bracing the ends of the gate laterally.

HAY LOADER AND CARRIER.—Galen Meaders, Jeffersonville, Ind.—This invention relates to a new and useful improvement in a vehicle for gathering and transporting hay.

SEEDER AND CULTIVATOR.—J. T. Trowbridge, Akron, Ohio.—This invention has for its object to improve the construction of the seeder and cultivator, known as the "Champion of Iowa," so as to make it simpler in construction, stronger, more effective in operation, and more convenient in use.

ARTIFICIAL FUEL.—E. F. Loiseau and C. F. Requin, Nashville, Tenn.—This invention has for its object to practically utilize coal dust as fuel.

LUBRICATOR.—David Adamson, Bremen, Germany.—This invention relates to improvements in that class of lubricator cups, in which a piston is employed to receive steam pressure for forcing viscid or coagulating material out of the cup.

THREE-WHEELED CARRIAGES.—C. H. Barrows, Willimantic, Conn.—This invention has for its object to so construct the steering apparatus of three-wheeled carriages, that the vehicles can be more readily controlled, and less apt to be overturned than the ordinary carriages now in use.

DUST-PROOF VENTILATING WINDOWS.—M. C. Murphy, Boston, Mass.—This invention relates to improvements in ventilating windows, and consists in the employment, either with the ordinary plain glass windows or not, of two or more sashes with vertical, concave, or convex strips of glass or other substance, set in the upper and lower bars of the sash, with narrow spaces between the edges, and with the centers of the concave faces of the strips of the second set behind the spaces between the first, to cause the particles of dust carried in the air to strike against the concave surfaces and fall into discharge passages in the bottom of the window frame, and escape at the outside.

POWER APPARATUS.—Wm. Hammill, Parma, Mich.—This invention relates to improvements in machinery intended for generating power for driving light machinery, and has for its object to provide a simple arrangement of vibrating and swinging weights or pendulums and springs, which with the aid of an attendant for moving them past the "dead points," may be set into and kept in motion.

SLED BRAKE.—J. E. Coutant, Rondout, N. Y.—This invention has for its object to furnish an improved brake for attachment to bob and other sleds, which shall be simple in construction, effective in operation, and conveniently operated, being worked by the action of the horses in holding back the sled.

GRAIN LIFTERS.—Wm. M. Jackson, Woodland, Cal.—This invention relates to improvements in grain lifting or elevating attachments to heading and reaping machines for straightening the lodged grain in advance of the cutters, and consists in an improved arrangement of means for elevating or depressing the lifting or elevating fingers or shoes moving in advance of the cutters, when applied to the heading machines. This invention also comprises an improved construction of the shoes, which move in advance of the cutters to support the elevating fingers.

REFRIGERATING ATTACHMENT TO WELLS.—J. L. Wiley, Vermont, Ill.—This invention relates to apparatus for use in connection with wells, for the reception and suspension immediately above the water of articles of food for preservation in warm weather, and it consists in the application along the walls of the well from the bottom to the top, and projecting a suitable distance above the top of the guide rails, and the application thereto of a crib capable of moving up and down, and of holding the articles to be preserved, and a winding crank, rope, and balance weight, for raising and lowering the crib.

GRAIN BINDERS.—Wm. B. Oglesby, Bridge Prairie, Ill.—This invention relates to improvements in grain binding attachments to reaping machines, and consists in one or more pairs of clamps mounted on a horizontally revolving support, and provided with a twisting device and a tucking device, and arranged to be held open for reception of the gavel by the weight of one of the jaws, which is closed up by a fixed bent rod, or cam, after reception of the gavel, and the twister and tucker are set in motion by toothed racks, gearing with pinions attached to them as they are moved past the said racks, twisting the band of straw previously placed in the clamps by hand, and securing it by tucking the end under, as in hand binding, after which the over jaw falls open, and the bundles are ejected by a fixed rod, having one end arranged to stand in the path of the bundle when carried by the open jaw.

MERCURIAL EXPANSION ENGINE.—Charles G. Wilson, Brooklyn, N. Y.—This invention has for its object to furnish a simple, cheap, safe, and reliable motor, designed for use where any small power is required, and which shall be so constructed that it may be easily manipulated and kept in repair.

SAW SET.—Moritz T. Klahre, Bloody Run, Pa.—This invention has for its object to furnish an improved saw set by means of which a number of the teeth of the saw may be set upon both sides at the same operation, and which shall at the same time be simple in construction, effective in operation, and conveniently and quickly operated, and which may be easily adjusted to set the teeth more or less, or to set different sized teeth as may be required.

SULKY HARROW, CULTIVATOR, ROLLER, ETC.—James A. Casey, Maysville, Ky.—This invention has for its object to furnish an improved machine which shall be so constructed that it may be readily adjusted for use as a harrow, cultivator, or roller, doing its work well in either capacity.

WEANING BIT.—Isaac L. Baker, Prairie City, Kansas.—This invention relates to a new and useful device for weaning colts and calves, and for other purposes, and it consists in so forming a bit that air is admitted into the mouth in the act of sucking, thereby preventing a vacuum being formed, and consequently the flow of milk.

DOOR AND SHUTTER BOLT.—G. B. Green, Philadelphia, Pa.—The object of this invention is to provide a durable, safe, and ornamental bolt fastening for doors and shutters, and to be employed in all situations where it may be found useful; and it consists in the use of a slotted sliding bolt, and in plates of ornamental casting, or ornamental plates struck up or swaged of any form, or size, or design, which plates are attached to the studs which pass through the doors or shutters.

ANIMAL TRAP.—Samuel Arnold, Silver Springs, Tenn.—This invention relates to a new and useful improvement in traps for catching rats or other animals, birds, or fishes.

ADJUSTABLE SCHOOL DESK.—Charles H. Loomis, New Philadelphia, Ohio.—This invention relates to a new and useful improvement in desks or tables for school-rooms and other purposes, whereby they are made more convenient and useful than such articles have heretofore been, and it consists in making the top adjustable, so as to suit pupils of different ages, and so that the desk or table may be made to accommodate a person in an office, or elsewhere, while either standing or sitting.

APPARATUS FOR ROLLING AND COOLING BARRELS, CASKS, ETC.—David Cammerer, Cincinnati, Ohio.—This invention has for its object to construct an apparatus for agitating and cooling barrels and casks immediately after the inner sides of the same are covered with pitch, or other water-proof composition.

SPRING PACKING.—John Hughes, Saxton, Pa.—The object of this invention is to provide a spring packing for steam cylinder pistons, which shall be simple and durable, and readily adjustbale to the walls of the cylinder.

CULTIVATOR.—Joseph Adams, Manteno, Ill.—This invention has for its object to furnish an improved cultivator, which shall be so constructed and arranged that the plows may be easily adjusted closer together or farther apart, and raised or lowered to regulate the depth at which they work in the ground.

GATE LATCH.—W. R. Goodrich, Whitestown, N. Y.—This invention has for its object to furnish an improved drop latch for gates, which shall be simple in construction, convenient in use, and effective in operation.

QUARTZ CRUSHER.—Jesse Quaintance, Bucyrus, Ohio.—This invention relates to improvements in quartz crushers, of that kind in which two or more rotary crushers are employed upon a circular bed.

PAPER FILE.—William Boyrer, New York city.—This invention relates to a new file for music, newspapers, etc., and has for its object to preserve the paper, and to allow the same to be opened flat at every place. The invention consists, first, in providing removable elastic cord holders to the ends of the covers, and, secondly, in the application to the said holders, of one continuous cord, to which a suitable number of separate papers may be attached.

MORTAR-MIXING MACHINE.—Seth Wetmore, Wellsboro, Pa.—The object of this invention is to construct a machine by which mortar, for building purposes, can be more completely mixed and tempered than by the ordinary manual process.

CLOTHESLINE HOLDER AND STRETCHER.—Nathaniel E. Buffington, North Providence, R. I.—The object of this invention is to provide an apparatus for properly holding clotheslines, so that the same will not be worn or chafed where they are bent to form angles, and also to permit their being properly stretched to take up the slack produced by use.

DOOR STRIPS.—Jerome M. Gray, Hamilton, N. Y.—The object of this invention is to provide simple, durable, and efficient means for preventing wind and water from entering dwellings, and other buildings, beneath and around outside doors, and it consists in the use of one or more thicknesses of felt, or cloth, or other pliable or elastic material, attached to the bottom or lower portion of the door, supported and held in place by means of an adjustable spring rod, and, in combination therewith, of one or more elastic rods or fillets, in the casing of the door, or in the door itself.

SAFETY CAPS FOR CANS.—Horace C. Alexander, New York city.—This invention has for its object to furnish an improved safety cap for cans, which shall be simple in construction, effective in operation, and convenient in use.

VIOLIN HOLDER.—Isaiah H. Arey, Boscawen, N. H.—This invention has for its object to furnish an improved violin holder, or chin rest, for violins, which shall be so constructed as to adapt it for holding the violin in proper position almost without effort, and which shall, at the same time, be simple in construction and easily attached to and detached from the instrument.

HORSE HAY FORK.—John S. Yinger, Manchester, Pa.—This invention has for its object to furnish an improved horse hay fork which shall be simple in construction, strong, durable, not liable to get out of order, and conveniently operated.

MACHINE FOR STRIPPING BLUE GRASS SEED.—Major Joseph W. Stivers, North Middletown, Ky.—This invention has for its object to furnish a simple convenient, and effective machine for stripping the seed from blue grass while standing in the field.

REAPER AND MOWER.—Jesse C. Miles, Bloomington, Wis.—This invention relates to improvements in reaping and mowing machines, and consists in improved attachments for guiding the caster wheel, to hold the machine up to the standing grain, to cut the full breadth on sidehills; also, to prevent it from tipping over, and to prevent side draft.

ROTARY PUMP.—William A. Allyn, Boston, Mass.—The object of this invention is to provide a machine for throwing a constant stream of water by means of an annular piston, operated by means of an eccentric on a central shaft.

ROTARY PUMP.—August Leuchtweiss, Cincinnati, Ohio.—This invention relates to a new rotary pump, which is constructed to throw a continuous stream, with great force, and without requiring great power. The invention consists in the combination of a paddle wheel with a rotary cut-off wheel and stationary packing for the same.

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104,398.—FOLDING DENTAL CHAIR.—C. M. Adams, Canton, Miss.

104,399.—CULTIVATOR.—Joseph Adams, Manteno, Ill. Antedated June 11, 1870.

104,400.—LUBRICATOR.—David Adamson, Bremen, Germany.

104,401.—POTATO DIGGER.—James Albaugh, Lyons, N. Y.

104,402.—SAFETY CAP FOR CANS.—Horace Clifton Alexander, New York city.

104,403.—ROTARY PUMP.—William A. Allyn, Boston, Mass.

104,404.—AUGER BIT.—Albert L. Andrews, Bristol, Conn. Antedated Dec. 21, 1869.

104,405.—VIOLIN HOLDER.—Isaiah H. Arey, Boscawen, N.H.

104,406.—ANIMAL TRAP.—Samuel Arnold, Silver Springs, Tenn.

104,407.—HARVESTER.—A. P. Ayres, Chicago, Ill.

104,408.—WEANING BIT.—Isaac L. Baker, Prairie City, Kansas.

104,409.—THREE-WHEELED CARRIAGE.—Chas. H. Barrows, Willimantic, Conn.

104,410.—JIG SAW.—Thomas Blandin, Charlestown, Mass.

104,411.—CAR STARTER.—Robert Bogardus, New York city.

104,412.—SOLDERING IRON.—Jabez A. Bostwick, New York city.

104,413.—NOZZLE AND SEALING CAP FOR SHEET-METAL CANS.—Jabez A. Bostwick, New York city.

104,414.—APPARATUS FOR FILLING OIL CANS.—Jabez A. Bostwick, New York city.

104,415.—PAPER FILE.—William Boyrer, New York city.

104,416.—INSTRUMENT FOR GIVING FLUID MEDICINE TO ANIMALS.—Henry Adolph Brandes, Newark, N. J. (Francis H. I. Bosch executor).

104,417.—TUNING PIN FOR PIANOS.—Julius M. Branig, New York city.

104,418.—TREE PROTECTOR.—Sterne Brunson, Benton Harbor, Mich.

104,419.—CLOTHES-LINE HOLDER AND STRETCHER.—N. E. Buffington, North Providence, assignor to himself, John Rich, and Lysander Flagg, Smithville, R. I.

104,420.—DOOR KNOB.—G. W. Cady, Providence, R. I.

104,421.—APPARATUS FOR AGITATING AND COOLING BARRELS AND CASKS DURING THE PROCESS OF PITCHING.—David Cammerer, Cincinnati, Ohio.

104,422.—DEVICE FOR ROASTING AND BAKING.—John J. Carroll, Washington, D. C.

104,423.—SULKY, HARROW, ETC.—James A. Casey, Maysville Ky.

104,424.—MACHINE FOR FELTING HATS.—Angelo Cattaneo (assignor to himself and Henry Lefort), Newark, N. J.

104,425.—CABLE STOPPER.—E. R. Cheney, Boston, Mass., and John J. Emery, Owl's Head, Me.

104,426.—PIPE TONGS.—E. B. Clark, Philadelphia, Pa.

104,427.—INCLOSED TAIL RACE FOR WATER WHEEL.—W. A. Cobb, Orange, Mass.

104,428.—WATER WHEEL.—Alpheus C. Corpe, Stafford, Conn.

104,429.—SLED BRAKE.—John E. Coutant, Rondout, N. Y.

104,430.—NOZZLE AND CAP FOR OIL CANS.—E. T. Covell, Brooklyn, N. Y.

104,431.—SOLDERING MACHINE.—E. T. Covell, Brooklyn, N.Y. Antedated June 6, 1870.

104,432.—VIAL FOR FILTERING COLLODION.—D. H. Cross, Bennington, Vt.

104,433.—METHOD OF COVERING WHIPS.—V. W. Crowsen (assignor to himself and Stephen Massey), Westfield, Mass.

104,434.—MANUFACTURE OF WHITE LEAD.—James Cuddy, Pittsburgh, and G. S. Selden, Philadelphia, Pa.

104,435.—FARM GATE.—John Dickason, Vevay, Ind.

104,436.—GAGE KNIFE FOR CUTTING LEATHER.—C. T. Durham, James Wood, and Theodore Hair, Norristown, Pa.

104,437.—VISE.—Jacob Edson, Boston, Mass.

104,438.—MACHINE FOR CANNING FRUIT.—John H. Ellis, Peoria, Ill. Antedated June 11, 1870.

104,439.—APPARATUS FOR TOWING CANAL BOATS.—A. H. Emery and Gabriel Leverich, New York city.

104,440.—DIE FOR FORGING EARS FOR CARRIAGE SPRING HEADS.—John Evans, New Haven, Conn.

104,441.—SHIELD FOR PADLOCKS.—C. C. Gale, Indianapolis, Ind.

104,442.—MACHINE FOR FORMING EYELET STOCK.—Thomas Garrick, Providence, R. I.

104,443.—MACHINE FOR FEEDING STOCK TO EYELET MACHINE.—Thomas Garrick, Providence, R. I.

104,444.—HAND STAMP.—Jeremiah C. Gaston, Cincinnati, Ohio.

104,445.—CARD CLOTHING.—Artemas W. Gates, New York city.

104,446.—PREPARATION OF MINERAL BATH TO IMITATE MINERAL WATERS.—Otto Gavron, New York city.

104,447.—LATCH FOR GATES.—W. R. Goodrich, Whitestown, N. Y.

104,448.—WEATHER STRIP FOR DOORS.—J. M. Gray, Hamilton, N. Y.

104,449.—BOLT FOR DOORS AND SHUTTERS.—G. B. Green, Philadelphia, Pa.

104,450.—RAIN-WATER CONDUCTOR AND FILTER.—James C. Hall, Battle Creek, Mich.

104,451.—MECHANICAL MOVEMENT.—Wm. Hammill, Parma, Mich.

104,452.—MILKING STOOL.—Geo. W. Haviland, Fort Dodge, Iowa.

104,453.—INSTRUMENT FOR REMOVING TWINE AND WIRE FROM BOTTLES.—John T. Haviland, San Francisco, Cal.

104,454.—MACHINE FOR BOARDING LEATHER.—J. W. Hildreth, Boston, Mass.

104,455.—SIDE SADDLE TREE.—William Hill, New York city

104,456.—SIDE SADDLE.—William Hill, New York city.

104,457.—AUGER.—R. H. Hopkins, Hinsdale, N. H.

104,458.—MITER MACHINE.—James R. Howell, Buffalo, N. Y.

104,459.—PISTON PACKING.—John Hughes, Saxton, Pa.

104,460.—GRAIN LIFTER AND HARVESTER.—W. M. Jackson, Woodland, Cal.

104,461.—COOKING STOVE.—S. S. Jewett and F. H. Root, Buffalo, N. Y.

104,462.—CAR COUPLING.—Wm. J. Johnson, New Orleans, La.

104,463.—METALLIC BRACKET.—A. D. Judd, New Haven, Conn.

104,464.—METALLIC BRACKET.—A. D. Judd and E. M. Judd, New Haven, Conn.

104,465.—SPRING BOLT FOR WINDOWS.—Morton Judd, New Haven, Conn.

104,466.—THERMOMETER.—John Kendall, New Lebanon, N. Y.

104,467.—SAW SET.—Moritz Theodore Klahre, Bloody Run, Pa.

104,468.—Suspended.

104,469.—ROTARY PUMP.—August Leuchtweiss, Cincinnati, Ohio.

104,470.—BLEACHING DARK SOAP AND "FOOTS."—Oscar Loew assignor to John M. Pendleton), New York city.

104,471.—ARTIFICIAL FUEL.—E. F. Loiseau and C. F. Requin Nashville, Tenn.

104,472.—ADJUSTABLE SCHOOL DESK.—C. H. Loomis, New Philadelphia, Ohio.

104,473.—HEAD REST.—Baxter Lyon and Charles M. Curtis Springfield, Mass.

104,474.—SHIPS' PORT.—C. E. Marshall, Chicago, Ill.

104,475.—BREAST STRAP FASTENING FOR HARNESS.—J. H. Martin, Columbus, Ohio.

104,476.—MACHINE FOR BORING POSTS AND POINTING RAILS.—Rudolph Martin and Matthew Harner, Taneytown, Md.

104,477.—PAPER BOX MACHINE.—Charles A. Maxfield, New York city.

104,478.—JOURNAL BEARING FOR CALENDAR ROLLS.—Wm. McAdams, Newton, Mass.

104,479.—DEVICE FOR MOLDING AND CASTING PIPE.—John McClelland, Washington, D. C.

104,480.—HAY GATHERER AND CARRIER.—Galen Meaders, Jeffersonville, Ind., assignors to himself and Rozel Weissinger, Louisville, Ky.

104,481.—LAMP.—R. S. Merrill, Hyde Park, assignor to himself, W. B. Merrill, and Joshua Merrill, Boston, Mass.

104,482.—HARVESTER.—Jesse C. Miles, Bloomington, Wis.

104,483.—HARVESTER RAKE.—Wm. W. Miller, Zionsville, Ind.

104,484.—DOUBLE LEVER MASTER WHEEL.—D. E. Mitchell, Rural Dale, Ohio.
104,485.—SLEEPING CAR.—Geo. F. Morse, Portland, Me.
104,486.—VENTILATING WINDOW FOR RAILROAD CARS.—M. C. Murphy, Boston, Mass.
104,487.—GRAIN BINDER.—Wm. B. Oglesby, Ridge Prairie, Ill.
104,488.—PAIL EAR.—Joel A. Otis, Rutland, N. Y.
104,489.—HARVESTER.—John G. Perry, Kingston, R. I.
104,490.—HARVESTER.—John G. Perry, Kingston, R. I.
104,491.—EVAPORATING CANE JUICE.—Simeon A. Poche, Parish of St. James, La.
104,492.—MACHINE FOR GRINDING ROLLERS.—J. M. Poole (assignor to himself, Wm. T. Porter, and T. S. Poole), Wilmington, Del.
104,493.—COMBINED STOVE DOOR AND HEARTH.—J. A. Price, Scranton, Pa.
104,494.—CONCENTRATING THE JUICE OF TOMATOES.—Christopher T. Provost, New York city.
104,495.—CLOTHESLINE REEL.—D. D. Pugh, Brooklyn, N. Y. Antedated June 11, 1870.
104,496.—QUARTZ CRUSHER.—Jesse Quaintance, Bucyrus, Ohio.
104,497.—GRIDIRON FOR STOVE AND RANGE.—J. M. Read, Boston, Mass.
104,498.—CULTIVATOR AND ROLLER COMBINED.—Linas G. Reed and Erastus E. Reed, Stark county, Ill.
104,499.—POCKET OR "CHARM" LETTER SCALE.—George S. Rice, New York city, assignor to Vulcanite Jewelry Company.
104,500.—TURBINE WATER WHEEL.—B. F. Sampson, West Brookfield, Mass.
104,501.—STEAM RADIATOR.—Sidney Sanders, Springfield, Mass.
104,502.—BREECH-LOADING FIRE-ARM.—Edward L. Sargent, Watertown, N. Y.
104,503.—THRASHING MACHINE.—William Schnebly, Hackensack, N. J.
104,504.—SPRING BED BOTTOM.—D. A. Scott (assignor to Allen C. Richards), Cincinnati, Ohio.
104,505.—TWINE HOLDER.—James S. Smith, Middletown, Conn.
104,506.—MEAT CUTTER.—John E. Smith, Buffalo, N. Y. Antedated June 15, 1870.
104,507.—METHOD OF MAKING FILES.—Thomas S. Smith, Cincinnati, Ohio.
104,508.—SEED STRIPPER.—Major Joseph W. Stivers, North Middletown, Ky.
104,509.—BOLT AND RIVET TRIMMER.—Mathias Theisen, Waukon, Iowa.
104,510.—STEAM HEATER.—Samuel D. Tillman, Jersey City, N. J.
104,511.—STEAM GENERATOR.—Samuel D. Tillman, Jersey City, N. J.
104,512.—PROPELLING VESSELS.—Samuel D. Tillman, Jersey City, N. J.
104,513.—METALLIC PAVEMENT.—Samuel D. Tillman, Jersey City, N. J.
104,514.—COMPOSITION ROLL FOR CLOTHES WRINGERS.—William Henry Towers, Boston, Mass.
104,515.—SEEDER AND CULTIVATOR COMBINED.—James T. Trowbridge, Akron, Ohio.
104,516.—SHIELD FOR GAS BURNERS.—Hiram J. Wattles, Rockford, Ill.
104,517.—CHILD'S CHAIR.—Abraham H. Wehser, San Francisco, Cal.
104,518.—POTATO DIGGER.—Daniel B. Westfall, Lyons, N. Y.
104,519.—MORTAR MIXER.—Seth Wetmore, Wellsborough, Pa.
104,520.—GLUE OR CEMENT.—Nelson S. Whipple, Detroit, Mich.
104,521.—BEEHIVE.—N. F. White, Mount Pleasant, Iowa.
104,522.—STEAM GENERATOR.—S. Lloyd Wiegand, Philadelphia, Pa.
104,523.—REFRIGERATING ATTACHMENT FOR WELLS.—J. L. Wiley, Vermont, Ill.
104,524.—PREPARING GOLD FOR DENTISTS' USE.—Richard S. Williams, New York city.
104,525.—LAMP FOR BURNING CANDLES.—Thomas Scott Williams and Freeman A. Taber, Boston, Mass.
104,526.—MERCURIAL EXPANSION ENGINE.—C. G. Wilson, Brooklyn, N. Y.
104,527.—APPARATUS FOR BENDING AND UPSETTING TIRE.—John T. Woodward, Bowling Green, Ky.
104,528.—PADDLE WHEEL.—L. W. Wright, Brooklyn, N. Y.
104,529.—HORSE HAY FORK.—John S. Yinger, Manchester, Pa.
104,530.—FARE BOX FOR OMNIBUSSES, ETC.—W. H. Young, Chicago, Ill.
104,531.—GAS HEATER.—Amos Adams, Sturgis, Mich.
104,532.—MODE OF UNITING EDGES OF KNITTED GOODS.—Satterlee Arnold, Claverack, N. Y.
104,533.—STEAM GENERATOR.—Wm. Arthur, Newport, Ky.
104,534.—CHANNEL FOR BOOTS AND SHOES.—Robert Ashe, Boston, Mass.
104,535.—APPARATUS FOR INDICATING THE POSITION OF ELEVATORS.—William Stuart Auchincloss, New York city.
104,536.—GRAIN MEASURING ATTACHMENT TO THRASHING MACHINES.—Benjamin Baker, Addison, Mich.
104,537.—GRINDING MILL.—John G. Baker, Philadelphia, Pa.
104,538.—SPRING BED BOTTOM.—William W. Bartlett, Portland, Me.
104,539.—DRAWING KNIFE.—C. C. Barton, Rochester, N. Y.
104,540.—EDGE-IRON FOR SHOEMAKERS.—E. D. Beales (assignor to himself and John Dages), Gallipolis, Ohio.
104,541.—VISE.—Jonas D. Beck, Liberty, Pa.
104,542.—BILLIARD CUSHION.—John Berlien, Chicago, Ill.
104,543.—CAR COUPLING.—Abraham Beucus and Tennes Beucus, Waupun, Wis.
104,544.—CANE MILL.—Leopold Biddle, Knoxville, Iowa.
104,545.—HORSE HAY RAKE.—L. S. Bortree, Grand Rapids, Mich.
104,546.—LIFE PRESERVER.—Thos. B. Boyd, St. Louis, Mo.
104,547.—DETACHING HOOK.—John Bozorth, Camden, N. J.
104,548.—LOG LOADER AND PILER.—James G. Brady, Forest Hill, Mich.
104,549.—SOAP.—Leonard Brockett, West Haven, assignor to himself and David I. Stillson, Ansonia, Conn.
104,550.—BOILER AND WASHER.—E. C. Brooks, Norwich, N.Y.
104,551.—COMBINED WOOD AND CONCRETE PAVEMENT.—J. Warren Brown, Washington, D. C.
104,552.—CLOTHES DRYER.—W. H. Buell, Union City, Mich.
104,553.—METAL ROOFING.—Thomas Carter, Niles, Ohio.
104,554.—PRINTING INK.—G. W. Casilear, Washington, D. C.
104,555.—GATE.—John D. Chambers, Williamsport, Ind.
104,556.—GATE.—John D. Chambers, Williamsport, Ind.
104,557.—DRAFT AND HOLD-BACK ATTACHMENT.—William H. Chamberlin, Medina, N. Y.
104,558.—LAMP SHADE SUPPORTER.—E. E. Conrad (assignor to Henry Coulter and B. H. Jones), Philadelphia, Pa. Antedated June 13, 1870.
104,559.—FRUIT DRYER.—Newton C. Cooley, Wyoming, Del.
104,560.—SOLE EDGE FINISHING MACHINE FOR BOOTS AND SHOES.—Louis Coté, St. Hyacinth, Province of Quebec, Canada.
104,561.—THREAD CUTTER FOR SEWING MACHINE.—John Crowe, Guelph, Canada.
104,562.—ASPHALTUM OR CONCRETE PAVEMENT.—Austin G. Day, Seymour, Conn.
104,563.—STREET AND STATION INDICATOR FOR RAILROAD CARS.—Edward L. Dean, Newburgh, Ohio.
104,564.—BUCKLE.—Thomas Duncan, Brookville, Md.
104,565.—TATTING SHUTTLE.—B. L. Fetherolf, Tamaqua, Pa.
104,566.—PASSENGER REGISTER FOR HORSE CARS.—Eugene L. Fitch (assignor to himself and Carlos Clough), West Eau Claire, Wis. Antedated June 17, 1870.
104,567.—HOISTING APPARATUS.—O. H. Flook, Middletown, Md.
104,568.—STOP VALVE.—James Flower, Detroit, Mich.
104,569.—WAGON STEP.—M. C. Floyd, Bloomfield, Ill.
104,570.—ANIMAL TRAP.—Francis Fox, Meadville, Pa.
104,571.—GRAIN SEPARATOR.—Abram Gaar, Richmond, Ind.
104,572.—PADLOCK.—Edward L. Gaylord, Terryville, Conn.
104,573.—APPARATUS FOR UTILIZING THE EXHAUST STEAM OF STEAM ENGINES.—Henry Gerner, New York city.
104,574.—FRUIT JAR.—Thomas P. Gibbons, Philadelphia, Pa.
104,575.—BEER FUNNEL.—William Golden, Flint, Mich. Antedated June 11, 1870.
104,576.—SUCKER-ROD JOINT.—Adam Good, Jr., Titusville, Pa.
104,577.—COMBINED RULE, LEVEL, CLINOMETER, ETC.—E. A. Goodes (assignor to "Philadelphia Patent and Novelty Company"), Philadelphia, Pa.
104,578.—MACHINE FOR ROUNDING AND DRESSING IRREGULAR AND REGULAR FORMS.—H. A. Gore, Goshen, Ind.
104,579.—WATER WHEEL.—William Greenwell, Ripley, Ill.
104,580.—CAR TRUCK.—G. H. Griggs, Worcester, Mass.
104,581.—HEATING STOVE.—John Grossius, Cincinnati, Ohio.
104,582.—MACHINE FOR CUTTING BEVELS ON THE TENONS OF SPOKES.—A. F. Gue, Eastmanville, Mich.
104,583.—BUGGY SEAT.—Christian Haas, Chicago, Ill.
104,584.—GRINDING LEDGER AND FLY BLADES, PLANER-KNIVES, ETC.—Charles Hardy, Biddeford, Me.
104,585.—BLOWER.—Dexter D. Hardy and E. E. Wood, Cincinnati, Ohio, assignors to P. H. Roots and F. M. Roots, Connersville, Ind.
104,586.—DEVICE FOR FORMING CHANNELS IN RIVERS.—A. W. Harlan, Croton, Iowa.
104,587.—APPARATUS FOR TREATING DISEASES BY MEANS OF GALVANISM.—J. B. Hatting (assignor to himself and Stephen Sherlock), New York city.
104,588.—COOLING AND PRODUCING ICE.—C. E. Haynes, Boston, Mass.
104,589.—BOTTOM FOR WASH BOILERS AND SIMILAR VESSELS.—G. H. Hazelton, Philadelphia, Pa.
104,590.—SEWING MACHINE.—H. P. Henriksen, Copenhagen, Denmark, assignor to C. E. Brosser, Paris, France.
104,591.—CORN PLANTER AND FERTILIZER.—A. L. Holcomb, Hopewell, N. J.
104,592.—LINING BESSEMER CONVERTERS.—A. L. Holley, Brooklyn, N. Y.
104,593.—DUPLEX PRESSURE GAGE.—P. B. Hovey, New London, Conn.
104,594.—DREDGING MACHINE.—D. S. Howard, Lyons' Falls, N. Y. Antedated June 11, 1870.
104,595.—MOTIVE-POWER APPARATUS.—Abram Jackson, Lebanon, Tenn.
104,596.—BOOT CRIMPER.—Samuel W. Jamison, Newark, N. J.
104,597.—CLOTHES LINE HOLDER.—C. A. Kalck, Philadelphia, Pa.
104,598.—LOCK.—W. M. Keefer (assignor to himself and James Harding), Chicago, Ill.
104,599.—MACHINE FOR SHAVING HEELS OF BOOTS AND SHOES.—A. B. Keith, North Bridgewater, and T. K. Reed, East Bridgewater, Mass., assignors to Azra B. Keith.
104,600.—WATER WHEEL.—James C. Kelly, Groveland, N. Y.
104,601.—HANK FOR SAILS.—George Kirtland, Westbrook, Conn.
104,602.—FAUCET.—John Knoche (assignor to himself and Henry Varwig), Cincinnati, Ohio.
104,603.—PADDLE WHEEL.—W. F. Knowlton (assignor to himself and W. T. Clark, St. Cloud, Minn.
104,604.—PUMP.—R. M. Lafferty (assignor to himself and E. P. Smith), Three Rivers, Mich.
104,605.—WATER ELEVATOR.—James F. Latimer, Detroit, Mich.
104,606.—CLAMP.—J. J. Lebeau, Cincinnati, Ohio.
104,607.—CORPSE PRESERVER.—E. F. Lenox and Charles Eckhart, Trenton, N. J.
104,608.—MOTIVE POWER FOR SEWING MACHINES.—E. J. Leyburn, Lexington, Va.
104,609.—PICTURE KNOB.—H. C. Luther, Providence, R. I., and C. E. Richards, North Attleborough, Mass.
104,610.—MOTIVE POWER FOR SEWING MACHINES.—G. W. Manson, Jersey City, N. J., assignor to himself, C. M. Vandervoost, and R. B. Westbrook.
104,611.—BROILER.—Benjamin Marshall, Marietta, Ohio.
104,612.—TUCK CREASING MECHANISM FOR SEWING MACHINES.—C. F. Martine, Boston, Mass.
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104,682.—BREECH-LOADING FIRE-ARM.—L. V. Young, St. Louis, Mo.
103,098.—STOVE GRATE.—Reuben Solliday, Allentown, Pa.—Dated May 17, 1870.

REISSUES.

4,036.—CORN SHELLER.—John Bowles, Augusta, Ga., for himself, and S. P. Ross, Pittsburgh, Pa., assignee of John Bowles.—Patent No. 89,550, dated May 4, 1869.
4,037.—SHOE.—Charles Buffum, Lynn, Mass., assignee of Joseph B. Johnson.—Patent No. 46,299, dated Feb. 7, 1865.
4,038.—Division A.—EXCAVATING MACHINE.—O. S. Chapman, Canton, Mass.—Patent No. 63,857, dated April 16, 1867.
4,039.—Division B.—EXCAVATING MACHINE.—O. S. Chapman, Canton, Mass.—Patent No. 63,857, dated April 16, 1867.
4,040.—LIQUID METER.—Jose F. De Navarro, New York city, assignee, by mesne assignments, of Franz Wagner.—Patent No. 99,266, dated Jan. 25, 1870.
4,041.—SIDESADDLE.—John T. Gathright, Louisville, Ky., assignee of himself and John C. Freeman.—Patent No. 94,737, dated Sept. 14, 1869.
4,042.—GRATE.—James Old, Pittsburgh, Pa.—Patent No. 87,790, dated March 16, 1869.
4,043.—GLOBE STEAM VALVE.—The Rock Valve Manufacturing Co., Ludlow, Vt., assignee of E. A. Rock.—Patent No. 74,144, dated Feb. 4, 1868.

DESIGNS.

4,156.—TRADE MARK.—William A. Burke, Lowell, Mass., assignor to "The Proprietors of the Tremont Mills."
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4,164.—"BASCHLIK."—Martin Landenberger, Philadelphia, Pa.
4,165.—SHAPE OF A HOOD.—Martin Landenberger, Philadelphia, Pa.
4,166.—TABLE CASTER.—C. H. Latham, Lowell, Mass.
4,167.—PLATES AND FEET OF THE "DEXTER" COOKING STOVE.—John Martino & John Currie (assignors to Chas. Noble & Co.), Philadelphia, Pa. Antedated May 26, 1870.
4,168.—DOG MUZZLE.—F. J. Meyers, Covington, Ky.
4,169.—BREAST COLLAR FOR HARNESS.—W. R. Olmsted, Fayette, N. Y.
4,170.—BOTTLE.—O. H. P. Rose, East Greenwich, R. I.
4,171.—COOKING STOVE.—Garrettson Smith and Henry Brown, Philadelphia, Pa., assignors to C. S. Francis, Henry Francis, H. L. Buckwalter, J. A. Buckwalter, and John Sheeler.
4,172.—HEATING STOVE.—G. Smith and H. Brown, Philadelphia, Pa., assignors to C. S. Francis, Henry Francis, H. L. Buckwalter, J. A. Buckwalter, and John Sheeler.
4,173.—RING AND BUCKLE.—James E. Strode, Hillsborough, Ill.

EXTENSIONS.

BOOT TREE.—C. T. Eames, Milford, Mass.—Letters Patent No. 14,951, dated May 27, 1856; reissue No. 1,262, dated March 25, 1862; reissue No. 2,466, dated Jan. 29, 1867.
OPERATING STEAM STAMPS.—Adelia E. Ball and Edwin P. Ball, of Chicopee, Mass., administrators of William Ball, deceased.—Letters Patent No. 14,944, dated May 27, 1856.
GRINDING CIRCULAR SAWS.—Wm. Clemson, Middletown, N. Y. Letters Patent No. 14,950, dated May 27, 1856.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

MACHINE FOR PREPARING FIBROUS SUBSTANCES FOR SPINNING.—James Apperly and William Clissold of Dudbridge, Great Britain, have petitioned for the extension of the above patent. Day of hearing Nov. 16, 1870.

REPAIRING RAILWAY BARS.—Geo. Johnson, Marshall, Mich., has petitioned for an extension of the above patent. Day of hearing Aug. 24, 1870.

HARVESTER.—William P. Mason, Elmira, N. Y., has applied for an extension of the above patent. Day of hearing Aug. 24, 1870.

SAW GUMMER.—Richard H. Garrigues, Salem, Ohio, has petitioned for an extension of the above patent. Day of hearing Aug. 24, 1870.

MACHINE FOR SWEEPING STREETS.—Robert A. Smith, Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Aug. 24, 1870.

MODE OF CONSTRUCTING WALLS AND FLOORS OF CELLARS.—Sophia A. Moen, Stamford, Conn., and Philip L. Moen, Worcester, Mass., have petitioned for an extension of the above patent. Day of hearing August 24, 1870.

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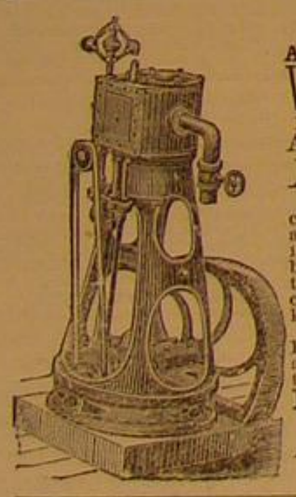
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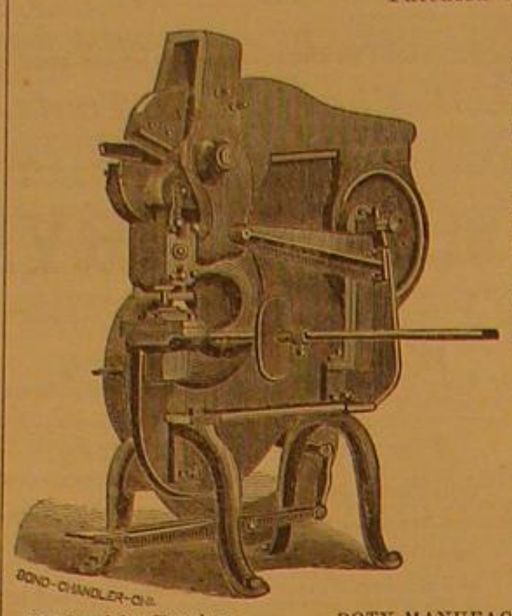
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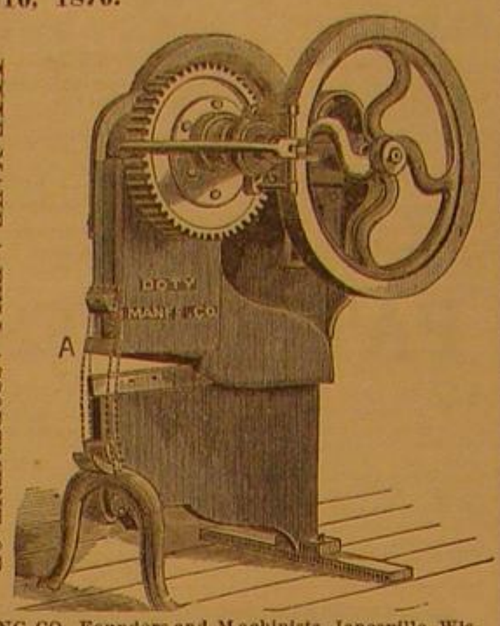
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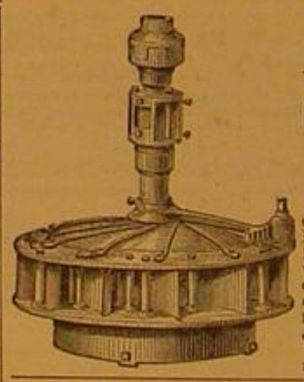
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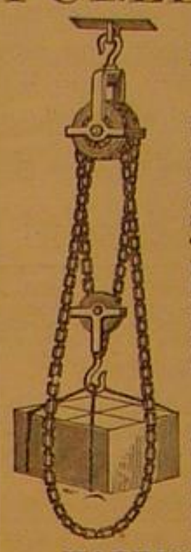
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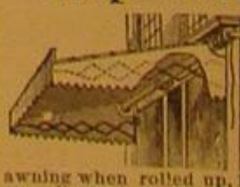
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Fig. 1

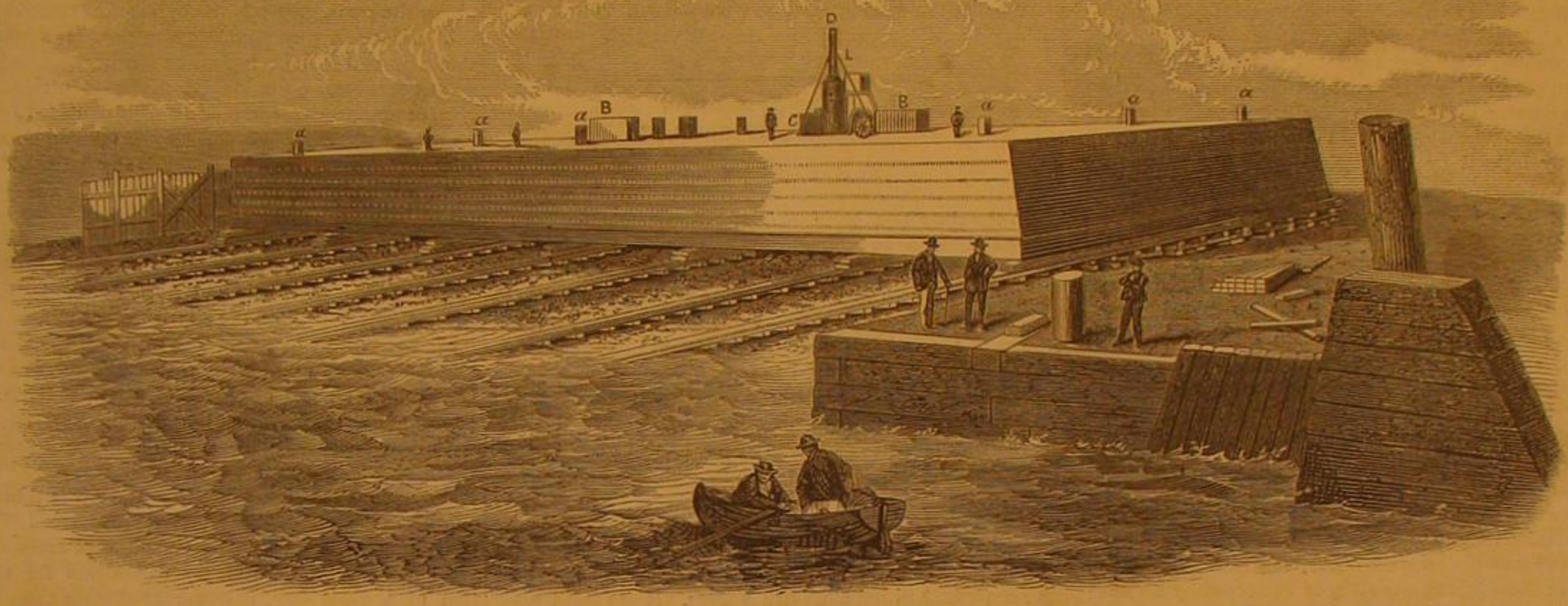


Fig. 2

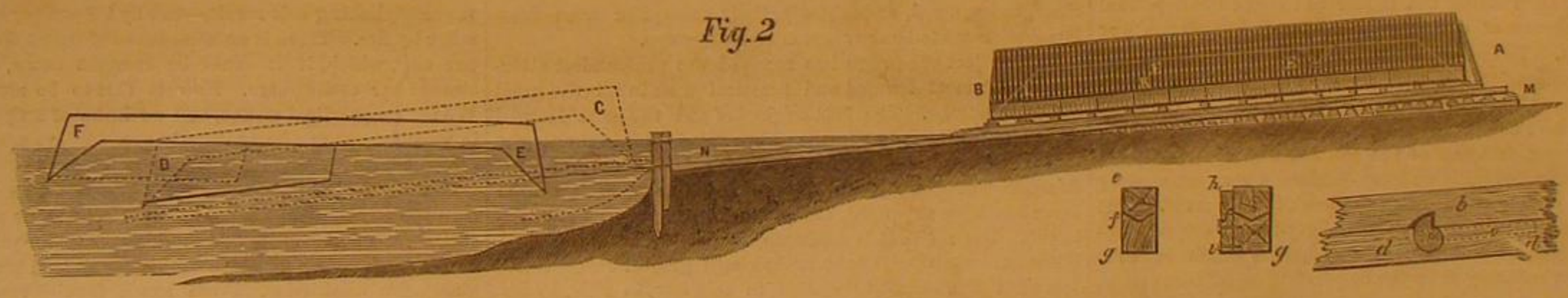


Fig. 3

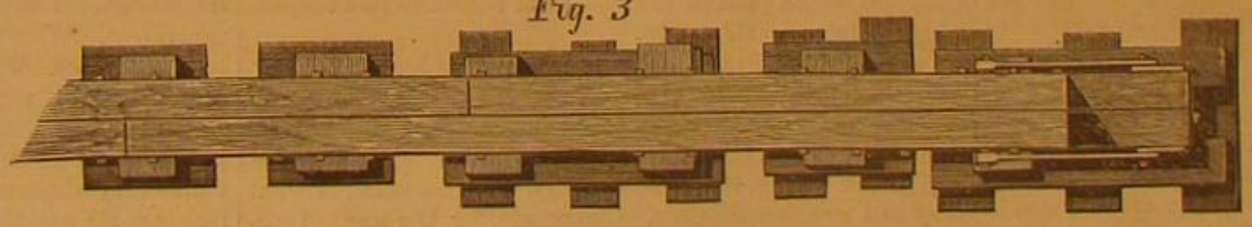


Fig. 5

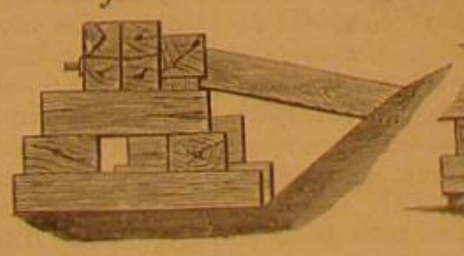
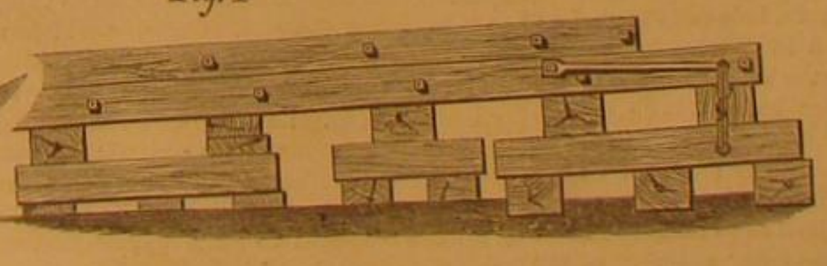


Fig. 4



LAUNCHING OF THE CAISSON OF THE EAST RIVER BRIDGE

Our engravings show the caisson on the ways, as it appeared when ready to be launched, and also some details by which the construction of the ways and the plan of procedure in making the launch may be comprehended.

The structure was put together with its longer side parallel to the river bank, and about 100 feet distant from it, and the ways upon which it rested were seven in number, and each about 180 feet in length. These ways were laid in such a manner that their upper faces were curved to a radius of about 312 feet, and at a slope which made the chord of this arc form an angle of about 5°, the curved sine of the arc being some 13 inches, and the upper ends of the ways 15·6 feet higher than the lower ends. By this means an accelerated motion was given to the caisson in the latter part of its transit, the increased velocity it thus obtained enabled it to overcome the great resistance it encountered from the water when it struck the river broadside on. The details show the form given to these ways, and it will be observed that they rest upon cross and longitudinal timbers; the letters, *f g*, refer to the bearing pieces of the fixed ways, and *e f*, to the sliding ways attached to the underside of the caisson. The surfaces of the former of these were cut to an angle, as shown, that of the corresponding slide being made to fit, in order to insure a perfectly true motion of the caisson in the process of launching. Besides this, timbers, *h l*, were bolted to the inside of the two outer ways, which projected above the sliding surface, in order to check any swerving tendency. To insure a means of casting loose the caisson from every point at the same moment, a check cam, shown in the detail, was fixed into each of the ways near the upper end. The cam at the point where it took the bearing of the sliding way was provided with a projection which held it fast against the timber, and it was kept immovable by means of a lever secured by ropes at its extremity. These ropes being cast off simultaneously the cams were thrown over, and the caisson was free to move equally throughout its length. The position of the caisson upon the ways when ready for launching is clearly shown in the figures. The position of the air chamber is indicated by the dotted lines, H, K, L, and at E is shown a partition, which was constructed to divide the air chamber, and prevent the air from any sudden movement from one part of the caisson to another, which would have affected its stability. The dotted lines, C D, show the position assumed by the structure just as it left the ways, and E F represents it after it had been launched and had come to rest in the water.

In connection with this subject, a description of a visit to and

A DESCENT INTO THE CAISSON,

furnished us by one of two gentlemen, whose curiosity recently rose superior to all fears of the inconveniences and discomforts which—to novices—attend the descent, will be read with interest. It is as follows:

Save the employment of one gang of men above and one below for the completion of some extra service, the day's work on the caisson had ceased, when we two busy *bees* (or busy-bodies, if you prefer that term) presented ourselves at the entrance gate adjoining Fulton Ferry. We were neither engineers nor experts, nor did we propose an examination on which a scientific report might be based. The gratification of a great curiosity, to see with our own eyes the condition and mode of conducting one of the grandest engineering projects of the age, was the sole impelling motive.

We were made the more cheerfully welcome because we had chosen an off-hour for our visit; and that circumstance contributed to our own gratification, because it afforded better than usual opportunity for an undisturbed inspection of the work in all its parts.

The caisson inclosure extends some 250 feet along the river front, and thence back about 300 feet. The caisson itself has a frontage on the river of 168 feet, and a depth of 102 feet, the basin in which it is being sunk extending a few feet more in each direction. The caisson is, in effect, a box made of heavy timbers, sixteen feet in depth, and divided by like heavy timbers into six compartments. This great compartmented box, without a cover, was turned bottom upward and floated over the spot which it now occupies. Several layers of timber were then securely bolted over the entire upper surface, increasing its already immense strength, and sinking the structure until its sharp edges—protected by heavy iron plates—rested upon the bottom of the basin.

The problem was, and is, to sink this enormous caisson through mud and earth and boulders forty or more feet, until a firm ground is reached, there to leave it as the foundation for the immense towers of the bridge that is to be constructed. This is effected by maintaining and constantly changing an atmosphere, and at the same time excluding the water from each of the compartments of the caisson; thus furnishing means for carrying on the work of excavation to the best advantage. The means to this end are a supply of air forced by steam-driven pumps through pipes and hose into

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the caisson chambers, and a sufficiency of weight on the upper surface of the caisson to counteract the buoyancy alike of timber and air, and maintain the caisson at all times, firmly, on the bed of the excavation. This weight is provided by commencing at once the erection of the towers. For this purpose the entire surface of the caisson is covered with blocks of heavy stone, the interstices of which are filled with the best cement. As the caisson sinks other tiers of stone will be added, and when it rests upon its final bed the towers will be carried up their full hight.

The method whereby the workmen enter and leave their workrooms at the bottom of the caisson—already fifteen or twenty feet below the surface of the water and growing deeper day by day—and the method of removing the earth and rocks which they dig out are matters of greatest interest. To drive the water out of the caisson requires a pressure of air inside equal to six pounds to the inch. The workmen must therefore go in and out and take out the material excavated without leaving any open space through which the air could escape. And how is this done?

Down through these tiers of stone and timber—from the outer air to the inside of the caisson—is placed a tube of boiler iron some six feet in diameter. The upper end of this tube is closed, save a man-hole of perhaps 18 inches diameter. About seven feet below this upper end the tube is again closed by an iron division, save another man-hole of the same size as the first. On one side of the tube, from top to bottom—the seven feet space between the man-holes included—is fixed an iron ladder. The two man-holes are fitted with covers which are closed or opened at pleasure by means of suitable appliances in the seven feet chamber between them. These covers are operated by an attendant, who remains in the little chamber, at all hours, for the purpose.

And now we busy-bodied-bees present ourselves for admission. The upper man-hole is open, and the attendant below directs us to descend into his little room by means of the iron ladder. The man-hole below is right closed. The little room is abundantly lighted by heavy glass set in the iron-work overhead. The cover to the man-hole by which we entered is now closed by a few turns of the windlass, and we three are cased in the strongest of iron prisons. Before we can feel the effects of our confinement the attendant opens a small valve which communicates by means of a pipe, with the space below the iron floor on which we stand. An unearthly and deafening screech, as from a steam whistle, is the immediate result, and we instinctively stop our ears with our fingers to defend them from the terrible sound. As the sound diminishes we are sensible of an oppressive fullness about the head, not unaccompanied with pain, somewhat such as might be expected were our heads about to explode. Meanwhile the sound stops entirely; the lower man-hole is opened, and the attendant directs our attention to the iron ladder below as the means of descent. The first determination to draw back and gain the pure air above, regardless of failure to accomplish the object of our visit, is succeeded by a sober second-thought, and in spite of present pain we drop through the man-hole and down the ladder as though life depended upon the celerity of our movements and the brevity of our explorations. But as the seconds fly we become accustomed to the "situation." The pressure on the head is relieved so that in three or four minutes we feel quite at ease. We place ourselves under the care of the superintendent in charge, Mr. Charles Young, foreman of the caisson, and are conducted from point to point until we have obtained a very satisfactory idea of the principles on which the work is conducted. The compartments, which are each some forty-five feet square, appear very much like the cellars of houses which have for months been submerged by the overflow of an adjacent river, and are now newly freed from water. A slimy mud covers everything. Planks are laid from point to point, serving alike as ways for feet and barrow-wheels, and doorways are cut through the different compartment partition walls to facilitate the passage between them.

In one of the compartments, as already intimated, we find the work going on, while the other five are dark and dank; slimy and silent. A single great boulder obstructs the progress downward of the caisson, and these men are engaged in its removal. They have dug around the inner side of it, but the excavation is filled with water. Indeed the boulder is concealed in the water, and they work at it, thigh deep, in the muddy liquid. They have drilled a hole and inserted an eye-bolt, such as is used in raising a large stone to its place on the walls of some great building. The boulder weighs ten, or it may be twenty tuns, and besides that is so bedded in mud that a power equal to twice its weight is required to loosen its hold. That power is obtained by means of an hydraulic jack. Unlike the usual lifting jack, in use for raising great weights, this one is so contrived as to exert the same power in pulling the weight. The water chamber of the jack is above and not below the piston, and the piston rod terminates in a hook instead of a lifting shoulder. This hook being first attached to the eye keyed into the boulder, and the opposite end of the jack chained fast to the nearest inner timber partition, the pump which forms part of the jack is put in motion. When the strain is fairly made the boulder yields and is drawn into the compartment. Here it is speedily drilled through and broken into manageable pieces. Let us follow them.

Down through the layers of stone and timber there reaches from the upper air to the level of the bottom edges of the caisson a huge square box, some eight or ten feet on either side, open at both ends. The water which is driven out of compartments where the work goes on, by the great air pumps, rises freely in this box to the level of the river beyond. As the caisson sinks the workmen dig around and under the lower edges of the box, keeping a space under it free from earth. Inside the box is a steam-operated lifter, so constructed as to dip great buckets full of whatever of earth or stones may be found at the bottom. It is, in short, a dredging machine, and is operated as such. It dredges out the earth below the box to a depth greater than that reached by the caisson, and thus forms, as it were, a cistern or space filled with water below the box. This cavity or cistern extends beyond the box itself into the working compartments on either side.

Hither the workmen bring the broken pieces of rock, the mud and earth, or such material as may have been excavated. It is thrown into the cistern, is dipped up by the dredger buckets, and lifted *through the water* into the upper air, there to be finally removed. The process is simple enough, and yet one almost wonders to stand at ease near the bottom of such a box—two of them are in use—and consider it as without either cover or bottom and yet full of water to a hight of a dozen feet above the head. The way is open, apparently, for the water to run out, and yet the flood is stayed! But that we have become accustomed to the condensed air in which we stand, and have forgotten that it exerts a pressure of six pounds to the square inch upon that water, and thus presses it up into the box and holds it up there to a hight of nearly twenty feet, we should not thus wonder. The process *is* indeed simple, but it is not the less difficult to realize. All around the caisson is the same wall of water, high above our heads, kept from overflowing us by the compression of the air in which we stand.

And thus the workmen are enabled to undermine the entire caisson—to sink it slowly and surely to its final rest. When that point has been determined, the entire inner space will be packed full of cement, and the whole will became substantially a vast rock, never more to be disturbed.

B. & B.

[For the Scientific American.]

THE DISPOSAL OF SEWAGE.

BY PROF. JOHN DARBY.

From the time men gathered into communities, some sanitary regulations have been adopted. It required no long experience, on the part of the members of a thickly peopled locality, to teach them that aggregation, alone, was a cause of disease. The reason of this result was not apparent; but the existence of the fact led to the establishment of hygienic regulations, which were supposed to have a bearing on the subject. The accumulation of filth, in a crowded population, was considered a prolific cause of disease. To get rid of this was the problem. Moses purified his camps by fire, or by regulations that carried the offensive materials off too far for them to exert any deleterious influence. To remove these morbific elements from cities, sewers were an early means. It was presumed that, by running water in sewers, all the decaying matter could be transported to a river or the ocean, and be lost or consumed in the abundant waters. Rome stood upon a net-work of sewers (*cloacæ*), and its vast population, in ancient times, owed, undoubtedly, their exemption from desolating diseases to the perfection of its sewage.

The subject of sewage has received the profoundest attention of the most learned and practical men in all the great cities of Europe. The best engineers and the most learned hygienists of Paris and London have spent their best energies on this subject; and the effect of their labors has been, undoubtedly, of great good. In the city of New York, similar labor has been expended, and similar happy results have followed. But all that is desirable has not been accomplished. Efforts are unabated to accomplish still greater results. No less than 7,455 deaths occurred in this city, in 1868, by diseases, in a great measure, due to impure air. There are two questions which present themselves in regard to this subject, which require consideration.

1st. What is it in the air that is so fatal to human life?

2d. How is the material to be destroyed?

There has never been any doubt in the minds of observers, that there was present in the air a material, which they called malaria, or miasm, the generator, in a great measure, of what they call zymotic diseases. One reason, for the want of success in removing entirely this destructive agent, is due to the fact, that its true properties have not been discovered or acted upon. Importance, also, has been given to agents that exerted no influence in the case. Carbonic acid has been sought for, found, and estimated in unhealthy localities. Carbonic acid exerts no influence in producing disease. It is a comparatively harmless gas. Le Blanc says carbonic oxide is twenty-five times more poisonous than carbonic acid, which is equivalent to saying that carbonic acid is not poisonous at all, which we have good reasons for believing. The amount of carbonic acid is always too small to exert any deleterious influence in the most malarious localities. It never amounts to more than one third of one per cent, which is too small a quantity to produce any injurious effect.

It is true that carbonic acid may accumulate in wells, cisterns, sewers, or caves, and suffocate any one descending into them. It is a heavy gas, and has slight diffusive power, and hence, will remain for some time in a close place, where it is generated. It suffocates, in these cases, as any other gas would do with like diffusive power.

It produces no zymotic diseases. The workmen in soda-water works breath an atmosphere often much more highly charged with carbonic acid than in any natural localities, and yet are perfectly healthy.

Angus Smith says, that a deficiency of oxygen, or the accumulation of carbonic acid is not the cause of the injury, but the discharging into the air some organic substance. Whatever this substance may be, as to its real nature, whether germs, puterine, organic nitrogen, or albuminoid ammonia, is of little or no consequence; its properties and effects are beyond dispute. That it is a producer of disease there is no question. In sixty-eight places, in England, the death rate was in direct relation to the quantities of this material in the air. It is to this organic substance that attention is directed.

To detect this material, we devised a means more than ten years ago. We attached to an aspirator one of Liebig's potash bulbs, containing a dilute solution of permanganate of potash; and as the water passes out of the vessel, a like quantity of air passed through the bulb, and any organic matter was indicated by the change of color of the permanganate from a deep reddish purple to a colorless solution. Care must, however, be taken to previously deprive the air of any sulphureted or phosphureted hydrogen; which is easily done. By this means the air can be tested from any locality or place wherein an india-rubber tube can be inserted—from cellars, bed rooms, or in the beds, from drains, from the tops of houses, or above them, sewers, etc.

By the same arrangement of apparatus, ozone may be tested, by putting into the bulb a solution of iodide of potassium and starch, prepared in the same manner as for ozone papers, only more diluted.

The following facts are established in regard to malaria by experiments:

1st. It is not generated at a temperature below 50° Fah.

2d. With due moisture and a temperature in the neighborhood of 80°, it is generated wherever organic matter is undergoing decay. The emanations of the human body afford it promptly under like conditions.

3d. It is heavier than the air—never rising but a few feet above the earth unless borne by upward currents.

4th. It is in very minute quantities. If a bottle of air be taken from the most malarious locality and submitted to an expert chemist, he would give the exact percentage of nitrogen, oxygen, water, carbonic acid, sulphureted hydrogen, etc., and make up 100 parts, but would take no notice of this organic substance. The deficiency, if any, he would—and might justly—attribute to error in observation. The permanganate is specially fitted for its detection, from its deep color and excessive sensitiveness to the presence of organic matter, especially if undergoing change.

In the months of July and August, especially, the temperature of every part of the city is raised to a point favorable for miasmatic production. The sewers, filthy streets, inclosed yards, and all filthy places, whether indoors or out of doors, become foci for the discharge of active malaria. Here it is, entering our homes, invading the sleeping rooms, and, perhaps, generated there, unless scrupulous neatness and thorough ventilation is observed.

Our second question comes to us, "How is this organic substance to be got rid of?" We are persuaded that chemical disinfectants are nearly or quite powerless. They are mere partial and temporary expedients for the purification of a great city, however applicable they may be for a single dwelling. We can conceive of but two ways of accomplishing this result,—one by the agency of ozone, the other by fire. There is an abundance of ozone floating above our city, which, if it could be brought down, would soon cleanse our atmosphere. How is this to be accomplished? We see no practical means, and we know of no practical way in which ozone can be artificially produced, to accomplish the same end.

Can we apply fire?

In the city of New York there are twenty-nine sugar refineries, eighteen saw mills, 324 establishments for printing, nine flouring mills, sixty-five iron founderies, sixteen planing mills, ninety-five distilleries. From much inquiry that we have made, and the average we have been able to make, the above establishments consume 2,000 tuns of coal per day, or its equivalent. We will suppose they use but 1,000 tuns. This is 2,000,000 lbs. To burn this coal—supposing it to be pure carbon—would require 5,333,333 1-3 lbs. of oxygen. The amount of air required to afford this amount of oxygen, supposing it all to be consumed, would be 26,666,666 2-3 lbs. Converting this into cubic feet, on the fact that 100 cubic inches of air weigh 31 grains, we should get about 36,000,000 cubic feet, which would fill a sewer 4-ft. by 3, and 568 miles long. The sewers of this city make 260 miles in length, and they will not average 3x4-ft. A great part of the length of the sewers is tubes, from 1-ft. to 1 1-2-ft. in diameter. We may safely calculate that, with the burning of 1,000 tuns of coal, all the sewers of the city would be emptied three times a day, if the furnaces in which the coal is burned drew their air from the sewers.

The proposition is, to connect the furnaces or bellows with the adjacent sewers. No one will deny the feasibility of this adjustment. It is no new thing to draw air for a blast from below. The air furnaces in New England, fifty years ago, drew the air by a subterranean trench, from outside the furnaces. Many farmers' fireplaces were furnished with a hole between the andirons, covered, when not needed, with an iron plate. It fulfilled two purposes—to let the ashes into a brick bin, below, and to blow the fire from a current of air from the cellar. The feasibility we consider settled.

Some objections may be raised on other grounds. It may be said, that the air of sewers is not fitted to support combustion, as well as external air. The amount of oxygen will not vary one third of one per cent, as analysis shows. Moreover, the air in the sewer will be from ten to twenty degrees colder than that of the furnace room, whence the air is now drawn. For the condensation of the air by this lower temperature will make a cubic foot of air in the sewer contain more oxygen than a cubic foot of external air, allowing for all impurities.

But it may be said, the foul gases may interfere with com

bustion. All the gases, except carbonic acid, generated, including the malaria, are combustible, and will add fuel to the flame.

It may, also, be objected, that the air is damp. This is so. But the water is in the form of vapor, and not liquid, hence the thousand degrees of caloric are not required to convert the water into steam. This vapor, passing over the glowing carbon, would be decomposed, and, by no means, diminish the the intensity of the combustion, but rather increase it.

The advantages of this operation are manifest. In the first place, the offensive matters are burned up, and not allowed, as now, to be diffused through the air. By this process there will be a constant downward tendency of the foul airs to flow into the sewers, wherever generated, whether from the surface of the streets, or in dwellings, or outhouses. Like the water, they will all flow off into the sewers, and be drawn up into the furnaces. The tendency, now, is to accumulate and rise up as the quantity increases, and flow into the dwellings, instead of flowing from them. The sewers themselves are now centers of the foulest emanations, as any one may convince himself by experimenting on the air over the water holes at the corners of the streets.

It is feared by some, that the immense production of carbonic acid, and other noxious products produced by the manufactories of New York, may demand, sooner or later, their removal from the city. These fears, probably, have their origin in the analysis of the air in the great cities of England. They certainly have not arisen from the analysis of the air of New York. The cases of English cities and New York are very different. In the first place, the kinds of manufactories of New York are small or null in those materials which most load the atmosphere of some English cities. In the next place, we have a very different atmosphere. While theirs is moist, and loaded with vapors, ours is comparatively dry, and will not sustain them. Although immense volumes of carbonic acid are raised into the air, yet the winds, in a few minutes, will transport them to distant places.

This principle may be applied with much benefit to private dwellings. If the dwelling is furnished with a furnace, the air for combustion could be drawn from the lowest place on the premises, and the supply of air would come from the upper portions of the house, creating a tendency to ventilate the dwelling by pure air drawn from above. The cellars of private buildings might be connected with the sewers, and when the draft was strong, the stagnant air drawn out and fresh air supplied.

It might be objected, that circumstances might occur, when the air could not be drawn from the sewers from obstructions or from their being full. Then the usual source could be employed by removing the jacket, and the dampers in the tube be shut. Where the tubes are employed, and too small for the supply from accumulations of water in them, the furnace could be connected with the reservoirs for surface water at the corners of the streets. But the furnaces, generally, are in operation only in the daytime. Still, if the sewers are thoroughly aerated three times in twenty-four hours, no harm could result, certainly none when they are kept pure for twelve hours, and that in the hottest portion of the twenty-four.

Hotels might draw their air from the same source to their ranges and furnaces, and their premises supplied with pure air.

The only facts we have observed in examining the *literature* of sewers, that relates to this matter, are the following: A proposition was made, in London, to connect the sewers with the chimneys of manufactories, above the fires, which the owners objected to, from its diminishing the draft. In Paris, when the sewers become so foul that the workmen cannot enter them with safety, they have movable chimneys, which they put over the holes in the streets, and, by building a fire in the chimneys, draw out the foul air. This involves our principle, which we have discovered since the above was written.

It may be objected that insuperable difficulties would arise in putting the above views in practice. That difficulties would arise, is probable, but, that they are insuperable to the engineering talent of New York, we do not believe. We imagine the expense of the various efforts now put forth for a partial success, if rightly directed, would achieve a perfect and permanent relief from malarial influences, and would supply the now most miasmatic districts with pure air.

WHAT IS ENERGY?

[Balfour Stewart in Nature.]

It has been shown in a former article (See SCIENTIFIC AMERICAN, page 360, Vol. XXII.), that energy, or the power of doing work, is of two kinds, namely, energy due to actual motion, and that due to position. We ended that article by supposing a stone shot vertically upwards had been caught at the summit of its flight and lodged on the top of a house; and this gave rise to the question, What has become of the energy of the stone? To answer this we must learn to regard energy, not as a quality, but rather as a thing.

The chemist has always taught us to regard quantity or mass of matter as unchangeable, so that amid the many bewildering transformations of form and quality which take place in the chemical world, we can always consult our balance with a certainty that it will not play us false. But now the physical philosopher steps in and tells us that energy is quite as unchangeable as mass, and that the conservation of both is equally complete. There is, however, this difference between the two things—the same particle of matter will always retain the same mass, but it will not always retain the same energy

As a whole, energy is invariable, but it is always shifting about from particle to particle, and it is hence more difficult to grasp the conception of an invariability of energy than of an invariability of mass. For instance, the mass of our luminary always remains the same, but its energy is always getting less.

And now to return to our question—What has become of the energy of the stone? Has this disappeared? Far from it; the energy with which the stone began its flight has no more disappeared from the universe of energy, than the coal, when we have burned it in our fire, disappears from the universe of matter. But this has taken place: the energy has changed its form and has become spent or has disappeared as energy of actual motion, in gaining for the stone a position of advantage with regard to the force of gravity.

If we study this particular instance more minutely, we shall see that during the upward flight of the stone its energy of actual motion becomes gradually changed into energy of position, while the reverse will take place during its downward flight, if we now suppose it dislodged from the top of the house. In this latter case the energy of position with which it begins its downward flight is gradually reconverted into energy of actual motion, until at last, when the stone reaches the ground, it has the same amount of velocity, and, therefore, of actual energy, which it had at first.

Let us now revert, for a moment, to the definition of energy, which means the power of doing work, and we shall see at once how we may gage numerically the quantity of energy which the stone possesses, and in order to simplify matters, let us suppose that this stone weighs exactly one pound. If, therefore, it has velocity enough to carry it up one foot, it may be said to have energy enough to do one unit of work, inasmuch as we have defined one pound raised one foot high to be one unit of work; and in like manner if it has velocity sufficient to carry it 16 feet high, it may be said to have an energy equivalent to 16 units of work, or foot-pounds, as those units are sometimes called.

Now, if the stone be discharged upwards with an initial velocity of 32 feet per second, it will rise 16 feet high, and it has therefore an energy represented by 16. But if its initial velocity be 64 feet per second it will rise 64 feet high before it turns, and will therefore have energy represented by 64. Hence we see that by doubling the velocity the energy is quadrupled, and we might show that by tripling the velocity the energy is increased nine times. This is expressed in general terms by saying that the energy or quantity of work which a moving body can accomplish varies as the square of its velocity. This fact is well known to artillerymen, for a ball with a double velocity will penetrate much more than twice as far into an obstacle opposing its progress.

Let us now take the stone or pound-weight having an initial velocity of 64 feet per second, and consider the state of things at the precise moment when it is 48 feet high. It will at that moment have an actual velocity of 32 feet per second, which, as we have seen, will represent 16 units of work. But it started from the ground with 64 units of work in it; what, therefore, has become of the difference—or 48 units? Evidently it has disappeared as actual energy; but the stone, being 48 feet high, has an energy of position represented by 48 units; so that at this precise moment of its flight its actual energy (16), plus its energy of position (48), are, together, equal to the whole energy with which it started (64).

Here, then, we have no annihilation of energy, but merely the transformation of it from actual energy into that implied by position; nor have we any creation of energy when the stone is on its downward flight, but merely the re-transformation of the energy of position into the original form of actual energy.

We shall presently discuss what becomes of this actual energy after the stone has struck the ground; but, in the meantime, we would repeat our remark how intimate is the analogy between the physical and the social world. In both cases we have actual energy and energy of position, the only difference being that in the social world it is impossible to measure energy with exactness, while in the mechanical world we can gage it with the utmost precision.

Proteus-like, this element, energy, is always changing its form; and hence arises the extreme difficulty of the subject, for we cannot easily retain a sufficient grasp of the ever-changing element to argue experimentally regarding it. All the varieties of physical energy may, however, be embraced under the two heads already mentioned; namely, energy of actual motion and of position.

We have chosen the force of gravity, acting upon a stone shot up into the air, as our example; but there are other forces besides gravity. Thus, a watch newly wound up is in a condition of visible advantage with respect to the force of the main spring; and as it continues to go it gradually loses this energy of position, converting it into energy of motion. A cross-bow bent is likewise in a position of advantage with respect to the spring of the bow; and when its bolt is discharged, this energy of position is converted into that of motion. Thus, again, a meteor, a railway train, a mountain torrent, the wind, all represent energy of actual visible motion; while a head of water may be classed along with a stone at the top of a house as representing energy of position. The list which represents visible energy of motion and of position might be extended indefinitely; but we must remember that there are also invisible molecular motions, which do not the less exist because they are invisible.

One of the best known of these molecular energies is radiant light and heat—a species which can traverse space with the enormous velocity of 186,000 miles a second.

Although itself eminently silent and gentle in its action it is, nevertheless, the parent of most of the work which is done in the world, as we shall presently see when we proceed to another division of our subject. In the mean time we may state that radiant light and heat are supposed to consist of a certain undulatory motion traversing an etherial medium which pervades all space.

Now, when this radiant energy falls upon a substance, part of it is absorbed, and in the process of absorption is converted into ordinary heat. The undulatory motion which had previously traversed the thin ether of space has now become linked with gross palpable matter, and manifests itself in a motion which it produces in the particles of this matter. The violence of this rotary or vortex-like motion will thus form a measure of the heat which the matter contains.

Another species of molecular energy consists of electricity in motion. When an electric current is moving along a wire, we have therein the progress of a power moving the light with enormous velocity, and, like light, silent in its operation. Silent, we say, if it meets with no resistance, but exceedingly formidable if it be opposed; for the awe-inspiring flash is not so much the electricity itself as the visible punishment which it has inflicted on the air for daring to impede its progress. Had there been a set of stout wires between the thunder-cloud and the earth, the fluid would have passed into the ground without disturbance.

The molecular energies which we have now described may be imagined to represent motion of some sort not perceived by the outward eye, but present, nevertheless, to the eye of the understanding, they may therefore be compared to the energy of a body in visible motion, or actual energy as we have termed it.

But we have also molecular energies which are more analogous to the energy of position of a stone at the top of a cliff.

For instance, two bodies near one another may be endowed with a species of energy of position due to opposite electrical states, in which case they have a tendency to rush together, just as a stone at the top of a cliff has a tendency to rush to the earth. If the two bodies be allowed to rush together this energy of position will be converted into that of visible motion, just as when the stone is allowed to drop from the cliff its energy of position is converted into that of visible motion.

There is finally a species of molecular energy caused by chemical separation. When we carry a stone to the top of a cliff, we violently separate two bodies that attract one another, and these two bodies are the earth and the stone. In like manner when we decompose carbonic acid gas into its constituents we violently separate two bodies that attract one another, and these are carbon and oxygen. When, therefore, we have obtained in a separate state two bodies, the atoms of which are prepared to rush together and combine with one another, we have, at the same time, obtained a kind of energy of molecular position analogous on the small scale to the energy of a stone resting upon the top of a house, or on the edge of a cliff on the large or cosmical scale.

Preservation of Freestone.

The *Hub*, a Boston cotemporary, in discoursing on the above subject, remarks that many methods have been adopted to preserve brown stone, and a number of patents have been taken out for preparations for this purpose.

In regard to the cause of the scaling of the brown stone so much used of late in this country, it would seem to be chiefly due to its porosity, whereby it absorbs water, which, in freezing beneath the surface, splits it apart by the expansion which water undergoes at temperatures below 39° Fah. This force of expansion is very powerful, as is shown by the rupture of water pipes, which so often burst in cold weather. It is frequently the case that these pipes do not crack until the temperature moderates and melts the cylinders of ice contained therein, and this has given rise to the delusion that it is the thawing which bursts them.

It has been theorized that the decay of the stone is due in part to the corrosive action of the sulphuric acid which exists in the atmosphere of large cities, proceeding from the coal there burned. Even if this theory be correct, the acid could not affect the stone unless absorbod into its pores with moisture. Stop these pores therefore, and the decay will be arrested. For this purpose the journal from which we condense this article recommends the varnish known as "Permanent Wood Filling." It says oil has been used on walls of brick and stone, but it soaks away before drying, and leaves but little at the surface where it is most needed, while the "Filling," being more viscid, remains in the surface pores until it hardens and closes them forever. This article, like most modern discoveries, was known in principle before the Christian era, and if Sextus Tarquin had not scowled on the gypsy we might perhaps have found in the sibylline books the formula for its preparation. It is at least certain that the asphaltum, which enters into its composition, was used by the Egyptians to preserve their dead, by impregnating the bandages in which they wrapped the bodies to make mummies; and after a trial of four thousand years, we are justified in calling this species of dry pickle *permanent*. In the fossil gums, moreover, which are also used in its composition, we find insects and leaves which have been handed down to us from antediluvian times, and which would indicate the preserving qualities of those gums. Is it not probable that if frail organic remains have been thus preserved by its ingredients, that they will as well protect a hard stone wall? To us it seems that nothing can be more durable than a surface composed of the elastic "Filling," closing the pores of the stone, and the silicous cells of the latter guarding the "Filling" from abrasion. The motives of reformers are often assailed, but the principles of natural philosophy are here in question and not the principles of men.

Improvement in Pumps.

The object of this invention is to so construct a pump for the use of ships and railways, and for domestic purposes, that the lower valve and seat, A, Fig. 1, may be taken out without taking up the pump.

It results from this construction that ships' pumps may be used without a strainer, as whatever may be drawn through the pipe into the barrel may be easily removed. This class of pumps most frequently clogs at the strainer, necessitating loss of time, often in cases of great emergency when minutes lost are lives lost.

For railways also the pump offers advantages, as the valve may be placed below the reach of frost, and be as readly removed for cleaning or repair as though it were near the surface.

The improvement consists in providing the valve seat, B, Fig. 2, with a bail, C, with which a hook, D, attached to a cord or formed upon the end of a rod, engages, and the valve seat and valve may be withdrawn and taken out at the top of the pump.

The valve seat is made tapering, to fit a similarly shaped recess at the bottom of the barrel of the pump, the wedging action being sufficient to hold it in place when the pump is in action, but offering but little resistance when the valve is desired to be removed. It also has a leathern packing, E.

The valve may be taken out of a ship's pump made in this way, all obstructions removed, the valve again replaced, and the pump put in operation, within five minutes from the stoppage of the pump.

Patented, through the Scientific American Patent Agency, July 27, 1869, by John W. Williams, of Syracuse, N. Y., whom address for further particulars.

Mack's Patent Circulator.

Our engravings illustrate a new apparatus for the generation of steam, for which the inventor clai ms the merits of safety, economy, and freedom from incrustation, and which, therefore, will attract the attention of steam engineers and consumers.

Fig. 1 is a perspective view, and Fig. 2 a cross section, showing its construction. It will be seen that the boiler proper is mounted upon a circulator attachment, the object of which is to prevent the intense heat of the fire acting upon the boiler proper, and to present a thin body of water to the heat, which, by its constant circulation, will bring every particle of the water in the upper boiler over the immediate action of the fire, thereby rendering the boiler a reservoir for water and steam, and preventing violent commotion from extra heat in the boiler, wherein the steam and water will become distinctly separated, so as to leave the steam perfectly dry. It is also claimed that incrustation is likewise prevented, as the constant motion of the water in the circulator prevents deposits accumulating on it. The water enters the circulator from the bottom of the boiler to the lowest part of the circulator by the tubes, D, on each side, moving around the bars or stays, till both streams meet on the top or crown of the circulator, and enter the boiler by the pipe, E, at or near the water line.

B and C are the outer and inner plates of the circulator, between which are the stays or angle irons, A. B can be made of stronger and better material, or if made of copper, it will surpass iron for withstanding the effects of the heat.

Thus the water comes from the boiler at about the lowest point through two large tubes, and descends and enters the circulator at the lowest point of the same on opposite sides, thence passing around the bars (which are placed to guide the course of the water) on both sides, till they meet on the top or crown, where they enter by a tube back to the boiler again near the water line, where the steam and water become silently separated, the steam ascending, the water descending, to be again returned back through the circulator.

The longitudinal bars, around which the currents move in the circulator, may be placed so as not to exclude the water entirely from the fire-plate, as they are only to guide the same in its course, therefore they do not require to be riveted like the outer edges. Rings or washers might be placed to raise the bars $\frac{1}{16}$ or $\frac{1}{8}$ of an inch from the plate, or hollow or fluted bars might be used.

The boiler represented in the engravings is 7 feet long, 26 inches in diameter, and has 21 3-inch flues. The circulator is 7 feet long, having 1¼ in. water space between plates, B and C. The feed pipes, D, are each 2½ in. in diameter. The eduction pipe or tube, E, is 1¾ in. in diameter.

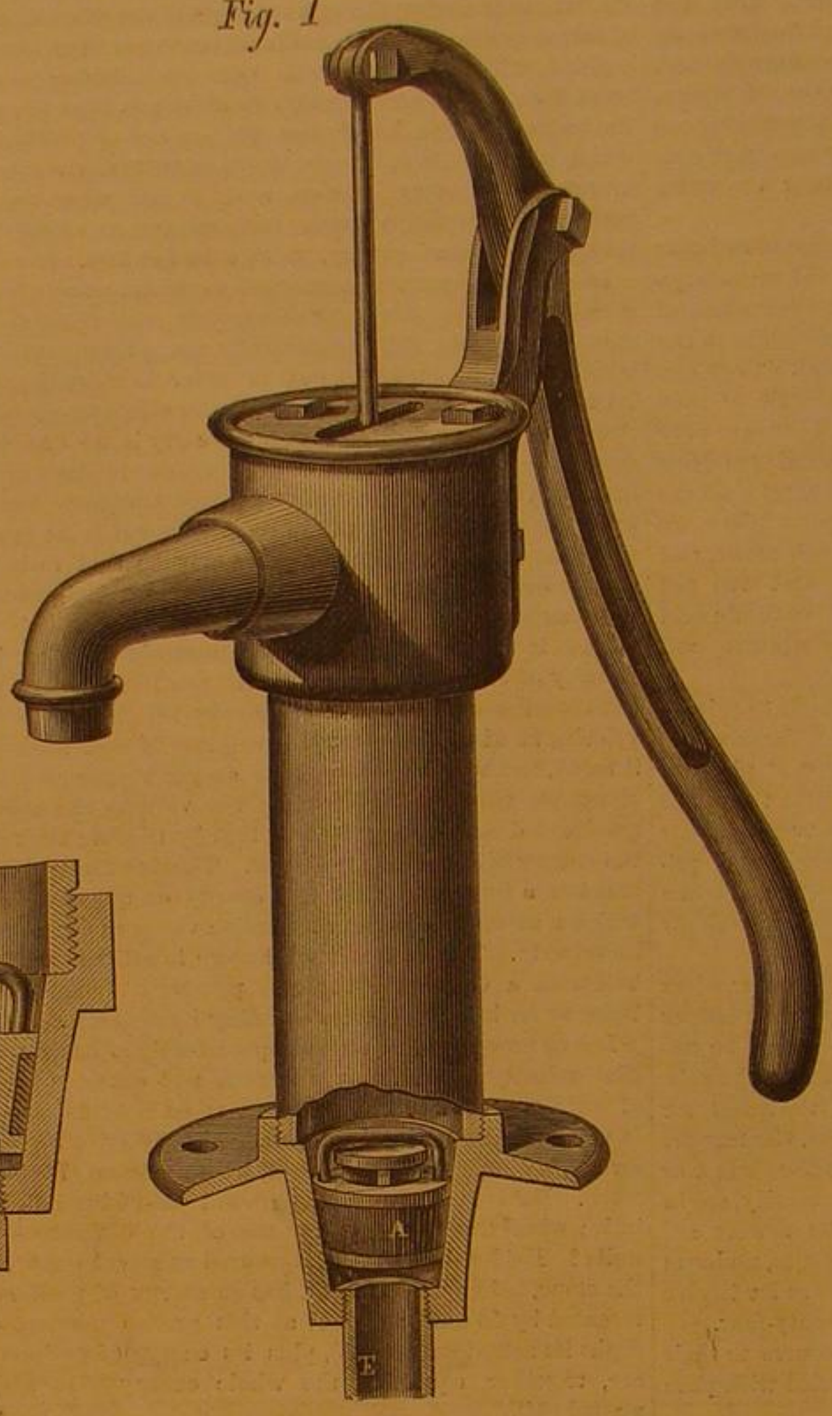
The bars or stays should be made hollow, or so raised by small washers under them that the water can pass under them—they are merely to guide the current of water in its course.

Patented by W. B. Mack, November 11, 1869. All communications relative to purchase of rights, etc., should be addressed to D. B. and H. M. Duffield, Jefferson avenue, corner of Griswold street, Detroit, Mich.

Lime Burning.

"The limestone quarries at Rockland," says the *Architectural Review*, "near the mouth of Penobscot Bay, Me., are at present worked on a more extensive scale than ever before. The old fashioned kiln for burning the limestone has been entirely superseded by the patent perpetual kiln, and a large amount of capital is invested in the business. The kilns are situated on the shore of a peninsula, and are built at the foot of a bank and at the head of a wharf. The kilns are constructed with walls of thick granite and lined with fire-brick, being eighteen feet square and thirty feet deep, narrowing towards the lower part. Each kiln will hold from one hundred and fifty to two hundred casks of lime, and a charge of limestone rock and fuel is burned in from seven to eight hours, and is drawn three or four times a day, according to the character of the rock. The lime, it is stated, swells in the kiln, and prevents the unburned portions from falling down. When the lower layer is sufficiently burned, iron rods are run into the furnace, and the lime, in large glowing red lumps, is removed by means of long handled shovels, and when cool is broken up, sorted, and packed in casks. The fuel is either wood or bituminous coal, the kilns using one cord of wood or two tuns of bituminous coal to produce the same yield. One hundred casks of lime consume in their manufacture four and a half cords of wood. The kilns and the fuel are covered by large sheds, the buildings for a pair of kilns occupying an area of seventeen thousand square feet.

Fig. 1



WILLIAMS' IMPROVED PUMP FOR SHIP AND RAILWAY USE.

Fig. 2

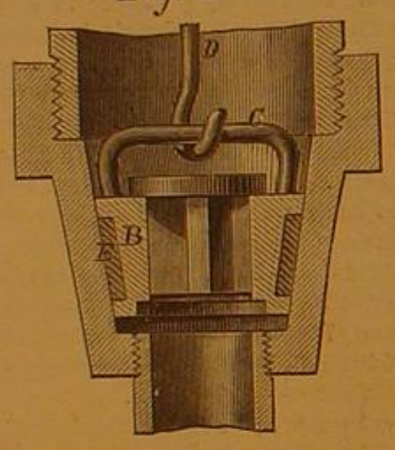
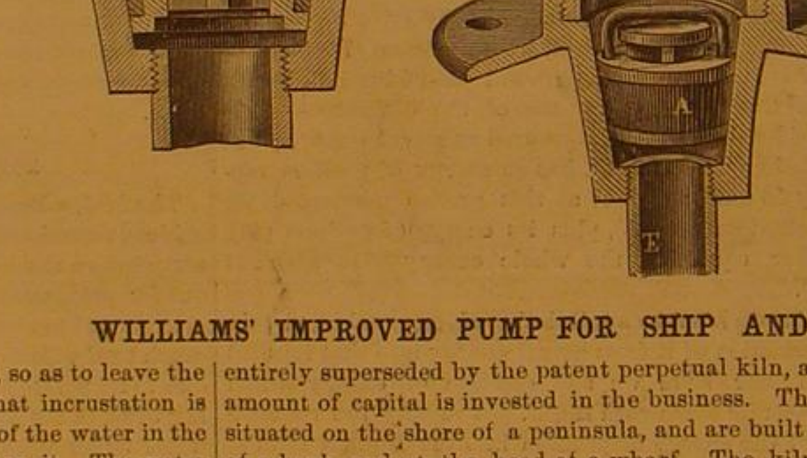
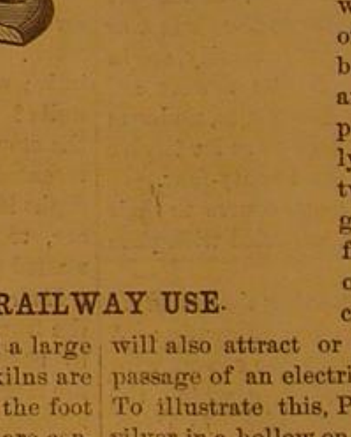


FIG. 1.





MACK'S PATENT CIRCULATOR.

FIG. 2.

Heat From Electric Currents.

Professor Tyndall, in a recent lecture, pointed out how the metal zinc is virtually "burnt" or made to enter into combination with oxygen, in the cells of the Grove's battery; the consequence is, that the temperature of the liquid in the battery cells is raised. If both ends of the battery be joined by a very short, thick copper wire, a definite amount of heat is produced in the cells; but if a thin platinum wire be placed in the circuit, so that the said wire shall be made red hot by the current, there is no additional creation of heat, for the temperature gained in the wire is compensated for by less heat generated in the battery cells. He also explained, that when an electrical current raises the temperature of a wire, it thereby creates increased resistance to its own passage through the wire, for the cooler the metal the more freely does the current pass. To illustrate this, Professor Tyndall passed a current from a forty-cell Grove's battery through a fine platinum wire, rather more than a yard long; the result was, that the wire became red-hot. He then took this red-hot wire by its two ends, with the current still passing through it, and held it so that it hung in a curve like the letter U, and he let the bottom part of the U-curve sink slowly into a glass vessel full of water. The result was, that the water quenched the redness of the wire, wherever the wire was immersed, and the current then passed more freely through the cooled portions; this, of course, increased the heating action of the current upon those portions of wire which were not immersed in the water, so that they became white hot, and, after glowing brilliantly for a time, were fused by the intense heat. The lecturer explained how some metals conduct electricity better than others. For this purpose, he joined up short lengths of platinum wire and silver wire of the same thickness, so as to form one long wire, and then he passed a powerful galvanic current through the whole arrangement; the platinum lengths then became white hot because of the resistance they offered to the passage of the electricity, but the silver lengths remained quite cold and dark, because their good conducting power permitted the current to pass freely. In this lecture he also showed how two wires, through which a current of galvanic electricity is passing, will, when free to move, visibly attract or repel each other, according to the direction of the current through each. An electrified wire will also attract or repel the electric arc produced by the passage of an electrical current between two carbon points. To illustrate this, Professor Tyndall placed a little lump of silver in a hollow on the top of the lower carbon of the electric lamp. When the upper carbon was permitted to touch the silver, the current soon made the metal boil, and when the carbons were separated a little, a brilliant arc of bright green silver vapor extended between the points. A bright image of this arc was projected upon the screen, by means of the lenses of the lamp, and when a wire, through which a galvanic current was passing, was brought near the arc, it was seen to attract it in a remarkable manner. In fact, it could be made to draw the arc of luminous vapor so far on one side as to break it, and to extinguish the light altogether. Professor Tyndall also called attention to the fact, that when frictional or galvanic electricity is passed through one wire, it will induce currents of electricity in another wire lying near, but not touching the first one. He placed one flat coil of insulated wire on the top of another flat coil of insulated wire; then, on passing the discharge from a Leyden jar through the first coil, the electrical current produced in the second one was so strong, that it set fire to gun cotton placed between the terminals of the secondary coil. In another experiment, he showed that these effects may be produced when the two coils are a considerable distance apart, and he repeated the experiment, after first separating the two coils to the distance of eight or nine inches from each other.

IN digging wells or sink-holes great care should be exercised that the drainage from the latter does not affect the former. Many wells are poisoned in this way. The water tastes unpleasantly; which is a proof that it is unhealthy. Seek out the cause—suspect that it is the sink-hole, and you will be on the right track. Many families suffer from the effects of water drawn from wells affected by sinks.

[For the Scientific American].

THE BUTTERFLY.

[By Edward C.H. Day, of the Schoolof Mines, Columbia College].

Nothing strikes the nature-loving stranger, who chances to land here from the British Islands or the northern part of Europe, during the hight of our summer season, more than the abundance of insect life that swarms around us. The incessant shrilling of the crickets and the grasshoppers, led by the energetic cries of the katydids, drives sleep from his eyes by night, while by day, if the somewhat too monotonous and high-pitched music of the cicada as "he trills his sonorous drum," continues the offense to his ears, he is compensated by the sight of a multitude of beautiful insects, such as he seldom or never had the chance of observing in his own more temperate native land. The gorgeous butterflies that sport among our flowers, adding fresh beauties to the parterres, and giving a flickering of gay life to the oppressive stillness of the noontide heat, include, as a rule, larger and more gaily-colored kinds than are to be found in Northern Europe.

Handsome, however, as are our larger kinds they are but aberrant witnesses of the almost tropical intensity of our summers; for we are but on the verge of the conditions that favor the development of these, "the knights," as Linnæus termed them, of butterfly society. If we would see these aristocrats at home we must visit the moist regions under the equator—sojourn with Bates on the banks of the mighty Maranon or wander with Wallace amid the islands of the East. And who that has read the writings of these enthusiasts has not wished to stroll in the glades of the South American forests and see those glorious beauties of the air, that flash meteor-like above the topmost hights of the trees, scorning to descend within mortal reach? or has not felt a longing to gaze for once, if only for once, on that wondrous *Kallima paralekta*, as it sits in a bush of dead leaves, itself the most perfect imitation of a leaf in decay, "blotched, mildewed, and pierced with holes," and, more than all, apparently covered with minute fungi. Or who would not travel far to see such sights as described by Sir Emerson Tennent, as occurring in Ceylon, flights of butterflies, "apparently miles in breadth, and of such prodigious extension as to occupy hours, and even days, uninterruptedly in their passage—whence coming no one knows; whither going no one can tell. The natives have a superstitious belief that their flight is ultimately directed to Adam's Peak, and that their pilgrimage ends on reaching the sacred mountain.

"A friend of mine drove for nine miles through a cloud of white butterflies which were passing across the road by which he went." And does not the thought of the sylph, or "specter-butterfly," described by the same author, "as found only in the deep shade of the damp forest, usually frequenting the vicinity of pools of water and cascades, about which it sails, with graceful flight, heedless of the spray, the moisture of which may even be beneficial in preserving the elasticity of its thin and delicate wings, that bend and undulate in the act of flight," suggests a whole world of marvels and poetry to the genuine lover of nature? Truly the museum of the naturalist is in the field and the forest, and not in dingy, deceptive mausoleums of dried bugs and stuffed skins.

But there is no need, good reader, for us to be disheartened; we have a splendid collection around us, albeit we are a long way from "the line." The traveler who wishes to see the most must pay the heaviest fees; and if we will but read and inwardly digest the observations and reflections of such men as Darwin, Bates, and Wallace, and then go forth with an observant eye and a trifle of patience, we may see beauties and marvels enough around our own doors, without exposing ourselves to hardships and fevers, and to the thousand extra ills which flesh is heir to in the tropics. For instance, you are passing by a blighted apple-tree—a moderate-sized, orange-brown butterfly is flitting around it; it has vanished, and you are sure it did not fly away. Look closely at the aged trunk, and perchance you detect several such butterflies, the marbled underside of their wings, erected as they are at rest, so exactly resembling the varied shades of the bark, that even an observing person might pass and repass the trees without noticing these unless they take wing. These "bark-winged" butterflies, as we might well term them, are common butterflies, upon the undersides of the wings of which you will detect little metallic letters, and we think that you could scarcely find a better illustration of a protective resemblance of this particular kind, even among South American examples. Have you been reading of "polymorphism," or the fact that individuals of the same species in some cases are found differing widely from each other, though of the same sex? Our common *Papilio turnus*, or large yellow "swallow-tail," furnishes you at once with an illustration that has recently been oft quoted; and if you wish to earn a reputation for research, you have but to discover what are the peculiar conditions that influence this species, so that, north of the latitude of New York, females, yellow, similar to the males, prevail, while south of that line, black females are the rule; females, in fact so black that they resemble other species much more than their own! So you see, good reader, that you need not journey far from your own door to find illustrations of the observations of more traveled naturalists, or to enable your own thoughts to make intelligent criticism on their writings.

Your own observations, coupled with your readings, will soon bring you back to the point whence we set out. You will recognize that while the head-quarters of the Papilios and other large and strikingly-colored butterflies are in the tropics, species belonging to other families extend the range of the Lepidopters, even into the Arctic regions. Such arctic forms occur in the United States, restricted, however, to the summits of the highest mountains, isolated there by the gradual amelioration of the climate that has advanced over these regions since the close of the glacial epoch. These forms belong to the family of the *Satyridæ*—a family that is otherwise extensively developed over the temperate regions of both the Old and the New World.

The butterflies belonging to this group are mostly of sober hues; the very name in French of the insect figured herewith



THE HALF-MOURNING BUTTERFLY.

indicates this fact. It is called the "Demi-deuil," or "Half-mourning" butterfly, from which the reader will safely infer that its coloration is simply black and white. Its scientific name is *Arge Galathea*. The *Satyridæ* of this region mostly haunt the shades of woods and form no exception to the general rule of sober coloration. Browns and grays of various shades only relieved by eye-like spots of brighter colors, predominate among our native species. They fly with a quick jerking flight, and when they alight the dull tints of their underwings correspond well with those of the objects amid which they rest and the shadows that surround them. The caterpillars of many species of this family feed upon grasses, as is the case with those represented before us.

Simply adorned as these retiring butterflies are, they are not devoid of a neat beauty of their own, and doubtless there remains much of interest in their habits and associations to repay the student who may devote his attention to them.

THE fall of a large mass of rocks situated between Heidelberg and Weisloch, caused by the recent earthquakes in Germany, has revealed the works of an ancient silver mine which was worked by the Romans. Very little silver ore was left in the mines, but an abundance of rich zinc ore has been found which had remained untouched by the ancient workers.

Crime the Result of Disease.

In "Hammer and Anvil," recently published by Leypoldt and Holt, we find the following extract, which those who are giving attention to social reforms will do well to heed:

"As the only true criticism is creative, which takes the secrets of art as the starting point of its judgment, so that none but an artist can be a real critic, even so men's actions can only be judged by those to whom the old wise word applies, that nothing human is alien to them, because they have experienced in themselves and in their brethren the whole misery of humanity. But for this are necessary, as I said before, the feeling heart and the seeing eye, and an ample opportunity for training and using both.

"Who has a better opportunity for this purpose than the superintendent of a prison? He and the physician, when their views coincide and they strive together towards the same ends, alone can know what the most conscientious judge has no means of learning, how the man whom mankind have thrust out from among them for a time or forever, became what he now is; how, born thus, and of such parents, brought up in such associations, he acted thus and not otherwise at such a critical moment. Then when the superintendent, who is of necessity the confessor of the criminal, has learned his life in all its details, and the physician has discovered the defects with which he has suffered for years, when they consult upon his case, the question only is if he can be helped and how; and in the so-called prison they see, respectively, but a reformatory and an infirmary. For—and this is a point of infinite importance, which physiology will yet compel jurisprudence to acknowledge—nearly all who come here are diseased in the ordinary acceptation of the word; nearly all suffer from organic defects, and in almost every case the brain lacks the proper volume which a normal man needs for normal activity, for a life which shall not bring him into conflict with the law.

"And how could it be otherwise? Almost without exception they are children of want, of wretchedness, of moral and physical malformation, the Pariahs of Society, which in its brutal egotism sweeps by with garments gathered up for fear of defilement, or thrusts them away with cruel violence from its path. The right of wrong! Insolence of Phariseeism! A time will come when this invention of the philosophers will be placed on a level with that other of the theologians, that death is the atonement for sin, and men will thank God that at last they have awaked from the night of ignorance which gave birth to such monsters.

"That day will come, but not so soon.

"We are still deeply sunk in the mire of the Middle Ages, and no man can yet see when this flood of blood and tears will have passed away. However far the glances of a few brighter intellects may reach into the coming ages, the progress of humanity is unspeakably slow. Wherever we look abroad into our own time, we behold the unbeautiful relics of a past that we had believed to be overthrown long ago. Our systems of government, our nobility, our religious institutions, our official arrangements, the organization of our armies, the condition of the laboring classes—everywhere the scarcely hidden relation between masters and slaves; everywhere the critical choice whether we will be hammer or anvil. All our experience, all our observation seems to prove that there is no third alternative. And yet no greater misconception of the real state of the case is possible. Not hammer *or* anvil, hammer *and* anvil is the true word, for every man is both, and both at once, in every moment of his life. With the same force with which the hammer strikes the anvil, the anvil strikes the hammer; the ball is thrown off from the wall at the same angle under which it impinges upon it; the elements which the plant has appropriated in its growth, it must exactly restore in its decomposition—and so throughout all nature. But if nature unconsciously obeys this great law of action and reaction, and is thereby a cosmos and not a chaos, then should man, whose existence is subordinated to precisely the same law, acquire an intelligent knowledge of it, and endeavor intelligently to shape his life in conformity with it; and his worth increases or diminishes exactly in proportion as he does this or neglects it. For though the law remains the same, whether the man knows it or knows it not, yet for himself it is not the same. Where it is known, where the inseparableness, the unity of human interests, the inevitableness of action and reaction, are recognized, there bloom freedom, equity, justice, which are all but varying expressions for the same law. Where it is not known, and he fancies in his blindness that he can with impunity make a tool of his fellow-man, there flourish rankly slavery and tyranny, superstition and priestcraft, hatred and contempt, in all their poisonous luxuriance. What man would not naturally wish rather to be hammer than anvil, so long as he believes that the choice lies open to him? But what reasonable man will not cheerfully renounce the part of hammer, when he has

learned that the part of anvil will not and cannot be spared him, and that every blow that he gives smites also his own cheek; that the serf corrupts the master as well as the master the serf, and that in politics the guardian and the ward are rendered equally stupid."

Correspondence.

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

The Pine-Apple.

MESSRS. EDITORS:—There is, perhaps, no production of the tropics which is so generally and deservedly esteemed by the people of the North as the pine-apple, yet of none have they such vague ideas as to its manner of growth. Not unfrequently have we heard it expressed as being the fruit of a tree; associating it with the cone-bearing trees of our own country. The pine-apple plant (*Ananassa sativa*) is a native of tropical America, growing wild in the forests, but is also largely cultivated in those regions, as well as to some considerable extent in the West Indies, and on the eastern continent.

It has fifteen or more long, serrated, ridged, sharp-pointed leaves springing from the root, resembling in its general aspect the century plant, but much smaller in size. In the center of this cluster of thick, succulent leaves, springs up a short stalk bearing a spike of beautiful flowers, which in time produces a single pine-apple. On the summit of the fruit is a tuft of small leaves, capable of becoming a new plant, which, together with suckers, are the means by which it is propagated, as the cultivated plant seldom produces seeds. It flourishes best in a moist and warm climate, but is able to survive a long drought and extreme heat.

There are several varieties of the pine-apple, differing in their leaves being more or less spiny on their edges, and in the shape and color of the fruit. Great care is requisite in its cultivation, otherwise it will be coarse and fibrous, with but little sweetness. Nothing can surpass the rich and delicate flavor of a pine-apple which has been properly grown, or of the wild fruit of the forest, which we always found equal, if not superior to the cultivated ones.

A word as to the manner of preparing a pine-apple for eating may not be out of place here. Let the rough exterior first be removed to a sufficient depth, and then slice the fruit longitudinally with the core, and not across the hard center, as is generally done with us. As soon should an ear of green corn be divided in sections when the kernels must be pulled from the cob, as a pine-apple across the core, instead of nicely slicing the fruit from its adherents. The deliciousness of a pine-apple when freshly picked from the plant and prepared in the above manner cannot be surpassed.

H. M. MYERS.

Orbital Motion.

MESSRS. EDITORS:—I have devised a simple addition to the gyroscope, to serve as a popular proof and illustration of the demonstrable truth, that axial motion produces orbital motion. Dr. G. M. Ramsay says (Cosmos p. 78) "the Gyroscope demonstrates that axial, tangental force becomes an orbital propelling power, but it carries the gyroscope in a reverse orbital direction;" and hence he draws the conclusion, that "if the planets had an independent, direct axial force, they would move in a retrogade orbit."

I maintain that the gyroscope itself will show his conclusion incorrect. Set it to spinning with a direct motion, and observe it when the axis deviates a little from a perpendicular. The hub describes an orbit with a direct motion, the same as the wheel moves. The inclination of the axis represents the inclination of a planet's axis to the plane of its orbit; and also the nutation of the earth's axis. And even when the axis becomes horizontal, the under side of the wheel is, in fact, the outer side of the orbit, and its orbital motion is direct, the same as before.

Thus planetary, axial, and orbital motions are well represented by the gyroscope; but more truly and plainly by my addition, which any person can readily make or get made. It consists of a metallic bar (1 foot long and $\frac{1}{16}$ inch in diameter for the small gyroscope), bent about 30° in the center, a cavity on the concave side, so as to balance on a pivot like a compass needle; a socket on one end, a weight on the other, to balance the gyroscope. Set it to spinning in this socket, and it at once produces an orbital motion around the pivot, direct or retrograde, just as you spin the gyroscope.

That this must be so appears as certain and plain as Archimedes' "Eureka." The radius vector of a planet may be regarded as a lever. The direct axial tangental force at the outer end of the planet's diameter, which coincides with the radius vector, is just equal to the tangental force at the inner end of the same, where the motion is retrograde to the orbit; but the outer tangental force having the longest leverage, the motion must be direct.

S. N. MANNING.

Kankakee, Ill.

How to Make a Perfect Boiler.

MESSRS. EDITORS:—To make a perfect boiler the following rules should be observed: First, the iron in each cylinder should be of uniform thickness and of good quality, and a templet made corresponding with the thickness of iron and size of boiler. Each plate should be marked off with a marking punch from this templet. (I do not approve of using a pencil or white lead for marking). There should be a center on the press punch to enter the mark indicated by the marking punch. This will make every hole in the boiler so perfect that a reamer will not be required. Secondly, the rings should be so laid out that by driving a pin in each of the lap holes both rings will be closely hugged together. To make good holes the punches should be largest at the end, and tapering back, with the face a little concave, so that the edges touch the plate first. When the punch becomes dull throw it in the scrap heap; it will not pay to repair or reharden it. Thirdly, all flat surfaces of boilers should be braced to sustain a pressure equal to the bursting pressure of the cylinder; the braces being in all cases straight, so as to take a direct and positive strain, fitted of the exact bevels of the plates and riveted when possible, never using pins, as they are liable to work loose; for in my opinion, this evil has caused the destruction of many boilers. Use the *best American iron*; thanks to protection, we can now produce an article equal to the best in the world. The edges of plates should be planed, not chipped, and the riveting and caulking done by experienced workmen. For working pressure Haswell's rule should be the guide, as it is more accurate than any I have ever seen. The boiler should be in charge of a *sober*, intelligent, industrious man; then there will be no fear of explosion.

As bituminous coal is now much used; would it not be economy, to say nothing of the abatement of a great nuisance, to consume the smoke? I think also that if the water was sufficiently heated to disengage impurities, and injected into a receiver, beneath the fire box, it would be attended with benefit; there would be little or no commotion, and the water would then flow into the proper channel, and leave impurities where a blow pipe would carry them off. I think both these results can be effected; let me have your opinion upon the subject.

PATRICK QUINN.

South Newmarket, N. H.

Mental Science.

MESSRS. EDITORS:—There are periods of crime, as illustrated by the homicidal epidemic prevailing throughout the country. There are also tendencies to mental and moral insanity in various degrees, from ungovernable temper to mania, and the question arises, "Should these particular tendencies absolve from responsibility either at the bar of conscience, or in the verdict of the jury?"

If such tendency be the result of indulged selfishness or intemperance of any kind, the acquittal places a premium on criminality, and the next step may be as in the East, to consider the insane not only deserving of sympathy, but under the special protection of the Almighty.

While we predict the eclipse and the revolutions of Saturn, we unfortunately know little of the wondrous system within us, and our educators would vindicate their noble profession by teaching the pupil the science of self-knowledge, to ascertain the recurring laws of emotion, controllable to a certain point, and regular (to the thoughtful) as the cycle of the seasons. Said a recent victim, "My paroxysm is coming; be careful at such an hour." Would it be impracticable to extend this idea to self-application; to watch the recurrence of internal tendencies carefully as external occasions; to realize that injury to ourselves or others from uncontrollable passion (alias insanity) comes in most cases from long continued criminal negligence, and cannot, therefore, escape the penalties of responsibility?

G. A. LEAKIN.

Baltimore, Md.

A Question for Watchmakers.

MESSRS. EDITORS:—I would be very glad to see through your excellent journal what argument pocket chronometer makers use when it is stated to them that the balance in the chronometer escapement has an unlimited motion, and in the pocket, winding, or careless handling, a valuable hair-spring may be subject to more tension than it ought to have.

I never could account for this oversight, and always wondered how it is looked at from a watchmaker's standpoint, who not unfrequently has much trouble before he can get the spring to work to his notion; and, there are springs in use in high priced pocket chronometers that could not be bought at half the price a whole movement costs, while a mere accident may destroy them.

In this matter the lever principle has the advantage over the chronometer escapement, as every one can see. Now, I do not want to find fault with the chronometer, I only want to point out the cause of hair-spring breaking, and a necessity for its prevention in expensive watches.

J. MUMA.

Hanover, Pa.

Information Wanted About Brick Making.

MESSRS. EDITORS:—I desire to learn all the improvements in brick manufacture. I manufacture bricks in this city. I use the Vervalen & Wiley machines. The main difficulty is that in this part of the South we have so much rain, during the summer months, that it prevents the bricks from drying. I understand there exists some artificial invention to dry them as it would to dry vegetables and fruits. I have an idea that it is similar to a bakers' oven. I would like to know at once, without experimenting, as I have no time to lose; and also to learn how to make the concave bricks for roofs, and fire-bricks. I wish to obtain the pamphlets of all brick manufacturers that exist at the present day. I will pay for the pamphlets, and also for the tunnel or anything else that can answer for that purpose.

JOSEPH BORRO.

Savannah, Ga.

DR. STÖLZEL gives what he considers an excellent, cheap, and durable substitute for the copper cylinder in Daniell's battery. A piece of well-polished sheet tin is immersed in a very dilute solution of a copper salt and put in connection with a weak galvanic current. After the lapse of from fifteen to eighteen hours a layer of firmly-adhering copper is deposited upon the plate, which may now be bent into the required form.

WHAT INVENTORS SAY:

We are in daily receipt of strong testimonial letters from patentees who have employed this office to secure their letters patent. We present some examples received within a few days:

MESSRS. MUNN & CO.:—It is with the greatest pleasure I inform you, that through your Agency, I this day received my letters patent all right and in good condition; and in expressing thanks to you would say, that next to having a good patentable article on which to obtain a patent, is the importance of employing those whose experience and discernment—as solicitors—enable them to "sift the wheat from the chaff," and while tenacious in giving their clients the full benefit of what rightly belongs to them, are conscientious as to the rights of others—always painstaking and reliable. Such, gentlemen, have I, on more than one occasion, found your firm to be, and for which please accept this acknowledgment.

Meantime, I remain, yours truly,

WM. A. COBB.

Orange, Mass., June 23, 1870.

MESSRS. MUNN & CO.:—It affords me much pleasure to acknowledge the receipt of the patent papers for my Lock Nut, also the duplicate specifications of the same. The success of this, your fourth effort, in securing patents for me, is an additional assurance to me that the increase of business, does not lessen your interest in the applications of those who intrust their business to your hands. If success is possible, I am satisfied that your firm is the most reliable medium to secure it. It may be of some satisfaction to you to know how my method of tying a nut stands practically. I can say that it has stood the test of nearly six months on the Reading road, and is being tested on two other roads leading from this city.

Yours respectfully, U. B. VIDAL.

Philadelphia, Pa., June 20, 1870.

MESSRS. MUNN & CO.:—Allow me to express to you my thanks for the very prompt and efficient manner in which you have successfully prosecuted my application for a patent on my Vapor Burner, which was allowed May 26th. I have already realized from it the amount of $3,000, and consider myself not only truly fortunate in that, but that in selecting you to prosecute my claims, I found those who did it so promptly and ably.

Accept my best thanks, therefore, and allow me to say that the fees I paid you were not only the best investment I ever made, but that I can earnestly recommend all the inventors of America to intrust their cases to you if they desire a certainty in having them faithfully and ably attended to.

Yours truly, THOS. MOORE.

Bloomington, Ill., June 20, 1870.

MESSRS. MUNN & CO.:—The letters patent for my Rotary Pump came duly to hand. I am highly pleased with the prompt and efficient manner in which you have conducted my business at the Patent Office, and shall take pleasure in recommending your Agency. Respectfully yours,

W. B. ALLYN.

Boston, Mass., June 27, 1870.

MESSRS. MUNN & CO.:—We are perfectly satisfied with our patent, and we must say that it is impossible to secure an invention better than you do. You have found in our invention applications we never dreamed of. You may depend upon us to praise and recommend your office.

Respectfully yours,

E. LOISEAU & C. REQUIN.

Nashville, Tenn., June 25, 1870.

MESSRS. MUNN & CO.:—Letters patent for my Projectile have just been received. I desire to thank you for the perfect and satisfactory manner in which you have prosecuted my claim to a successful issue.

Respectfully, your obedient servant,

JOHN G. BUTLER.

Philadelphia, Pa., June 22, 1870.

The White Man's Feet.

Edward E. Cheever, in the May number of *The Naturalist*, gives a most interesting paper on the "Indians of California," in which we find the following passage: "In tracking white men, they (the Indians) cannot make mistakes. The white man's foot is deformed, made so by the shape of his boots and shoes, and even when barefooted, his toes are turned inward. The Indian's foot, never having been compressed, has the toes naturally formed and straight as our fingers are, and he can even use them to hold arrows when he is making them. When he walks, therefore, each toe leaves its imprint in the dust or sand, the imprint of the little toe being as straight, perfect, and distinct as the largest."

This paragraph might be made the text for an article, and perhaps Mr. Brigham will make it one before he concludes his present series of valuable papers. We wish we knew of some plausible reason, why Indians deserve better formed feet than white people, but we do not. No doubt it is a matter of accident, rather than of choice, but so it is. And surely, the white race, with all their glorious achievements in the sciences and the arts, might easily construct boots and shoes on such models as would allow nature full play; and we believe they would if they had a proper understanding of the subject, and a higher ideal of what a glorious state physical perfection is, and the degradation of deformity. The foot is not so degraded a member of the body that we should neglect it, and it cannot grow into perfect form if pinched and cramped by bad shoes, and the sooner people know it the better. It is no excuse that it is kept so much out of sight,

for the true artist recognizes deformity, even though covered by finery and leather.

Will not our mothers who have the care of children look into this subject, and if they have been in error before, a once apply the true remedy?

ADULTERATION OF PAINTS.

BY PROFESSOR HENRY E. COLTON.

It has been said that this is an age of adulteration. This may or may not be true. When prices are high those articles whose nature permits the frauds, will be adulterated, but there is a point in the decrease of prices where adulteration cannot be done with profit, taking into view, first, the cost of the article of adulteration; second, the deterioration in the article adulterated; third, the at least constructive damage to the adulterator if detected.

Almost the only adulteration of paints is sulphate of baryta, commonly called barytes. The oxide of zinc is frequently put into white lead, but it is questionable whether it is not an improvement rather than an injury. The commercial article, "barytes," is a sulphate of the alkali baryta, which has as a base the metal barium. It is insoluble in water and the weak acids, and but sparingly soluble in the most concentrated acids. Its specific gravity is about 4·84, being the heaviest known mineral, hence its common name among miners is heavy spar.

It is chiefly produced in the State that gave us the wooden nutmegs, and goes by the cant name of "Connecticut Lead." It is abundant in Virginia, North Carolina, Missouri, Georgia, and New Jersey. The best article now produced comes from Missouri. It usually accompanies lead ore; varies in color from a milky to a clear white, and can easily be told by its great weight and crystalline structure. Its value depends upon its freedom from specks of iron, copper, or lead ore.

To prepare it for market the ore is cracked into pieces, about the size of buck shot. These are then agitated in dilute sulphuric acid to dissolve the copper and iron, then washed with water, again treated with acid, then washed repeatedly with water, dried, and ground perfectly fine. After which it passes through a number of bolting cloths, and is ready for market. Lead specks are more difficult of extraction. If not very numerous no effort is made to take them out, but if desirable to do so, the cracked ore is treated with strong hydrochloric acid, and sometimes with lime. Some manufacturers do what is called "floating," that is, after grinding the rock to flour dust it is run through a series of vats, water passing through them and constant agitation being carried on. The lighter impurities pass off, and nearly perfectly pure sulphate of baryta precipitates. The impurities of the ore other than above mentioned, are silica, carbonate of lime, and sometimes a little sulphate of strontia. The article differs very much in color and fineness as put on the market; that from St. Louis has, just now, the highest reputation, it is in fact less crystalline in structure than any other—partaking somewhat of the fibrous nature of strontia.

The present product is about 20,000 tuns per annum, but it is estimated that in 1865-6 fully 40,000 tuns were imported into and produced in the United States. At that time the price per tun ran as high as $90, now it is $35 and $40. The imported article comes from Nova Scotia, Germany, and England. The profits of its production and manufacture have been very large; but it is doubtful if it can be produced with profit for much less than $30 per tun.

We have been thus explicit with this article because of its whole product fully four-fifths enter into the adulteration of paints. Its other uses are for the adulteration of other articles, even medicines. We believe its only good use is as a substitute for white lead in enameling paper collars. As an adulteration of paints it adds to the weight and injures the quality. The paints containing it are better than whitewash just in the proportion that they have a larger percentage of lead or zinc in them. Some are the merest shams, others have 75 and 80 per cent of lead and zinc, and are proportionably valuable. Some of the latter have attained great reputation, especially when ground in a peculiarly refined oil, which contains some of the acids used in its refining. No person need be fooled by an adulterated paint. If he buys it, it is simply his own fault. If he desires cheapness more than durability and purity, he gets it. Every one knows when he buys a coat below the cost of the wool in it, and the labor on it, that he is getting shoddy. Metal lead, for instance, is 8 cents per pound (gold); white lead then would likely be about 12 cents per pound (currency) ground in oil. Hence, if a man buys a paint at 8 cents, he should have sense enough to know he does not get a pure white lead. It is further the custom of manufacturers never to put their names with the words "Warranted Pure," on adulterated brands. The latter or the former may be on, but never both together. Besides, no respectable firm ever sells a customer an adulterated paint if he asks for the pure and is willing to pay its price.

HOW CAN THE ADULTERATION BE DETECTED.

In a late statement of how to analyze white lead in oil, published in the SCIENTIFIC AMERICAN, it was recommended to dissolve out the oil with spirits of turpentine. This is next to an impossibility, as that article is not sufficiently volatile, has itself somewhat of an oily nature, and some of the particles of the pigment will remain coated with oil and not dissolve in the after process, hence creating an idea of impurity when the paint may be actually pure. Our experience has been large, and we prefer bisulphide of carbon to all other solvents of oil. It evaporates freely, takes less of it to do the work, and leaves the pigment cleaner; nearly as good is high gravity gasoline, say 80°. It is our custom to agitate the paint in the liquid, allow it to settle and draw off. Place the pigment on a funnel, filter, and triturate again and again with the solvent. Then dry the pigment on a sand bath, wash with water and re-dry. Any one can easily tell from its looks and feel if he has extracted all the oil. Perfect dryness and perfect freedom from oil is absolutely necessary. Dissolve the dry pigment thus obtained in dilute nitric acid. Strong nitric acid will not dissolve white lead, it must be diluted with four or five times its volume in water, perhaps more. The operation is accompanied with the evolution of carbonic acid gas. If all is dissolved it is pure lead or zinc—either oxides or carbonates. If there is residuum after repeated trials, with more or less dilute acid, it shows presence of an adulteration—most likely barytes, perhaps sulphate of lead. Take this and boil in hydrochloric acid, if it dissolves it is not barytes. If dissolved, pour into the solution a little hydro-sulphuret of ammonium, a black precipitate shows that you have sulphate of lead. If there is no precipitate, put in a little dissolved oxalic acid; a white precipitate shows lime. The sulphate of lead is seldom or never used as an adulterant in this country, the sulphate of lime never in paint. For zinc, pour into the nitric acid solution sulphuric acid, the lead will precipitate as sulphate; then into the liquid pour a little hydro-sulphuret of ammonium, a white precipitate will show zinc. There is, however, in the market a pigment containing a sulphate of lead, not crystalline in structure, and perfectly soluble in dilute acids. It is made by sublimation.

Whiting and terra alba are seldom or never used as an adulterant for any white paint. They are two light and turn dark in oil. Some colors, however, have terra alba as a base. The process indicated, if conducted with care, will give a perfect result. The main point is to get the oil out entirely; and with all due respect we assure our friends of the SCIENTIFIC AMERICAN that it cannot be done with spirits of turpentine.

There is just now coming into practice another species of adulteration which for worthlessness bids fair to eclipse the baryta paints. This is the use of water instead of the full quantity of oil or spirits of turpentine. A paint is valuable and durable just as it has the proper quantity of pure oil in it. This new adulteration is thus accomplished: The soluble salts of the metals and alkalies disolved in water and mixed with oil form a sort of soap, add to this a pigment and it will mix and be held in solution. Small quantities of spirits of turpentine or benzine are added. To such an extent can this be carried that in some of the paint sold "Mixed ready for use," fully one-half is water. Their worthlessness for work exposed to the weather is evident. There are paints thus sold, however, which are properly mixed.

[Notwithstanding our correspondent's criticism, we insist that very good results may be obtained by proceeding as we directed in the article to which he refers. He seems to have overlooked the subsequent washing with alcohol, after the spirits of turpentine have been used to remove the bulk of the oil. Alcohol dissolves both linseed oil and turpentine, and by its use the solid substances contained in the mixture may be rendered sufficiently clear for subsequent treatment, if the oil is pure linseed, as we can vouch from experience. If the linseed oil used is adulterated with fish oil, rape-seed or cotton-seed oil, other solvents must of course be used. In that case ether or the solvents he names are better. The bisulphide of carbon, or ether, is not, however, available to painters generally. Benzine and gasoline are, however, good solvents, and may be advantageously substituted for the turpentine. Turpentine and alcohol are, however, to be found in all painters' shops. If the alcohol be heated to boiling, it will be more effective than when used cold, and less will be required. —EDS.

SIRUPS FOR SODA WATER.

SIMPLE SIRUP.—Take of white sugar, 14 lbs. (com.); water, 1 gal. Dissolve with the aid of a gentle heat, strain, and when cold add the whites of two eggs, previously rubbed with a portion of the sirup, and mix thoroughly by agitation. (The egg albumen is added to produce froth).

LEMON SIRUP.—Take of oil of lemon, 25 drops; citric acid, 10 drachms; simple sirup, 1 gal. Rub the oil of lemon with the acid, add a small portion of sirup, and mix.

ORANGE SIRUP.—Take of oil of orange, 30 drops; tartaric acid, 4 drachms; simple sirup, 1 gal. Mix as above.

VANILLA SIRUP.—Take of fld. ext. vanilla, 1 ounce; citric acid ½ ounce; simple sirup, 1 gal. Rub the acid with a portion of sirup, add ext. vanilla, and mix.

GINGER SIRUP.—Take of tinc. ginger, 4 ounces; white sugar, 7 pounds (com.); water, ½ gal. Heat the sugar and water until the sugar is dissolved, raise to the boiling point, then gradually add the tinct. ginger, stirring briskly after each addition.

SIRUP SARSAPARILLA.—Take of simple sirup, 1 gal.; comp. syr. sarsap. *ad lib.*; powd. ext. licorice, 1 ounce; oil sassafras, oil wintergreen, aa, 15 drops; oil anise, 10 drops. Rub the oils with powdered licorice, add a portion of sirup, rub smoothly, and mix the whole together by agitation.

ORGEAT SIRUP.—Take of cream sirup, ½ pint; vanilla sirup, 1 pint; simple sirup, ½ pint; oil bitter almonds, 5 drops. Mix.

COFFEE SIRUP.—Take of ground, roasted coffee, 4 ounces; boiling water, 2 pints; sugar, 4 pounds (com.). Infuse the coffee in the water until cold, strain, add the sugar, and make a sirup.

STRAWBERRY SIRUP.—Take of fresh, ripe strawberries, 10 quarts; white sugar, 24 lbs.; water, ½ gal. Spread a portion of the sugar over the fruit, in layers, let it stand four or five hours, express the juice, strain, washing out the marc with water; add remainder of sugar and water, raise to the boiling point, and strain.

SIRUP OF RASPBERRY.—Proceed as for strawberry sirup.

PINE-APPLE SIRUP.—Take of ripe pine-apples, No. 2 or 3; white sugar 16 lbs. water, q. s. Cut the fruit in thin slices, spread sugar over them, let stand 12 hours. Pour off juice and sugar, and set aside. Express the fruit, adding a little water. Then take water, q. s., to make, with the above liquid (juice and sugar), 1 gal. Form a sirup with the sugar and water, and boil the pieces of the fruit already expressed. When the sirup is nearly completed add the fluid and boil a few minutes, to clarify. Remove scum, and strain. These three fruit sirups should be bottled when warm, corked tightly, and when wanted for use add equal parts of the fruit sirup and simple sirup. They will keep a year without change.

NECTAR SIRUP.—Take of vanilla sirup, 5 pints; pine-apple sirup, 1 pint; strawberry or raspberry, 2 pints. Mix.

CREAM SIRUP.—Take of fresh cream, ½ pint; fresh milk, ½ pint; powdered sugar, 1 lb. Mix by shaking. Keep in a cool place. The addition of one half drachm bicarb. soda to this sirup will prevent rapid change.

Editorial Summary.

MIGRATION OF FABLES.—Professor Max Müller, LL.D., recently lectured at the Royal Institution on "The Migration of Fables." He narrated how the proverb, "Do not count your chickens before they are hatched" is founded on a fable, and he traced this fable back through many of the literatures of Europe and Asia, and through some of the ancient books of Persia, to the "Panka Tantra," an ancient Sanscrit book, rich in fables. In the course of this lecture, he told how "St. John of Damascus" was in reality an individual who held high office at the court of the Khalif Almansur. He also told how Buddha in the course of time became transformed into St. Josephat, and under that name was made a saint in the Romish Church. This announcement was recived with much laughter by the listeners, but Professor Müller added that, if Buddha actually lived the kind of life he is narrated to have done, no man ever better deserved to be made a saint by his fellow creatures.

ICICLES IN THE CELLS OF PLANTS.—At a meeting of the Academy of Sciences of Paris, on 21st February, M. Prillieux sent in an interesting paper on the congelation of plants. He has established the existence normally of large icicles in the interior of all frozen plants. These icicles form small columns, perpendicular to the surface, and often penetrating the epidermis. The ice is formed from liquids derived from the cells. The cells themselves remain intact, so that there is no destruction, but simply a separation of organs, and therefore what has been said concerning the death of plants by freezing goes for nothing.

So enormous are the losses of the Austrian Government from the frauds of the stamp washers, who collect old stamps and clean and sell them for new, that the Government finds it economy to furnish stamped envelopes free to the public except the usual postage duty.

In this country the envelope makers, who are anxious to raise the prices of envelopes, are whining for protection, and they want the Government to stop the sale of stamped envelopes. But if any change is to be made the people will prefer the Austrian plan.

A NEW PHOTOMETER.—A photometer, invented by M. Nagant, is based upon the formation of a column of liquid, partially opaque, which may be drawn out until the length is such that the light from an illuminating body ceases to be visible through the liquid. The length of the column, which completely obscures the light, starting from the point where the column is thinnest, gives a measure of the intensity of the light under examination.

THE following results from an extended series of experiments by W. Casselman, in order to determine the effect of boiling saline and other solutions upon glass and porcelain vessels, may be found useful: Water and acids hardly, if at all, act upon good porcelain vessels; the fixed alkalies attack porcelain, but less than they do glass, which is far more readily acted upon by the substances alluded to as well as by saline solutions.

CHINA appears to be overcoming the peculiar superstition which for ages has prevented the development of her vast mineral wealth. Permission has been given to open up the coal miles at Nanking and Kinthaing where coal of a superior quality is obtainable. Good specimens of coal have also been found at San-ti, some two hundred miles above Hankow.

PERFUMED CARBOLIC ACID.—It is said an article of this kind has been recently introduced in England, used for the handkerchief and as a dentifrice, for which latter purpose it is said to be excellent, as it prevents decay from its antiseptic qualities. This is a hint from which American perfumers may perhaps profit.

GEORGIA STATE FAIR.—The premium list of the State Agricultural Society of Georgia has been sent us. The Society will hold its Fair at Atlanta, beginning on Wednesday, October 19th, and closing on the 26th. The Assistant Secretary is Mr. Thomas C. Howard, of Atlanta, who may be addressed by parties interested.

EXIT MACFIE.—The *Mechanics' Magazine* says that Mr. Macfie's book on the "Abolition of Patents" can be had at 1s. each, that gentleman having so many on hand he is desirous of disposing of them at a nominal price. They were originally published at 5s.

THE DARIEN EXPEDITION.—It is announced that the exploration of the routes for the proposed Darien Canal, known as the Caledonia and San Blas, have been found impracticable for such a work, and that the survey has been abandoned, at least for the present season.

Improved Planer for Blind Slats.

Our engraving is an illustration of a very compact, well-constructed, and effective machine for planing the slats of window-blinds, which possesses several advantages of sufficient importance to merit the attention of manufacturers.

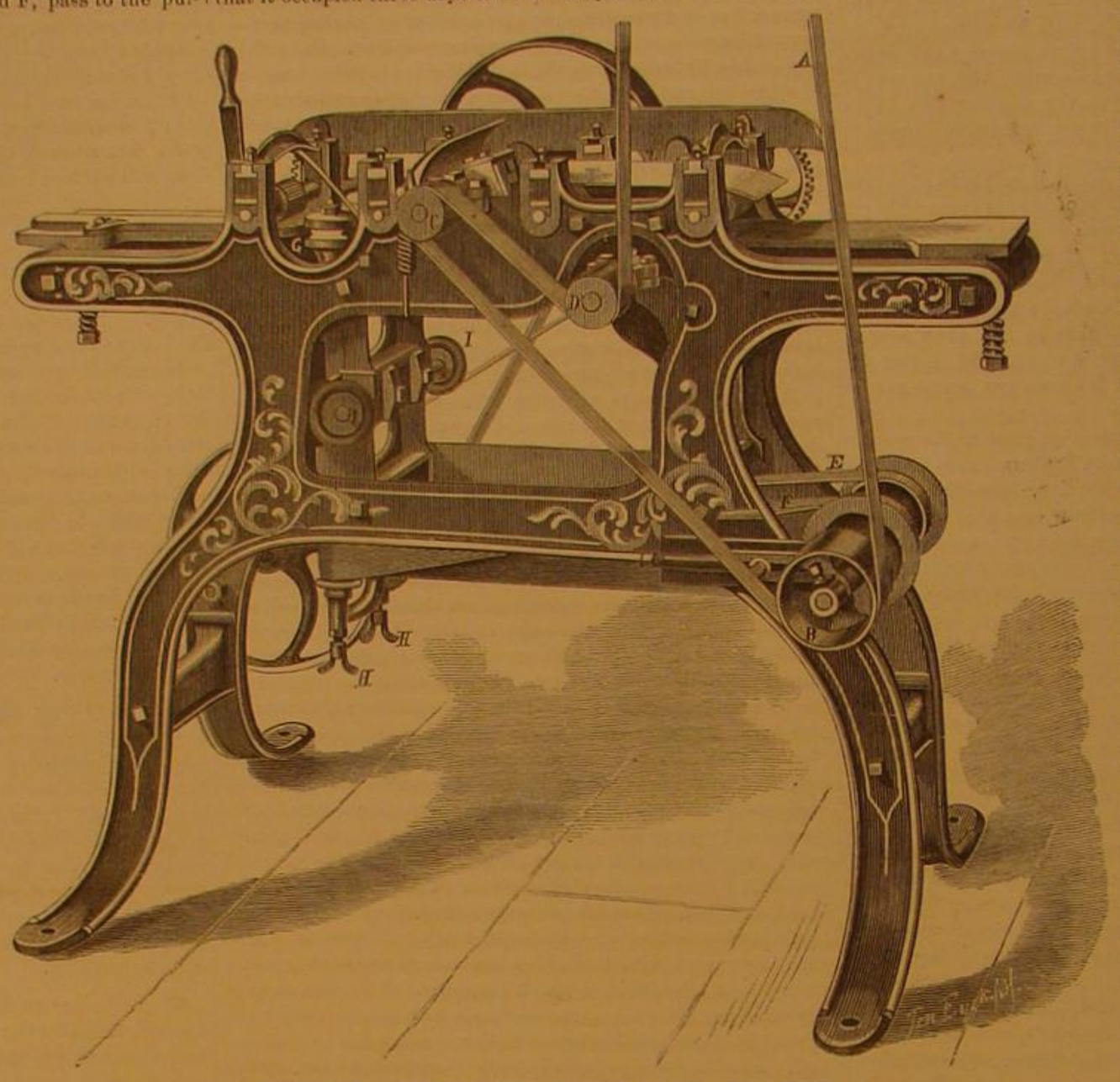
A is the main belt which, passing over the pulley, B, also passes over and drives the pulleys, C and D, on the upper and under cutter-head shafts. The pulley, B, drives a shaft with pulleys from which the belts, E and F, pass to the pulleys on the vertical arbors of the side-cutter heads, G. The special advantages obtained in the machine are the result of the perfect adjustability of all the parts to varying thicknesses and widths of the slats to be planed.

The edge-cutters, G, are adjustable both vertically and laterally; vertically by means of the thumb screws, H, and laterally by screws impelled by the hand wheels, I. The screws, H, raise the frame which carries the side cutters, G, so that these cutters move up and down together. Each of the hand wheels, I, works an independent screw shaft which moves the entire cutter-head arbor next it laterally and parallel to the other.

The hight of the table is adjusted by thumb-screws under the table, not shown in the engraving, but perfectly convenient of access. The under cutter-head maintains its relative position to the table during the adjustment. The frame which carries the under cutter-head can be removed for sharpening the cutters, and replaced by turning a single screw.

All the necessary adjustments can be made while the machine is running, which is a great convenience over other machines for the same purpose. The right hand edge-cutter being once adjusted to the gages, the width of slat is then governed by setting the left hand cutter out or in. The workmanship on this machine is of superior quality and will please the taste of those who admire good work, and the claims of the inventor as to its advantages will be found to be entirely within bounds.

Address for rights or machines, C. P. S. Wardwell, patentee and manufacturer, Lake Village, N. H.



WARDWELL'S IMPROVED BLIND-SLAT PLANER.

Improvement in Manufacturing Counters for Boots and Shoes.

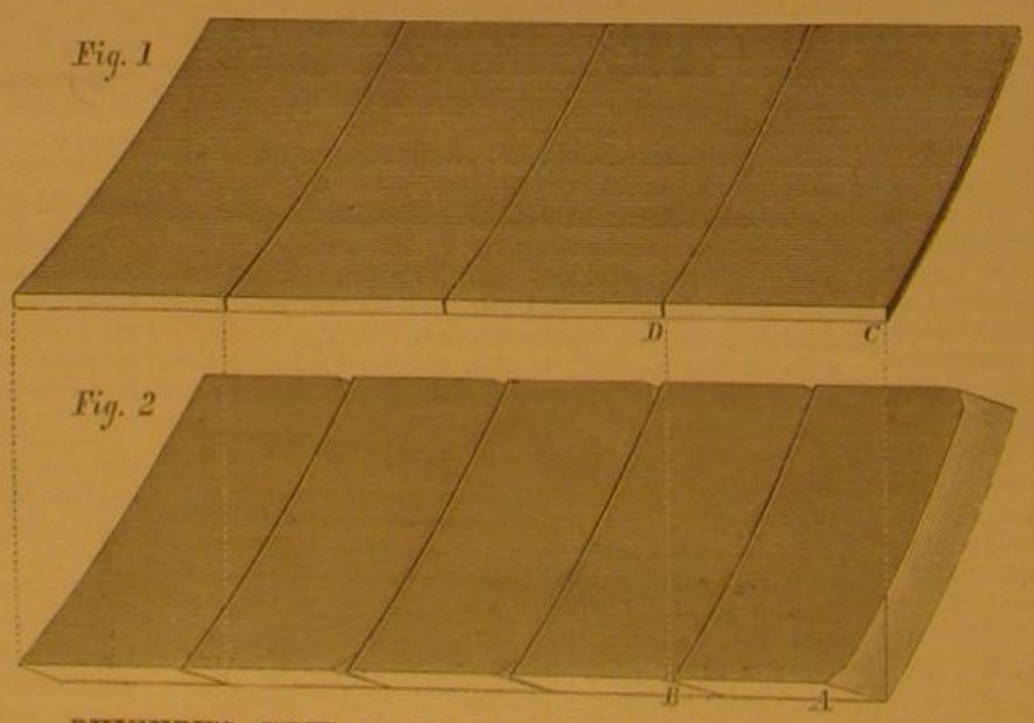
We regard this invention, simple as it is, as one of great merit. By its use a given amount of leather will cut twenty-five per cent more counters than in the old style of cutting. Twenty-five per cent of the cost of all the leather used for this purpose in the United States, in a single year, is a fortune in itself, as any one may convince himself by a simple calculation.

The old method of cutting these counters is represented in Fig. 1; the leather being cut square and afterwards scarfed off with the knife; the portions thus scarfed off being wasted; *or*, if afterwards utilized in some of the ways in which leather cuttings are worked up, their value is small compared with the first cost of the leather.

Fig. 2 represents the new method by which the counters are uniformly cut and scarfed off in a single operation; and, as will be seen in a comparison of the two methods, a gain of one counter in every four cut by the old method is accomplished.

The cutting instead of being done vertically to the surface of the leather, is done obliquely to it, as shown; thereby scarfing off an edge of two counters at once, and only requiring a width of leather of the full thickness shown between A and B, Fig. 2, whereas in the old method a proportional width, as shown between C and D, Fig. 1, was required.

In this cutting the proper curvature is given to the counter, and it is ready for use without further preparation.



PHINNEY'S NEW MODE OF CUTTING BOOT COUNTERS.

This invention was patented, through the Scientific American Patent Agency, February 9, 1869, by S. C. Phinney, assignor to himself and John G. Phinney, Stoughton, Massachusetts. Address S. C. & J. G. Phinney, as above.

Moving a Wind-Mill Sixteen Miles.

A novel experiment, not quite so sensational as the moving of an hotel at Chicago, but yet something quite out of the ordinary way, has been the removal of a wind flour-mill, with all its fittings, from Westacre to Clenchwarton, Norfolk, England, a distance of about sixteen miles. The mill was a wooden structure, standing upon wheels. Having been purchased by a man living at Clenchwarton, he determined to endeavor to draw it along the road by a traction engine, but all efforts to find one strong enough proved ineffectual; the application, however, of a powerful steam cultivation engine proved more successful. In passing along the route various expedients had to be tried, such as in ascending a hill the engine proceeded to the summit, and then pulled the mill up with a chain, and so carefully had the task to be performed, that it occupied three days to make the journey. In crossing the Great Eastern Railway at Walton the telegraph wires were broken. In attempting to cross the Ouse it was feared the celebrated long bridge would not be strong enough to bear the enormous weight, but the engine having first passed over, the mill itself was drawn over, the timbers of the bridge in the meantime creaking, and showing that a severe test was being put upon it.

Machines Wanted at the South.

We are almost daily in receipt of letters from Southern subscribers asking us to recommend the best machines in almost all departments of the arts. We now have on our table letters inquiring for machines to turn and mortise hubs, spokes, etc.; machines to bend fellies; scroll saws; cutting chair bottoms; turning bedposts; machines for separating grass-seed from rice, etc. Advertisers would do well to avail themselves of our large Southern circulation to place this information before those who wish to purchase.

HONORS TO WORKMEN IN FRANCE.—The Emperor of the French having nominated one of the leading pianoforte makers a Chevalier of the Legion of Honor, the workmen of the principal manufactories have sent a deputation to the Minister of Fine Arts to thank him and the Emperor for the honor thus conferred upon one of their members.

Supplying Water to Railway Trains.

Some time since we illustrated and described an English apparatus for supplying water to locomotives while in motion. The plan has now been introduced into this country, and has been experimented upon the Hudson River Railroad with success. At Montrose Station, near Peekskill, there was constructed in the center of the track a trough, 1,200 feet in length, fifteen inches in depth, and eighteen inches wide. This was lined with sheet-iron, heavily painted. The trough is perfectly straight, will hold 16,000 gallons of water, and is fed by a couple of springs to the north and east of it.

About the same time that the construction of the trough was commenced, locomotive No. 43 was taken to the repair-shop. Here, in a quiet manner, skillful workmen in a short time fitted her out with ingeniously constructed machinery, connected with her tender, to draw the water from the trough. From the man-hole in the tender, down through the latter to a position inside of the hind trucks, runs an ingeniously-formed pipe. The pipe curls as it leaves the man-hole, and after forming a half-circle, is fitted with a nozzle at its end, which always points the way the engine is going. An iron bar is fastened to the nozzle, which connects with another bar from a point near the fireman's box. When the locomotive approaches the trough, the nozzle can be dropped instantaneously into the water, while the train is running thirty miles an hour. The nozzle sinks only to the depth of two inches into the trough, yet when the 1,200 feet are passed over, 1,634 gallons of water will have been drawn into the tender.

The first experiments in taking water by this new method were made a few days ago. The locomotive dashed over the rails at the rate of thirty-five miles an hour. As the nozzle struck the water the fluid rushed into the tender with the roar of a young Niagara, and when the trough was left behind, the tender was full. The experiment was a great success, and gave complete satisfaction to the officers of the Hudson River Railroad Company.

It is next proposed to locate a trough between Hudson and Catskill, and at points on the Central and Western connections, so that in time trains may be run through from New York to Chicago in twenty-four or twenty-six hours.

Chinese Gold-Lacker.

The gold-lacker lining of a Chinese cabinet in the Museum at Cassel pealed off, and thus gave Dr. Wiederhold the opportunity of studying the composition of this substance. On examining it he found particles of tin foil attached to the lacker, so he comes to the conclusion that this material formed the ground upon which the lacker varnish was laid. His attempts to imitate the varnish were perfectly successful, and he gives the following directions for the preparation of a composition which closely resembles the true Chinese article. First of all, two parts of copal and one of shellac are to be melted together to form a perfectly fluid mixture, then two parts of good boiled oil, made hot, are to be added; the vessel is then to be removed from the fire, and ten parts of oil of turpentine are to be gradually added. To give color, the addition is made of solution in turpentine of gum gutta for yellow, and dragon's blood for red. These are to be mixed in sufficient quantity to give the shade desired.

Polytechnic College of Pa. Commencement.

The Polytechnic College of Pa. held its seventeenth annual commencement June 29, at the Academy of Music, in Philadelphia. A large and brilliant audience was present. The Germania Orchestra supplied the music. Hon. John P. Verres, in the absence of Governor Geary, presided. Rev. Dr. Davidson, formerly president of Transylvania University, Kentucky, opened the exercises with prayer. Addresses were delivered by Samuel C. Perkins, Esq., and Dr. A. L. Kennedy, president of the faculty. We are glad to learn that this institution is in a flourishing condition, and is doing a good work in the cause of technical education in this country.

PLANTS are the accumulators of the power which man and animals distribute and disperse.—*Picsse.*

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE PROGRESS OF CHEMISTRY IN 1870.

Although there have been no startling discoveries since the 1st of January, 1870, still chemistry has held even pace with all other sciences; and we have been called upon from time to time to record numerous improvements in the methods of manufacture of various articles, and in the new application of well-known compounds.

The uses of oxygen gas have been greatly extended since its cheap manufacture, and we hear of it as an important remedy in disease, as a powerful agent in the production of great heat, as a source of light, and it can now be purchased the same as any common agent employed by chemists.

The recent improvment in the preparation of hydrogen bids fair to become an important step in the manufacture of illuminating gas, as it can be converted into carbureted hydrogen very cheaply, when it will burn with a highly illuminating flame, thus affording a cheaper and purer light than has hitherto been known. The simultaneous discovery of the cheap and ready preparation of oxygen and hydrogen opens the way to many uses of those gases hitherto considered impossible on account of the expense attending their manufacture; and the study and development of this new industry must be assigned to the first half of this year. Hitherto, in speaking of hydrogen, we have been in the habit of assigning very few uses to it. That it would lift balloons on account of its levity has long been known, but its application in medicine is a novelty of which, now that we are likely to have the gas in any quantity, we shall probably hear much more. When breathed in large quantities it proves fatal, but in proper proportions it acts as an hypnotic, and we may hear of it hereafter as a rival to the hydrate of chloral in cases of sleeplessness.

Further uses of hydrogen in conjunction with oxygen for the fusion of the most refractory metals is no novelty, and has long been anticipated as a probable and desirable consummation. The practical application of the condensation of gases for the production of cold is a result that has been attained this year more than in any other former period. The fact of the possible compression of gases into liquids was long ago ascertained by Faraday, and feeble attempts were made a few years since to apply it for the production of cold, but it was not until recently that these experiments proved successful. There now appears to be no doubt that the liquefaction of gases is the true method upon which to found the artificial production of ice on a commercial scale; and we shall be glad to record the success of any mechanical contrivance that shall accomplish all that science pronounces as entirely practicable in this direction. The chemistry of the question has been fully worked out, and what remains to be done is a similar solution of the mechanical part of the problem.

During the present year we have recorded unusual progress in the art of photography, especially in the rapidity of printing, and the permanency of the pictures. The Albertype offers a method by which a thousand prints can be taken in a day, with durable ink, and in colors according to the natural appearance of the objects, where these colors are such that they can be introduced with the ink. The Albertype and the Woodburytype are among the most important improvements of the present day, and offer encouragement that a rapid method for the production of photographic prints has now been attained. Photographing natural colors has made very little progress during the last six months, and it appears doubtful if we shall ever be able to accomplish this desirable result.

In the manufacture of glass we have to mention the use of salts of baryta, of fluor spar, of salts of thallium, for optical purposes, and in general a very satisfactory progress.

Platinized mirrors have been introduced, and appear to give satisfaction for various purposes; but the manufacture has hardly reached such proportions as to enable us to pronounce with absolute certainty upon the success of the method. Silver mirrors, which at one time were urgently pushed as a cheap and most desirable invention, have by no means displaced the quicksilver mirror so long in vogue; and there would appear to be some practical difficulties in the way of the universal substitution of silver for mercury. From a sanitary point of view it is a misfortune that silver cannot take the place of mercury, as the latter is exceedingly poisonous to the workmen; and it was chiefly from this humanitarian consideration that Liebig took up the investigation and devised cheap and ready methods for silvering glass.

The uses of manganese have largely increased during the present year, and new and important industries appear likely to be founded upon recent discoveries of the cheap preparation of the permanganates and the metal. It is now well known that Tessié du Motay's method for the manufacture of oxygen gas is founded upon the use of the oxide of manganese and soda.

The ready way of making the manganate of soda has suggested the use of that salt for many purposes, and by degrees the permanganate has been introduced and applied as a disinfectant and for bleaching; it is for the latter purpose that the permanganates of lime and potash appear destined to become conspicuous. Disinfecting and bleaching are essentially founded on the same chemical process; for the former only small quantities of material are required, while for the latter the demand was much beyond the possibility of the supply. It has now been proved that the permanganates are among the best bleaching agents we have, and the past few months have shown the possibility of supplying them cheaply and in any quantity. No chemical progress of recent date is of more importance than this application of permanganic acid as a disinfecting and bleaching agent.

We have also to note the use of metallic manganese in combination with copper. Cupro-manganese is a white alloy closely resembling German silver, and possessing many of the valuable properties of the older alloy. It can be substituted for German silver in plated ware, and is now manufactured and successfully applied in Connecticut. There was formerly an insurmountable obstacle in the way of the use of manganese, and that was the production of the necessary heat to fuse it. This difficulty has now been overcome by the use of Siemen's furnace, and the alloy of copper and manganese is readily accomplished. We shall probably hear of its introduction as a substitute for the much more expensive alloy of nickel, and can now anticipate the manufacture of manganese steel more largely than ever before.

The progress in the economical use of products that were formerly wasted, has been satisfactory during the past six months. Earth closets have become better known, and by degrees we shall not only avoid the waste attending upon the old system, but also the frequent diseases and discomfort that custom has fastened upon us. The waste of coal-tar products is fast disappearing, and as we have recently had occasion to remark, so great has been the progress of discovery in the new application of the liquid and solid products of the distillation of coal that we may expect to see retorts erected for the purpose of producing them, rather than for the manufacture of gas. Gas will become an incidental product, while the object sought will be the tar from which to make aniline colors, and anthracene from which to manufacture alizarine and artificial madder dyes.

The manufacture and use of the hydrate of chloral, although not started this year, may be properly said to belong to it, as it has received its chief development within the last six months. This medicine may be pronounced the most valuable contribution of chemistry to *materia medica* that has been made for a long time.

The progress made in the uses of glycerin is worthy of note, and in nothing was it more unexpected than in the preparation of elastic sponge. By this recent improvement we have refuse sponge rendered available for mattresses, cushions, and other purposes. The use of glycerin in wine and beer, and for the preservation of animal substances from decay, and in medicine, is also worthy of note.

We cannot enumerate in detail each particular discovery, but have said enough to show that the recent progress of chemistry has been entirely satisfactory, and quite up to the precedents of the past few years.

STEAM ROAD ROLLING.

This method of consolidating roads, which, as our reader, are well aware, has been for the last two years under trial, both abroad and in America, seems to be entirely successful. So far as its results can be ascertained here they seem to warrant the belief that this system is destined not only to be adopted in cities but also upon rural highways, turnpikes, etc.

From abroad, we gather most encouraging accounts of the progress and results of the system in various cities of France and England. From the *Building News* we learn that Mr. Heaton, of Birmingham, calculates that an annual saving of $28,500 to that town would be effected by the use of the steam roller; the present annual expenditure for road material alone amounting to as much as $65,000. Though hesitating to assign a precise figure to the amount of saving effected by road rolling, Mr. Newlands, the Liverpool borough engineer, wrote in October, 1867, with regard to Messrs. Aveling and Porter's 30-tun roller: "Our roads are in much better order, and easier kept clean, than before its use, and our bills for macadam are not so heavy."

Mr. Newlands expects, however, that "the saving in macadam by every coating being at once consolidated will be very great, though he cannot at present put a value upon it." During the last two years, Mr. Samuel F. Holmes, the borough surveyor of Sheffield, has "used a steam road roller made by Messrs. Aveling and Porter." He finds "the saving in the cost of macadamized roads to be even greater than when rolled with a horse-roller," but he is "not yet in a position to give exact figures." He has no doubt it will increase the saving "at least 40 per cent over unrolled roads." Mr. Edward Buckham, the borough surveyor of Maidstone, writes as to the steam rolling carried out there in March, 1868, with a 15-tun Aveling and Porter roller, that "the results obtained from using the roller are economy, durability, comfort, and uniformity of section of road." Mr. Buckham considers that the constant use of a steam road roller would effect an economy in road maintenance of "at least" 20 per cent.

These are only specimens of like testimony received from London and many other places in England, and from Paris in France. The New York Central Park Commissioners have used a heavy steam roller of Aveling and Porter's make, imported for the purpose, with great success.

On Fourth avenue, Brooklyn, a most beautiful drive has been made by this process.

While the results named are highly satisfactory, we are constrained to say that in our opinion *the* steam road roller which shall be beyond question adapted to universal use on all sorts of road beds is not built. Perhaps the different nature of the materials used in road making will render it impossible to construct a roller which shall be equally adapted to all. We think this highly probable; but if so there is certainly room for the profitable employment of inventive talent in the construction of this class of machines. It has been only within a week that the proprietor of a valuable patent paving material has made inquiry at our office for something lighter, more rapid and portable than anything of the kind now in market.

We believe that the system might be extended to American country roads with great profit, provided some inventor would hit upon the right thing to do the work.

GAS AS FUEL.

It is scarcely necessary to preface what we are about to say with any remarks about the numerous family of gas-stoves for the consumption of and generation of heat from the combustion of ordinary illuminating gas. Those already introduced into market are answering a good purpose, and are both economical and convenient for many domestic purposes. We should, however, certainly fail in judgment and sagacity did we not fully comprehend the fact that the use of gas as fuel is in its infancy, and that it is destined to a far more extended application than at present obtains.

When, however, we use the term gas, we mean much more than illuminating gas; we mean all gases which by their chemical combination are capable of developing intense heat.

The old idea of separating water into its elements to reunite them and employ them as heat producing agents is perhaps no chimera. It is true that the heat thus developed will only be the equivalent of the force employed to effect the separation; and unless some natural force be by future discovery rendered available by conversion to produce the separation, no gain will result.

But recent advances in chemical discovery indicate that hydrogen as well as oxygen will eventually be obtained at so cheap a cost that they may find extensive application for heating as well as for illuminating purposes.

Be this as it may, its further discussion is foreign to the purpose of the present article, which is to institute some comparison between the relative economy of common illuminating gas and coal as combustibles for ordinary domestic purposes.

The comparison of the relative values of these materials as heat-producing agents would become extremely complicated were we to consider, in making it, all the compounds which enter into their composition. We shall find it, however, sufficiently accurate for our purpose, to consider the chief constituents of illuminating gas. These are carbon and hydrogen. To determine approximately the proportions of these elements contained in the best quality of illuminating gas, we shall take the results of the experiments of Peclet, who gives as the mean result of investigations upon the composition of coal the following:

In one thousand parts, carbon, 812 parts; hydrogen, 48 parts; oxygen, 54 parts; nitrogen and sulphur, 31 parts; ashes, 55 parts. From an analysis of eight kinds of coals, by Dr. Fyfe, we find an average of coke after distillation to be 1,254 lbs. per tun.

From Peclet's analysis we find there are on an average 1,624 lbs. of carbon in a tun of 2,000 lbs. and 96 lbs. of hydrogen. The coke (carbon), on the average being 1,254 lbs. after distillation, leaves an average of 370 lbs. of carbon converted into gas, which, added to the weight of hydrogen, makes 466 lbs. of gas as an average yield from 2,000 lbs. of coal; 27 lbs. more than an average of the weight of gas obtained from seven kinds of cannel coals by Wright. The heating power of 466 lbs. of gas, composed as above, is according to Dulong.

Carbon.....	370 × 12,906 =	4,775,220	Heat Units.
Hydrogen....	96 × 62,535 =	6,003,360	Heat Units.
Totals....	466 lbs.	10,778,580.	Heat Units.

This is all the heat that can be obtained from the gas pro

duced from a tun of coal. An average specific gravity of gas obtained from eight varieties of coal (Fyfe) is 0·629, air being 1. A cubic foot of air may be estimated as weighing 527 grains, nearly enough for our purpose, from which we compute the volume of gas corresponding to 466 lbs. as being 9,839 cubic feet. This amount is considerably lower than the best coals will produce. The cost of this gas in New York would be $3·50 per thousand cubic feet, or $34·44 for 9,839 cubic feet.

The heat developed by the combustion of an average tun (2,000 lbs.) of coal, as determined by experiments upon seventeen varieties, made by Playfair and De la Bèche, is 26,088,000 H. U., or about two and one half times the amount produced from the combustion of the gas that can be distilled from it.

It is quite evident, therefore, that if the heat be as completely utilized in the one case as in the other, that gas cannot compare in economy with coal. The heat from the combustion of gas is without doubt utilized more fully than that of coal; but, admitting that its percentage of utilization is twice, or even three times as great as that of coal, the latter would appear the cheaper fuel, at present prices, if we fail to take into account another consideration which greatly tends to reduce this disparity in cost. In coal fires, considerable expenditure of fuel is required before a degree of heat is obtained sufficient for cooking or other domestic operations; and after these operations are completed, still more is expended before the fire is extinguished, both of which expenditures are a total loss in warm weather.

With gas, however, the maximum heat is at once obtained and all expenditure may cease at once when the fire ceases to be required. This obviates the necessity of keeping fires up in the intervals between their employment. In this way large savings are made, so that even in point of economy gas may compete with coal during warm weather, while in convenience it is infinitely superior.

Thus the use of gas for minor culinary operations, heating sad-irons, etc., in the kitchen and laundry, and its application to light metallurgic and other operations in the laboratory, are constantly becoming more popular and extended; but it must be obvious that its application to the generation of steam for motive power, as has been proposed, cannot be economical, even were its price reduced to one dollar per thousand feet.

In a paper recently read before the British Association of Gas Managers by Mr. G. Goddard, he strongly urges this application, and describes an invention designed to effect the generation of steam by the combustion of gas.

The invention consists of a vertical tubular boiler, so constructed as to possess great power of generating steam, but of very small dimensions; the tubes are not more than one inch bore, and are placed very close to each other, so that an enormous heating surface is obtained; beneath the tubes on a revolving plate are a number of atmospheric burners, each supplied with a cock so that the heating power is completely under control and can be increased or diminished at pleasure, as more or less power may be required.

We have but to take the statements of Mr. Goddard to verify our opinions as to the cost of this application. He gives as the average consumption of gas per horse-power per hour, in the boiler described, 100 cubic feet. This in New York would cost for one horse-power per day of ten hours exactly $3·50. Allowing ten pounds per horse-power per hour of coal, with coal at eight dollars per tun, the same power would cost, if coal were used to produce it, only forty cents. The convenience of gas must be very great to compensate for such an increase of cost.

In a subsequent article we shall endeavor to point out some defects, and suggest some improvements in gas furnaces and stoves for domestic use.

HYDROPHOBIA AND DOG MUZZLING.

The hot weather is again upon us, and the newspapers considering it to be in season, begin to dilate upon the immense dangers of hydrophobia, and the importance of muzzling dogs. City authorities are also announcing their determination to extinguish the vital spark of heavenly flame in the bosoms of all such of the canine race as shall appear on the streets without muzzles. Nervous people are working themselves up into a state of trepidation for fear they shall be bitten.

We recently heard it proposed by an elderly, respectable-looking gentleman on board a ferry boat, to lynch even a good-natured dog who sat lolling through the meshes of a wire basket which decorated his broad nose. We are glad to say the proposition was rejected with scorn and disgust, and the respectable gentleman in the fear that the said dog—that looked as though he could not be coaxed to bite anything more animated than a well buttered beefsteak—would immediately spring at his throat, left the cabin amid the derisive laughter of his fellow passengers.

This foolish fear is very far removed from wise caution, and is certainly as baseless as it is foolish. Cases of genuine hydrophobia are extremely rare. One runs much more risk of being struck by lightning, and the latter risk is not great.

There is no doubt, however, of the wisdom of properly providing against even this small risk. This can be done without cruelty and with little trouble. Dogs do not run mad instantaneously. They show that they are ill some time before their paroxysms are dangerous. A dog that is sick should at once be attended to, and should receive humane care, or be put out of his sufferings by a kindly shot.

We are not of those who believe the season has much to do with the generation of this disease; but as there are many nervous people who do, it is perhaps well to allay their fears by some precautions. Let the dogs be muzzled but don't use a strap. A learned Irish veterinary surgeon states that the origin of this system was its supposed efficacy in preventing one dog biting another, as well as security to people. It is believed that dogs are liable to become rabid during the summer months, and hence the muzzle. The putting on of a peculiarly constructed strap upon the nose and mouth of a dog (be he ever so viciously inclined) is an effectual remedy for biting, but he declares the act to be one of great cruelty.

"If to prevent one evil another of perhaps greater extent is to be substituted, it is well to consider whether there is not still another and better remedy at hand—one devoid of cruelty. The structure and function of the nasal organ of the dog show that the ordinary mode of muzzling dogs is an act of great cruelty, and if placed in such a manner that it ceases to be cruel, then the wearing of a muzzle is a delusion and a snare. When a dog is in a passive state during hot weather, he will of necessity open his mouth and protrude the tongue. This becomes more manifest during exertion. The only way to make an ordinary muzzle bearable is to secure the actual repose of the animal. The moment the dog is called into active exertion, that moment cruelty commences. Placing a log of wood to its neck amounts to an absurdity, because it cannot possibly check his vicious propensity, should he possess any. A log of wood to be of service should be of great magnitude, or of considerable weight. There are three remedies at hand for the treatment of our canine friends, either of which may be tried, and two out of the three will be found easy of application, within the reach of all, and without objection. A wire muzzle open at the bottom will protect the public from injury, and it will at the same time enable the dog to use his respiratory organs without let or hindrance; and, further, it will not annoy him after he is accustomed to it. The second remedy is that of leading dogs when out of doors, which is perhaps the most effective remedy of the twain. The third is that of keeping them at home."

Now these remarks contain some common sense, which it would do well for people to heed. We are not ashamed to say we like a nice dog, and always feel indignant to see him ill-treated. There is nothing very new in the directions here given for the treatment of dogs, but their reiteration is justifiable in view of the fact that the public are slow to right the wrongs of dumb slaves.

PROGRESS OF INVENTION ABROAD.

Among the most interesting of the new inventions announced in our European exchanges is a new method of raising the screws of propellers—an English invention. The stern length of the propeller shaft has its inner end supported in a pivoted bearing, and a passage or way is constructed in the stern of the vessel, through which the pivoted shaft may swing upward, when lifted by a chain attached to its outer end. The inner end of the portion of the shaft which swings up in this way, extends beyond its pivoted bearing, so that raising the outer end in the manner described uncouples it from the other part of the shaft. The blades of the screw are made so that they can be folded together, and, when the screw is raised as described, they are stowed away in a recess. The shaft passes on one side of the stern part, and a sort of shutter closes the opening in the run when the shaft is down.

Another English invention, which, if we are not mistaken, was tried some years ago in this country, is an arrangement of stone-cutting and dressing machine, in which the dressing operation is performed by rotating disk cutters having conical edges, these cutters being mounted so that they revolve freely on inclined axes carried by a revolving cutter-head. The arrangement is such that the cutters make a kind of rolling cut, and their action is thus very similar to that of the "magic diamond," with which our readers are all familiar.

A London inventor has devised a method of securing sheets and panes of glass in metallic frames, so that they shall not be broken by expansion and contraction of the frames, through changes in temperature. In applying this invention to a lantern, a metal frame is constructed, which is composed of an upper and lower band, united by bars at the corners of the lantern. The panes or sheets of glass are placed upon the outside of these corner bars, and are then secured by metal bars or clips of a V-shaped or concavo-convex sectional form. These clips extend from the top to the bottom of each pane, and are secured to the upper and lower bands of the frame by means of sockets, screws, pins, or other devices which will hold them firmly, but will also allow them to be readily removed when desired. The bottom of the frame is provided with a fillet to receive the lower edge of the panes of glass, and this fillet is perforated at the bottom to permit the escape of any water that may be caught therein. By thus securing the panes or sheets of glass within, or between strips or bars of metal, without putty or other adhesive substance, they are held with sufficient firmness to prevent any vibration or displacement in their frames, while at the same time the said frames permit them to freely expand and contract under the sudden changes of temperature to which they are exposed.

A Birmingham inventor has made an improvement in water tweers for forges, which consists in forming the water tweer for hot blast with the entrance and exit air and water passages in one casting, and in affixing it directly to the water cistern and to the air-heating box or chamber without the use of separate connecting pipes. One part of the tweer passes through the water cistern, and another part passes through the center of the said heating box or chamber, and the tweer is secured to both cistern and chamber by means of flanges and screw bolts and nuts. The joints of the parts are made air and water tight by suitable packing. The air passage of the tweer is so formed that the entering air is conveyed by it through the water cistern, and then by a curvature of the passage is conducted into the air chamber where it becomes heated; the heated air from thence passes by means of another curved passage to the nose part of the tweer into the forge fire. Surrounding the air passages is the water space which opens by two openings into the water cistern, one above and the other below the entrance air passage, and the openings are so situated as to cause a circulation when the water becomes heated against the nose of the tweer.

A Manchester mechanic has invented a very ingenious method of joining the ends of old warp to the ends of a new warp in weaving. The ends of the old warp to which the ends of the new warp have to be joined are held in a clip, and the ends of the new warp are similarly held in a clip. The two sheets of warp are then placed in the machine. The sheet of old warp being placed over the sheet of new warp, they are then acted upon by the machine as follows: 1. The warp threads are laid evenly by means of brushes. 2. A pair of clips or nippers take hold of both warps after they have been laid evenly by the brushes. 3. These nippers take the threads into a pair of rollers set at an angle to tighten the warp threads. 4. The end thread of the old warp and the end thread of the new warp are detached from the other threads of the warps by a reciprocating pair of nippers. 5. The threads so taken by the reciprocating nippers are laid by other nippers over the side of a tube, by which the two threads are formed into a loop. 6. A hook passed through the tube takes hold of the ends of the two warp threads, and draws them into the tube, so forming a knot, the ends of the threads having been severed by a cutting blade or scissors to allow of this. 7. The knot is tightened by the threads being drawn through a narrow nick, which will not allow the knot to pass, and the threads are cut close to the knot.

THE STEVENS INSTITUTE OF TECHNOLOGY.

The late Mr. Stevens, of Hoboken, N. J., left $500,000 in addition to the lot and building, for the purpose of founding an institution in which technical education could be conducted on a plan analogous to that pursued at the Technological Institute, of Boston. The Trustees of the fund very wisely selected Professor Henry Morton, of Philadelphia as President and to him has been confided the important trust of putting into practical shape the will of the testator. The building is in process of construction, and is after an imposing and attractive design. It is to be built of trap rock with brown stone facing, and will eventually occupy the entire block, bounded by Fifth, Sixth, Hudson, and River streets, and will cost, when finished, $150,000.

Martha Institute, which was completed a few years ago, and has been a flourishing and useful school, will be supplementary to the Stevens Institute, and in a measure enable Professor Morton to dispense with the elementary classes.

It is not intended to make the Stevens Institute a free school, but by a judicious use of the income it is hoped that the tuition can be placed as low as $75 or $80 a year, covering all the studies of the course. A few scholarships will be established in connection with the public schools and the Martha Institute. A school of design for women is also included among the terms of the bequest.

The establishment of schools of technology is a favorable sign of the times, and will meet with the hearty support of the citizens of our country. They have become a necessity, and it is therefore with pleasure that we witness the prosperous beginning of a new enterprise in New Jersey. We shall be glad to record the opening of the Institute in the fall with a goodly number of pupils under the direction of professors of approved learning and experience.

SCIENTIFIC INTELLIGENCE.

GLYCERIN CEMENT.

Professor Hirzel of Leipzig has discovered an important use of glycerin that ought to be more generally known. He finds that when glycerin is mixed with fine and well-dried litharage, it yields a cement that is capable of a large number of applications.

All metals and nearly all solid bodies can be bound together by this cement; it is said to harden under water as readily as in the air, and to resist a temperature of 500°. It is especially recommended for such pieces of apparatus as are exposed to the action of chlorine; hydrochloric acid, sulphuric acid, sulphurous acid, and nitric acid; also the vapor of alcohol, ether, and bisulphide of carbon, as none of these agents act upon it. The cement can be used in steam engines, pumps, foundations for machinery, and, finally, as a substitute for plaster in galvano-plasty and electro-plating. The preparation of glycerin and litharge to be taken must depend somewhat upon the consistency of the cement, and its proposed uses. An excess of glycerin would retard the setting, as it does not readily evaporate. This new use of glycerin adds another application to a substance that only a few years ago was thrown away.

INFLAMMABILITY OF ROTTEN WOOD DUST.

Dry wood dust blown into a candle gives a clearer and more intense flame than resin, and the wick becomes covered with a resinous crust, so that the burning of the candle is greatly retarded. As this kind of dust when coming in contact with a candle takes fire, it is unsafe to conduct manufactures in which it plays a part at night when a light is required, and it is equally dangerous to strike a match. It appears that an accident occurred in a factory in Silesia, where wood dust was employed, by which five workmen were fatally injured.

CORK AS A NON-CONDUCTOR OF HEAT.

Cork is such a poor conductor of heat that it is largely employed about steam engines to prevent the cooling of cylinders and the consequent larger consumption of fuel. According to careful experiments, the economy in fuel amounts to

$2 for every 32 square meters of surface protected. Experiments conducted by M. Steubel, of Berlin, with locomotives, gave also entirely satisfactory results. This property of cork suggests its use in refrigerators, and if it be partially burned it would also act as a disinfectant to absorb bad gases. The refuse from the manufacture of corks ought to be tried for packings of machinery, and as a filling for ice boxes.

SODIUM.

Mr. Bell, who has made more sodium than any other manufacturer of the metals to be reduced by it, has found that, when large quantities of sodium are melted, it can be cooled in the open air without sensible loss by oxidation.

TO PREVENT THE BUMPING OF LIQUIDS.

Hugo Müller conducts a capillary glass tube through the cork to the bottom of the retort, and during the distillation passes a steady stream of carbonic acid or hydrogen through the liquid. A little piece of sodium amalgam thrown into the liquid will also frequently, by the evolution of hydrogen, prevent the boiling up of the liquid, and thus facilitate distillation. He was able, in this way, to distil rapidly very volatile liquids.

A Steep Railway.

A railway has been constructed in Pittsburgh, Pa., to carry passengers to and from the top of what is known as Coal Hill, which overlooks the city and the country around to a great distance.

The plane is located two hundred and fifty feet west of the Monongahela suspension bridge. The roadway starting from Carson street crosses the Pan Handle Railroad, and reaches the face of the hill (which at this point is ninety feet above the level of the Pan Handle Railroad track) by means of an iron bridge one hundred and sixty feet long. This bridge is supported by ten-inch columns, made of wrought-iron a quarter of an inch thick. The vertical hight of the hill at this point is three hundred and thirty feet, giving the plane a length of six hundred and fifty feet, and an inclination of thirty-five degrees. The roadway consists of two tracks, each five feet gage, with two cars—one ascending while the other descends. The cross ties on the iron bridge are yellow pine, seven feet by seven feet. The stringers are also yellow pine, six by eight feet, and the ties on the balance of the track eight feet by eight feet. A pine railing runs from the base to the top of the incline. It is three feet high and quite fancy. It is to be painted—probable white. The rails are of the "T" pattern, and substantially fastened to the stringers.

The cars are to be hauled up by a wire rope, and are provided with a safety cable which runs idly except in case of the breakage of the principal rope, when the drum about which the safety cable winds is held by means of a brake, thus preventing the accidental descent of a car.

BEAUTIFUL EXPERIMENT WITH LIGHT.—Choose a room where the sun shines in through the window, and then block out all the light, by means of a shutter or otherwise, taking care that all cracks are stopped. Then cut a hole about six inches square in the shutter, and stop the hole with two or three thicknesses of rich deep blue or bluish-purple glass. A broad beam of deep blue or purple light from the sun will thus stream down into the otherwise dark room. Then hold in the deep blue light a bottle or other article made of uranium glass. Ornamental bottles made of this glass, which is sometimes called "canary" glass, because of its light yellow color, are commonly on sale in chemists' shops. They are plentifully made to hold smelling salts, and may cost from sixpence to three shillings each. The blue light should be deep and not very brilliant. When the uranium glass bottle is held in it, the bottle will appear to glow with great beauty, with all the brilliancy of a glow worm, as if white hot.—*Septimus Piesse.*

CITY RAILROAD CARS.

We seldom treat our readers to poetry, but the annexed from *Appleton's Journal*, is too good, too truthful, to let pass.

Never full; pack 'em in;
Move up, fat men; squeeze in, thin;
Trunks, valises, boxes, bundles,
Fill up gaps as on she tumbles,
Market baskets without number,
Owners easy, nod in slumber,
Thirty seated, forty standing,
A dozen or more on either landing,
Old man lifts his signal finger,
Car slacks up, but not a linger:
He's jerked aboard by sleeve or shoulder,
Shoved inside to sweat and molder.
Toes are trod on, hats are smashed,
Dresses soiled, hoop skirts crashed.
Thieves are busy, bent on plunder;
Still we rattle on like thunder.
Packed together unwashed bodies,
Bathed in fumes of whisky toddies;
Tobacco, garlic, cheese, and lager beer
Perfume the heated atmosphere;
Old boots, pipes, leather, and tan,
And, if in luck, a "soap fat man."
Ar'n't we jolly? What a blessing!
A horse-car hash, with such a dressing!

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,544.—REFINING CAST IRON.—J. Henderson, New York city. May 27, 1870.

1,549.—SAFETY ATTACHMENT FOR STEAM GENERATORS.—H. Kimball, Randolph, Vt. May 27, 1870.

1,555.—ELECTRO-MAGNETIC MOTOR FOR SEWING MACHINES, ETC.—George Stevens and J. Hendy, San Francisco, Cal. May 27, 1870.

1,561.—REFINING TIN AND OTHER ORES.—S. H. Stevens, Grass Valley, Cal. May 28, 1870.

1,573.—APPARATUS FOR ILLUSTRATING THE MOTIONS OF SOME OF THE HEAVENLY BODIES AND VARIOUS CELESTIAL PHENOMENA.—Henry Bryant, Hartford Conn. May 30, 1870.

THE NEW YORK DOCK COMMISSION--THE PRINCIPAL PLANS SUBMITTED.

The Commissioners of the Department of Docks have held several meetings, and numerous plans have been submitted. None, however, have as yet been adopted. It is probable that the Commissioners will now hold frequent meetings, until something definite shall be determined upon. We append some of the most important of the plans proposed.

Mr. Wm. C. Waddell presented a plan proposing the construction of bulkheads and piers of stone. He advocated, also, the erection of substantial stone buildings, having not less than fifty feet elevation, to be used as receptacles or warehouses for freight delivered from shipping. He proposed, also the widening of the river streets to about 115 feet. The construction of proper stone bulkheads and warehouses, would, said Mr. Waddell, be less expensive in New York than in any other city, owing to the unlimited supply of stone which may be had in the almost immediate vicinity of the rivers, thus saving a vast amount of money necessary in other places to be laid out for transportation. He instanced the Palisades as having been apparently put just beside the Hudson River, by nature, for the very purpose of furnishing the supply of the material necessary for building substantial pier and bulkhead structures. The warehouses ought to be built on the bulkhead line, with two cartways, right and left, to each pier. In a few cases the proposed warehouses should have the second floor, or the first above the cartways, on a level with the tracks of the street railways, which he proposed should be elevated, proper turnouts being provided at each pier, to be constructed according to this plan. This system would allow of merchandise being passed direct from the cars to the ship, and *vice versa*. This plan proposes, also, an elevated railway, to run along the river front on each side of the City, and also the connection of the great depots with the proposed Arcade Railway.

Mr. S. B. Nolan, Civil Engineer, proposes a breakwater, extending from Long Island across Buttermilk Channel, with two draws of 75 feet each in width, and a flood-gate extending from Governor's Island to the Battery, in which there should also be two draws of 75 feet each, and locks calculated to prevent the full tide from ebbing. The inventor claims that by this arrangement the ebb tide may be cut off from the East River, and (another lock being provided at the upper end, extending from Randall's Island to Westchester) the whole East River front may, at will, be converted into the most magnificent floating dock in the world. He proposes, also, the widening of Harlem River to the extent of 100 feet, and the deepening of it to 25 feet, thus not only allowing free passage for shipping, but also providing for the full flow of the tide from Flushing Bay to the Hudson River.

Mr. C. H. Pierson appeared as the advocate of Capt. J. C. Nichols, who proposes a system of stone piers and bulkheads, the plan of which is the result of his personal observation as to the construction of submarine structures in various ports in Europe, Asia, America, and Australia. He contended that stone alone should be used in the construction of piers and bulkheads; that the engineering profession for submarine structures had long since condemned the use of iron. This plan proposes the construction of piers (foundation piles, not wharves), to be made of blocks of granite laid in broken courses, transversely, and held together by rods of iron, four of which run through these blocks, one at each corner of the foundation pile. Each block is to be covered with hydraulic cement while at the surface of the water, before it is lowered to its place, or slid down on the iron rods, two of which run through each one of these blocks. The pier or foundation pile, so formed to rest on a square, flat-surfaced block of granite, of a superficial area equal to that of the whole pile itself, resting directly on the hard-pan of the river bed, and in which the iron rods are to be firmly fixed at the bottom.

Mr. Charles Poultez exhibited and explained a model of the plan proposed by him. From this model it appeared that Mr. Poultez proposes to have the lowest stratum of his piles made of iron, each pile, thus based, to rest on the hard-pan of the river bed. Upon this he proposes to build up with granite, in broken courses, and each pier or wharf to have a caisson one hundred feet in length and forty feet wide; this caisson to be ballasted for the first five feet with stone, so as to make it float with steadiness. Ten feet space is then left for storage purposes, so that a vessel may unload her cargo right alongside the pier, and get it immediately under shelter. He claimed that if his plan be adopted the necessity for an exceedingly large number of piers will be obviated, and that greater facilities for lading and unlading shipping will be given than by means of any other plan.

Mr. Wm. H. Smith submitted a plan whereby it is proposed to construct the proposed new piers on piles covered with vitrified clay to preserve them from decaying. Beyond this, there was nothing strikingly novel in this plan.

Mr. John A. Bryan proposed the construction of a bulkhead-wall all around the city, to be commenced first on the Hudson River side, between which and an inner wall east of this bulkhead should be constructed a railway to be run by steam. The advantages of this plan, he contended, were, that it would afford quick transportation between the upper and lower sections of the city; that it would permit of piers being run out from the bulkhead at any desired point, and at any time; that in its construction, neither the gas nor water pipes would be interfered with; that thus the bulkhead might be utilized and made to bring in a revenue to the city; that the general travel of the city would not be in the least degree interfered with, either while the work is being constructed or after it is finished. Mr. Bryan said that he made no hobby of saving the sewage, as others had done; he proposed to let it run to waste as it now does.

The main point he had in view was to afford means of quick and easy transportation of both freight and passengers between the two ends of the city, and, at the same time, to take the first great step toward permanently improving the water front of the metropolis. By a slight alteration in the plan, he proposed, however, the sewage might be saved, if the Commission thought it desirable to do so. He proposed that in connection with his plan, independent conduits be laid down to carry off the rainfall and snow water, which now flow into the sewers. These sewers might thus be relieved from carrying off this immense body of water and left to the exercise of their legitimate work.

The material for this wall might be easily and cheaply obtained. The railway he proposed should have eight tracks, to run at an average distance of ten feet below high-water mark. He proposed that the line of wall inside the bulkhead be of a strength just sufficient to hold the earth embanked against it, and that between this and the bulkhead be the space appropriated to the proposed railway, which might be put ten feet below the level of high-water mark, or sixteen feet below the top surface of the bulkhead which is to extend upward above high water to the distance of six feet.

Mr. J. B. Van Deusen presented a plan, accompanied by a model, of an invention of his own, whereby he proposes to construct piers of iron. His plan contemplates hollow iron columns, on which the roadway of the pier is to be built. This roadway, or pier surface, to be of stone, cast iron arches being thrown from pile to pile, on which concrete is to be laid and the stone pavement set in. The external columns of the pier he proposes to make twenty inches in diameter, and the internal ones twelve inches. To remedy the tendency to sink, which might naturally be supposed to pertain to a pier thus built on iron columns, Mr. Van Deusen proposes to insert within the tubular piles, an arrangement which he] denominates a "claw base." This he places inside of, and sinks along with the column itself, and when the latter reaches the bottom or hard-pan of the river-bed, he throws out these claws under the bottom of the column; and after being thus out, they fix the column firmly in position. One great advantageous feature that he claims for his plan is, that the piers built in accordance with it will necessarily be fire-proof. As to cost, he offers to build a pier on his plan, 300 feet long by fifty feet wide, for $100,000, and to have it completed at the expiration of four months' time.

Mr. J. Burrows Hyde submitted a plan, of which the following is a synopsis compiled from the paper read by him before the Commissioners on the 29th June:

1st. The construction of a solid wall of masonry, built in intervals, as may be necessary, but with a view to its ultimate continuation along one uniform line of the shores, coincident with the present bulkhead limit. Through this wall the sewerage outlets will debouch at their proper intervals. The wall will serve as a deflector for the water, which will thereby not only carry off the sewerage matter, but also the mud brought by the complex current from the Hudson and East rivers. This will prevent the eddies which form pockets or still water for the deposit of mud banks for grounding vessels at the wharves, where is consequently stored up pestilential filth to permeate the atmosphere with poisonous and intolerable odors that not only render the air at times insupportable at the wharves, but lamentably influence the sanitary condition of the population.

2d. He proposes to construct from this wall permanent iron piers, by sinking cast-iron piles or pipes to the rock of firm bottom, and filling the pipes with masonry or with concrete under pressure to form solid artificial stone—a system which has been most satisfactorily employed for years in England and elsewhere. A primary duty of the hollow columns is to serve as coffer dams for constructing the vertical supporting columns of masonry. The iron columns alone will also be amply strong to sustain the superstructure loaded to any weight it will be required to carry. They will be prepared for resisting oxidization, and will, he maintains, last as long as the warehouse itself. The piles will be so arranged as not to impede the water currents, giving free circulation to the tides for carrying away all solid matter; at the same time will allow free space for dredging under the piers, should it become necessary.

Upon these piles a cart and landing way of iron and wood will be constructed; and as he designs this structure for more than ordinary duty, it will, when completed, be loaded with a testing weight of at least double that it will be required to carry. By the present system vessels cannot ordinarily receive or discharge car goes in bad weather; besides, merchandise on the wharves is ever exposed to injury. Upwards of $300,000 a year has been paid by our merchants for the hire of tarpaulins and other wharf coverings, which afford but partial shelter for the property. Besides, a major proportion of the merchandize designed for reshipment is now transported to an average distance of five hundred yards from the river for storage, involving, in most cases, two cartages before reshipment or distribution for sale here. Moreover the crowded conditions of our streets now, by carts and drays, present a rapidly increasing embarrassment to the business facilities of the port. And as within the water limits of the city there can be presented no possible relief or alleviation of this augmenting evil, we need but ask what must be the condition a few years hence, when the population will be doubled. Mr. Hyde therefore proposes to store merchandize beyond the bulkhead line. It really seems that the carts have already reached their maximum practical number, unless the locality for our general commerce is changed, which would afford but temporary relief. Mr. Hyde submitted that all merchandize designed for export or transhipment in its received condition should never cross a street at all, and should be, as far as possible, stored at the piers, and as warehouse room is not only much limited, but greatly needed convenient to the shipping, he proposes to meet all these requirements.

3d. Employing this pier for carrying a weather shed and warehouse, and by erecting thereon a fire-proof iron building five stories in hight. The first story or pier surface being, as now, free for the cart and landing way, open on all sides, with four closed lofts above for storing merchandize. The plan submitted shows a pier 500 feet long by 50 feet wide, with a warehouse 405 feet long by 35 feet wide. This gives five stores, each, say 100 feet long by 35 feet wide, divided by fire-proof partitions, and with four warehouse floors, with rails along the floors for conveying goods. Vessels will lie on either side alike, by bracing their yards fore and aft, or otherwise. He proposes, however, to increase the width over the present piers, as there is ample space for so doing.

Within the building one or more steam engines will be placed, and outside, just under the roof, strong swing cranes rigged; and through these two agencies all merchandise to and from the vessels and warehouses or wharf are conveyed, as well as directly to and from the pier below, by hatchways provided through the floors. It frequently occurs that the bulkhead end of the pier is so taken up with goods that vessels further out cannot work to advantage. By the plan proposed the floor above may be used as an auxiliary pier, and allow the loading or unloading to progress. By this system vessels will lie directly alongside of, and may discharge directly into, or receive goods directly from the piers or warehouses; the work will not be interrupted during inclement weather; and the goods may be landed and lie in perfect safety on the pier proper, if placed there to be taken away by carts. The steam engines will also be constructed for working powerful fire engines, which may be employed to extinguish fires in adjacent buildings, vessels, or otherwise. The proposed buildings being isolated and fire-proof, with unprecedented means for extinguishing fire, should any occur within the edifices, they will present unequaled security against that dreadful scourge to our commercial interests, and greatly lessen the rate of insurance on the property stored within them. The pier will be lighted by gas at proper distances at night, and the street end will be closed by gates, guarded by a watchman, to prevent the passage of improper persons.

Mr. Hyde claimed that the plan he submitted if adopted would secure the following advantages: An increase of the space for tide flow 500 feet on each river, that being in a good measure the distance as regulated from the bulkhead to the outer pier lines, the present piers acting as dams against the currents. An increase of from seven hundred to 1,000 feet to the width of the city, by adding these structures extending from each side, and which would form a line of buildings reaching from the Battery nearly to the Central Park. It will improve the harbor by permitting the tide to flow under and through the piers, carrying the sewerage washings into the channel. It will improve the health of the city by removing the sewerage matter from the present still water of the slips into the channel, which will carry it away. It will relieve the streets by stopping at the piers a great proportion of the merchandise which now has to be carted to warehouses within the city. It will enable the vessels to load and unload in at least half the time now necessary. It will greatly increase the value of the opposite property. It will greatly increase the tax revenues of both the State and the city. It will save one half the insurance. It will save cartage. It will create spacious and safe warehouses where most convenient, and upon a space now used for landing stages only, and thus relieve for active business the many buildings used for storage within the city, and relieve the sidewalks in front of them, over which goods have to pass and repass, greatly to the inconvenience and risk of pedestrians.

Mr. Hugh McKay, of Greenpoint, L. I., proposed to build a sea wall around the city, just outside the present bulkhead, said wall to be composed of two rows of square cast iron tubes side by side, and of the proper length to reach a firm foundation. The tubes are to be cast two feet by four in diameter, the out row to lap joints with the inner row, the whole to be bolted together and filled with concrete; the heads of the bolts extending into the concrete and forming anchors; these forming a strong, continuous and smooth wall without the expense of cofferdam, diver, or dredger, and capable of being built in a shorter time than any other kind of wall. To build the piers he proposed to sink three rows of the same tubes nine inches in the center and eight on each side, driven close together and bolted, and filled in with concrete as in the sea wall. Three hundred feet out of said wall, ten feet nearer the sea wall, a similar row of tubes, and four such rows between the above and sea wall, having a clear water way between each pier of about seventy feet. Close to the sea wall a single row of tubes is to be sunk, all the tubes to be sunk so that their tops shall be level with high water mark. A properly constructed tubular iron bridge eight feet high and thirty-two feet wide, to span the entire space between sea wall and pier head; the roof or deck of bridge to form the wharf proper. The inside of the bridge tube is to be used for the storage of merchandise. On a bridge or wharf of this kind sheds and storehouses can be erected as firmly as on land. As the deck of the wharf would be above the present grade of the street about four feet, all unloading and loading of carts should be done at the bulkhead, thus saving great wear and tear and confusion on the wharf. All merchandise could be carried along on the smooth floor by hand trucks or cars with ease and despatch. Between the two outer rows of tubes there should be placed a properly constructed tide wheel, to be kept in motion by the current, and to be continually employed in compressing air for the mechanical work of the pier, and also to raise the sea water to a reservoir on the top of the warehouse, to be available in case of fire; to water the streets, to fill paths, to scour the gutters and sewers, and thus

put to practical use the immense power that flows past our city. Mr. McKay thinks a wharf of this kind would give the greatest strength, with most warehouse capacity, and present the least obstruction to the ebb and flow of the tide.

Mr. A. D. Bishop submitted a plan which may be described as simply a succession of stone pillars, resting on piles, placed in position by means of a floating derrick. The cost of the construction of a pier 100 feet long, over this foundation, is estimated by Mr. Bishop at $35,000, and the cost of a pier of the same sort (granite), 45 by 400, $400,000.

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MRS. C. A. ROGERS.

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40,000 to 60,000 good tempered clay brick per day, made by "Winn's Portable Steam Brick Machine." Responsible parties furnished machines on trial. Address Wright & Winn, Lock Haven, Pa.

Fitts' "Patent Chronometer Governor Valves," are manufactured by the Union Water Meter Co., Worcester, Mass.

Automatic 10-spindle Drill—5,000 to 20,000 holes per day in casters, etc. Hardware machines a specialty. Ferracute Machine Works, Bridgeton, N. J.

$15 for the best Saw Gummer out. Address The Tanite Co., Stroudsburg, Pa.

Spools of all kinds, and spiral shade tassel molds made by H H. Frary, Jonesville, Vt.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 64 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Pictures for the Parlor—Prang's latest Chromos, Hart's Seasons. Sold in all Art Stores throughout the world.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

Carpenter Planes, the best quality, made by Tucker & Appleton, Boston. Send for list.

Of Washing Machines, there is nothing to be compared with Doty's.—Weekly Tribune, Dec. 15, 1869.

For Sale—The Right for the six New England States of L. Bertsche's self-fastening caster, the best caster ever used. Address L. Bertsche, 8th Ward, Allegheny City, Pa.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

A Superintendent wanted in a large wood-working and machine shop, in the State of New York. Address, in own handwriting, stating references, past experience, salary expected, etc. An interest in the business will be offered to the right person, if it is desired. Address "Superintendent," P. O. Box 773, New York city. The Editor of this paper will vouch for the responsible character of the establishment needing the above service.

For foot-power engine lathes address Bradner & Co., Newark, N.J.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 13 years in use. Beware of Imitations.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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

All reference to back numbers should be by volume and page.

A marine clock from Baltimore was received at this office some weeks ago. Who sends it, and for what purpose?

W. W. R., of N. J.—The substances which will generate heat, by simply coming in contact, are so numerous that it is hard to select what to recommend you. Sulphuric acid and water when mixed in the right proportions will produce a higher temperature than you mention. So will water and quicklime. Sulphuric acid acting upon chlorate of potash also creates a high degree of heat. But perhaps you mean substances that will by coming in contact, or by slight friction, produce a high degree of heat, without any chemical change. If that is your meaning, we know of no such materials.

O. S. M., of Va.—We agree with you that the method proposed to avoid the slow poisoning of workmen in paint manufactories, has theory to support it. The trouble would be to get the workmen to submit to the temporary inconveniences the plan entails. It has often been found that in attempts to promote the sanitary condition of workmen, that they generally prefer a remote risk to present inconvenience, though the latter be but slight.

C. P. T., of Mo.—We long ago discovered how rash it was to give an opinion as to the cause of a boiler explosion without being able to inspect for ourselves the state of affairs. The *ex parte* statements you send us are not enough on which to base an intelligent opinion. This much, however, we will say: It was not the generation of gas—unless steam be considered as a gas—that burst the boiler.

J. L. C., of Ill.—We should be glad to encourage you in the construction of your magnetic perpetual motion, but we cannot do so conscientiously, neither do we think the subject of such value as to warrant giving space to its discussion in our columns. This decision may seem harsh to you, but we must regard the general interests of our readers as paramount to the personal sympathy we feel in your case.

H. M., of N. Y.—The center of motion in a wagon wheel, so far as the parts of the wheel are related to each other, is in the axle; so far as the parts are related to the surface upon which the wheel rolls, the wheel has no center of motion. Whether we consider the relation of the parts of the wheel to each other, or to the surface upon which it rolls, it has no *fixed center*.

G. L. V.—Electricity has not only been thought of but actually tried as a motive force for car brakes, and also as a means of simultaneously unlocking mechanism on each car of a train, the mechanism through the power of springs or other means, to apply the brakes. There is nothing new or patentable in your invention, unless it may be some details of construction.

D. R. V., of Va.—Your friend is right. The discovery of the law called Marriotte's law—namely, that the volumes of gases are inversely as the pressures to which they are submitted—has been attributed to the English physicist, Boyle, and this law has therefore been called by some writers, Boyle's law.

A. F. S., of Texas.—The contraction of the spaces between the buckets of turbine wheels, so that the area of section at the point of discharge is less than that where the water is received, would undoubtedly result in loss of power.

D. E. W., of Mass.—The pigment called green verditer is a mixture of carbonate of copper and carbonate of lime. Blue verditer is also a carbonate of copper, or a mixture of the hydrated oxide of copper with hydrate of lime.

Q. D. O.—The cement known and quite commonly sold under the name of marine glue will unite leather, and it resists the action of water. We do not think, however, it will unite belting so as to obviate the necessity of rivets.

E. N. C., of N. H., describes the method of burning marl by the use of wood to manufacture lime. It is very expensive of fuel, and he wishes to learn of a better method. Can any of our correspondents supply this information?

D. R. P., of Fla.—Natural amalgams of mercury with silver are found in Sweden, Hungary, Spain, and other places. Dana describes a mass in the museum at Santiago, in Chili, which weighs 21·75 pounds.

R. L., of Cal.—You cannot submit stearine to a heat sufficient to distil it over without decomposing it. The products will be margaric acid, margarone, and a variety of hydrocarbons.

T. W., of Iowa.—Both the subjects to which you call attention have been recently discussed at length in these columns. We therefore decline to reopen them at present.

A. W., of Tenn.—The standard gallon contains 58372·2 grains of distilled water at 39·8° Fah. with the barometer at 30 inches.

J. K., of Mass.—The carbon used in galvanic batteries is that known as gas carbon, and is obtained from gas works.

D. V., of Mo.—We believe the sails of vessels are universally named after the mast, yard, or stay upon which they are stretched.

J. M. M., of La.—What are called Green stones are mixtures of feldspar and hornblende, or of feldspar and augite.

Recent American and Foreign Patents.

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

MEDICAL COMPOUND.—George C. Furber, Yreka, Cal.—This invention and discovery relates to a new and useful composition for medicinal purposes.

THERMOMETER.—John Kendall, New Lebanon, N. Y.—The object of this invention is to render thermometers more convenient and serviceable in dairies, and for many other uses, and it consists in forming the scale and plate in a single piece, with flanged edges, in combination with a removable band, for protecting the bulb of the thermometer.

PREPARING DENTISTS' GOLD.—Richard S. Williams, New York city.—This invention relates to a new and useful improvement in the mode or process of preparing dentists' gold, for filling decayed teeth, whereby such gold is rendered much more useful than it has hitherto been, and it consists in subjecting the gold, after it has been rolled to the desired thickness, to the action of a solution of *aqua regia*, whereby the surface is thoroughly cleaned of all foreign particles of matter, and the gold rendered adhesive.

LOOPING HOOK FOR SEWING MACHINES.—M. A. Keables, now temporarily residing at Ontario, Canada.—This invention relates to improvements in looping hooks, and consists in attaching them to the arm of the oscillating shaft, by which they are worked, on a pivot, so that they can vibrate thereon in a vertical plane, to allow the point to be raised by the action of the thread at the moment of the escape of the loop, to facilitate the same, and in providing a spring to restore it, afterward, to the required position, and hold it there.

TRACTION ENGINE.—Thomas F. Hall, Omaha, Nebraska.—This invention relates to a new traction engine, or construction of vehicle, of that class in which an endless belt of traction plates surrounds an inner frame, and travels around the same while propelling the entire apparatus.

STOVES.—C. E. Warring, Poughkeepsie, N. Y.—This invention relates to improvements in stoves, and consists in a detachable coal magazine, or base-burning attachment for heating stoves, adapted for application to stoves of any kind, having an opening at the top.

BALANCE SLIDE VALVE.—Wm. Dillon, Wheeling, W. Va.—This invention relates to improvements in balanced slide valves, and consists in suspending the valve by long adjustable rods, from a diaphragm in the top of a dome, placed upon the steam chest, the same diaphragm being made of flexible substance, and sustaining the same pressure as the valve does.

TOOL FOR DRIVING GLAZIERS' POINTS.—Alfred Woodworth and Edwin W. Warren, Cambridge, N. Y.—This invention relates to improvements in machines or tools for driving glaziers' points, and consists in a hand-tool having a vertical receptacle for the points, and a spring device, arranged to strike the lowest point in the receptacle, and force it out through a slot thread, the said spring driver being provided with a retracting paul, which trips the device and re-engages with it self-actingly.

QUILTING FRAME.—John Angus and John P. Angus, Mindenville, N. Y.—This invention relates to improvements in quilting frames, and consists in a combination of a roller for the lining, a roller for the top, another roller for both the lining and top, and a stretcher bar, all so arranged that the bats may be applied as the lining and top are wound on to the latter roller from the others, after which, both the top and lining, together with the bats are wound back on to one of the other rollers, to be quilted.

CLOTHES DRYER.—A. H. Patch, Hamilton, Mass.—This invention relates to improvements in apparatus for suspending clothes, for drying them, and consists in long bars, for hanging the clothes, suspended from cords, working over pulleys attached to the ceiling of the room, or a horizontal supporting beam, and thence passing to and over pulleys attached to the wall or a post and down the same, to a convenient position for attaching to pins or hooks for holding the bars in a low position for convenience in hanging the clothes on them, or in a high position for drying, where they will be out of the way.

SEAL LOCKS.—Gustave Ulmann, Ivry-sur-Seine, France.—This invention relates to improvements in seal locks, for mail bags, and other like uses, for guarding against the same being opened without giving evidence of the fact, and it consists of a hollow block of metal, for the reception of the hasp or bolt to be secured, and a spring bolt to be inserted, passing through the hasp, and catching, by its spring, behind shoulders, which prevent it from being drawn back; also, of a plate, perforated, for attachment to one side for securing the seal, the said plate having a bolt or stud through which the locking bolt also passes, and by which it is held, and, also, of a disk and perforating stud, which, when in the locked position, prevents the removal of the locking pin, or bolt, without perforating the seal.

TONGUE HOLDER FOR DENTSTS' USE.—Francis M. Osborn, Port Chester, N. Y.—This invention relates to improvements in tongue holders, such as used by dentists, to prevent the tongue of the patient from interfering with the filling of the teeth, or other operations thereon, and consists in a cone or bell-shaped cup of india-rubber, or other substance, and a deep, wedge-shaped slot in one side, which is mounted on a handle, and adapted for placing on the tongue, forcing it back, and holding it as required. It also consists in the application to the handle of projections, adapted to engage with the front teeth of the lower jaw, and hold the cup against the efforts of the tongue to thrust it out of the mouth.

LOCKING DEVICE FOR TRAPS.—Jasper E. Corning, Rye, N. Y.—This invention relates to improvements in devices for locking the doors of wire and other animal traps, having doors swinging in vertical planes, and consists in the application to rods on the door, which assume vertical, or nearly vertical positions when the door is closed, and to fixed vertical rods, arranged to be parallel, or nearly so, with the said rods on the door, when the latter s closed, of locking rings, which will drop to the bottom and hold the door against swinging open until the rings are raised, which may be done most readily by turning the traps bottom-side up, and allowing them to fall to the top of the trap, where they are retained by the aforesaid rods, attached to the doors after the latter are opened.

PUMP.—Anson Balding, Wheeling, West Va.—This invention has for its object to produce a constant stream of water from a pump cylinder by the operation of a single double-acting hollow piston, which receives water into its chamber alternately through orifices in its upper and lowers disks, according as the piston moves up or down, and discharges the same through its hollow piston rod; the water having been filtered previous to its introduction to the cylinder.

GLUE.—Nelson S. Whipple, Detroit, Mich.—This invention has for its object to furnish an improved glue for use upon wood, crockery, glass, marble, leather, metals, etc., which shall be simple in preparation, and will hold the parts to which it may be applied firmly in place, and which shall have a much greater adhesive power than any glue heretofore made.

REGISTER AND VENTILATOR.—Alfred Watson, Jersey City, N. J.—This invention has for its object to furnish an improved register for regulating the admission of warm or cold air in warming or ventilating buildings, which shall be so constructed as to greatly diminish the time and labor required for "fitting" the register, and consequently materially lessening the cost of manufacture.

STEEL BOWS FOR CARRIAGE TOPS.—J. F. Fowler, Alliance, Ohio.—This invention relates to a new and useful improvement in bows for the tops of carriages, buggies, etc., whereby they are made more durable, and are made to present a lighter and more elegant appearance than bows made in ordinary manner.

SIDE SADDLE.—William Hill, New York city.—This invention relates to a new and useful improvement in side saddles, whereby beauty, simplicity, and cheapness are secured, and it consists in combining in one piece the seat piece, "spring piece" and "jockey" of the tree covering.

BRIDLE BIT.—Henry C. Thompson, Mount Sterling, Ky.—This invention consists in the combination of two bits, one passing through a slot made nearly centrally of the other, the two bits being bound together by straps, in such manner that one may slide upon the other, and the joint bit elongated by drawing the bridle-rein rings, one of which is at the extremity of one of the bits, and the other of which is at the opposite extremity of the bit, away from each other, so as to increase the leverage upon the horse's mouth, while, at the same time, the curb-rein rings and cheek pieces are drawn toward each other, and compressed tightly against the horse's cheeks, by which means an unruly animal is the more easily controlled.

STEAM VALVE.—George Leckenby, Western, Mo.—This improved valve consists of a circular case with valve seat for attachment to the steam cylinder, having the ordinary live steam ports, in which case is a hollow cylindrical valve, receiving the live steam around the shaft which is hollow, and supplying it through the rim to the live steam ports, and receiving the exhaust therefrom into a passage leading from the rim to the motion shaft, by which it is discharged.

DREDGING MACHINE.—Ralph R. Osgood, Troy, N. Y.—This invention relates to a new mechanism for operating the scraper or scoop of a dredging machine, and for regulating the position of the same. The invention consists first in the use of double friction clutches, whereby the rigid shank of the scraper can be drawn in and out at will.

IRONING MACHINE.—William Jones, Oskosh, Wis.—This invention relates to a new and useful improvement in a machine for ironing clothes, whereby that tedious and laborious operation is rendered easy and agreeable, and it consists in the arrangement of a hollow self-adjusting steam heated roller operating in combination with other solid rollers, and a table and revolving apron.

TUNING PIN FOR PIANOFORTES.—Julius M. Blaug, New York city.—This invention has for its object to improve that class of tuning pins for pianofortes, which are operated by means of screws and worm wheels, and more particularly to strengthen such pins and to lessen the cost of their construction.

MANUFACTURE OF STEEL AND IRON.—G. F. Ansell, London, England.—This invention relates to the conversion of iron into steel or wrought iron, for armor plates, railways, and for other purposes, by the use of bisulphate of potash, or the bisulphate of soda, or a mixture of the two, the same being applied in such a manner as to act throughout the mass of melted metal.

ANIMAL TRAP.—Elonzo Sprague and George C. Belt, Bridgeton, Ind.—This invention has for its object to construct a trap, by means of which animals can be readily caught, and which will always remain set without any liability of getting out of order. The invention consists in providing a double treadle in an open passage, each treadle operating a gate, whereby the escape of an animal, once within the passage is absolutely prevented.

MOLD FOR CASTING SPOONS.—Luther Boardman and N. S. Boardman, East Haddam, Conn.—This invention has for its obect to reduce the expense of molds for casting spoons of britannia or other metal.

MUFF.—R. M. Seldis, New York city.—This invention relates to a new manner of securing pocket flaps on muffs, with a view of economizing material and labor in their manufacture.

FLOCK GRINDER.—Robert Aldrich, Forestdale, R. I.—This invention relates to a new construction of flock grinder, and more particularly to a new method of securing the knives in the grinding surfaces, with a view of adjusting the same to different kinds of work, and to provide for wear by the operation of grinding.

SAPONIFIED MINERAL BATH.—Otto Gavron, New York city.—This invention has for its object to furnish a convenient surrogate for mineral baths, which can be brought into a condensed form to be conveniently transported and handy for use. The invention consists in combining the minerals and salts that are contained in the mineral waters with soap, so that the soap thus prepared can be used in baths with the same effect as the mineral waters alone.

HAT AND CAP SWEATS.—Philipp F. Lenhart, Brooklyn, N. Y.—This invention has for its object to improve the sweat bands of hats and caps in such manner that the same will be more convenient and less injurious to health than those now in use. The invention consists in a novel treatment of the leather for the purpose of making the same water-proof, and still an absorbent of moisture.

CARPENTERS' PLANE.—Charles G. Miller, Brattleboro, Vt.—This invention has for its object to construct a plane which will be convertible into a grooving, rabbeting, or ordinary smoothing plane, and which therefore combines in one tool all the advantages heretofore included in three.

CHURNING APPARATUS.—James P. Curtis, Wytheville, Va.—This invention has for its object to furnish an improved churning apparatus which shall be so constructed and arranged that the operation of churning may be changed from a labor to a pleasure, enabling even a child to work the machine, and which shall, at the same time, bring the butter quickly and thoroughly.

LAMP-SHADE HOLDER.—Cornelius St. John, New York city.—The object of this invention is to furnish an improved lamp-shade holder, simple in construction, easily attached to and detached from the lamp, and which shall be so arranged as to allow the shade to be expanded or contracted at will.

CULTIVATOR PLOW.—James G. Miner, Nashville, Tenn.—This invention has for its object to furnish an improved plow which shall be so constructed as to cut up all the weeds and grass between two rows at a single passage, and turn up their roots so that they may be killed by the sun.

SEATS FOR VEHICLES.—P. F. Dean, Watsonville, Cal.—This invention has for its object to furnish an improved seat for buggies, carriages, cars, and other vehicles, so that when in use they may be easier to the rider.

INSIDE WINDOW BLIND.—Stephen Eich, East Toledo, Ohio.—This invention has for its object to furnish an improved inside blind for windows which shall be simple in construction and effective in operation, being so constructed that it may be closed so closely as not only to shut out the light, but also to prevent the entrance of flies and other insects, and which may at the same time be made light and ornamental.

WOOD BOX.—Frank Ficht, Dyckesville, Wis.—This invention has for its object to furnish an improved box for holding fire wood when prepared for the stove, which shall be neat in appearance, convenient in use, and easily kept clean.

SAFE LOCK.—Ludwig Beer, New York city.—This invention relates to improvements in that kind of locks in which a slotted key is applied to shift a series of slides or plates which serve as levers for turning a slotted locking cylinder, by which the bolt is moved. The invention consists chiefly in the application to the locking cylinder of a primary lock, which, engaging pins in a notch of said cylinder, prevents the same from being turned, even if the slides are properly set to unlock.

BOILER PLUG.—Robert L. Neill, Paterson, N. J.—This invention has for its object to economize boiler plugs which are, during the testing of the plates, used to close the holes that are provided for the reception of the tubes.

MEDICAL COMPOUND.—Wm. C. Tait, Alexandria, La.—This invention relates to a new and useful improvement in a compound to be used as a medicine for coughs and for all affections of the lungs or bronchial tubes, and other affections of the human system proceeding from colds, exposure, or other causes.

PROCESS OF CONCENTRATING TOMATOES.—Christopher T. Provost, New York city.—This invention has for its object to so prepare tomatoes for preservation, that only the nutritious and aromatic matter, but none of the useless bulk or body will be retained. The fruit can thereby be preserved in the most concentrated form, and will not occupy superfluous space.

DOOR AND SAFE LOCK.—Joseph Linder, Seneca Falls, N. Y.—This invention relates to a new construction of lock and key, with an object of preventing the opening of the lock by means of false keys. The invention consists chiefly in provision of complicate bolts and double key, all arranged so that a single key or bolt will not suffice to open the lock.

SIDE SADDLE TREE.—William Hill, New York city.—This invention relates to a new and useful improvement in trees for side saddles, whereby the strength, beauty, and utility of that article is increased while it is greatly simplified in its construction, and its cost diminished.

MOWING AND REAPING MACHINES.—Francis E. Rogers, Paw Paw, Ill.—This invention relates to new and useful improvements in mowing and reaping machines, having for its object to provide an arrangement of the cutting sections, whereby power may be economized, the cutters more easily detached for grinding, and the machines made to run with less noise than those now in use.

EXCAVATOR.—Benjamin Slusser, Sidney, Ohio.—This invention consists mainly in a scraper placed by the side of each of the rollers over which the endless apron runs, so as to clear the same of dirt, said scraper being attached at its ends to the boxes in which the rollers are mounted, so that whenever the boxes with the rollers are moved in one direction or the other in the frame, the scrapers are moved also to the same extent, and always preserve the same position relative to the rollers.

COMBINED CALL BELL AND SLOP BOWL.—Nathan Lawrence, Taunton Mass.—This invention consists of a metallic slop bowl provided with a threaded stem projecting downward from its under side, and with a horizontal arm connecting any two of its adjacent legs, on which arm is pivoted the thumb-piece and tongue of a call bell; and combined with the sounder of a call bell when the latter is either screwed upon the aforesaid projecting threaded stem, or slipped thereon and held by a nut.

FIRE AND DECK PUMP.—Peter M. and Oscar Snell, Williamsburgh, Ohio.—This invention consists in the application of a lever having a movable fulcrum placed in vertical slots, said fulcrum being directly connected with a slide valve to the operation of the piston of a force pump, for the purpose of giving the slide valve the movement requisite to opening and closing the cylinder ports.

WASHING MACHINE.—Gideon W. Cottingham, Marshall, Texas.—This invention consists of a globular case for containing clothes, provided with slots for admitting water, the globular case being intended to be suspended on trunnions in a vessel containing hot water, and to be revolved therein for the purpose of causing currents of water to flow through the case among the clothes.

INVALIDS' BEDSTEAD.—A. J. Russell, Baltimore, Md.—This invention relates to the simultaneous employment of two bedsteads, one above and outside the other, the inner one sustaining merely the mattress, and the upper one being provided with a contrivance for raising and lowering and supporting the other bedding, that part of which—that is, beneath the patient—being so contrived, that it may be removed and replaced without lifting the patient off the bed, and without in any way disturbing him.

STILL.—E. Melton, Flemmingsburg, Ky.—This invention relates to that class of stills in which the alcohol is carried off by steam ejected into the wash at the bottom of the chambers, and rising through the wash and passing off, charged with alcoholic vapor, to the refrigeratory.

BUCK SAW.—William Hankin, Williamsburgh, N. Y.—This invention relates to a new brace for buck saws, and has for its object to simplify the construction of saw brace and still permit the adjustment of the saw frame. The invention consists in constructing the said brace with forked ends and double arched edges, of one single piece of wood or other material, thereby producing an entirely reliable and inexpensive article.

STUMP EXTRACTOR.—C. Bilharz, Pittsylvania C. H., Va.—The object of this invention is to provide a stump extractor which will be yielding during operation, so that it will not require a change of position if by the weight of a stump one side should draw heavier than the other. The invention consists chiefly in suspending the entire operating apparatus from a semi-spherical yoke, which rests upon a perforated plate, so as to be swiveled thereon.

HAY AND COTTON PRESS.—Richard Ball, Petersburgh, Va.—This invention has for its object to provide means whereby the parts of a press will be kept from injury, even if the follower should not be held entirely level during its vertical adjustment. The invention consists chiefly in the application to the followers of swinging nuts and in the combination with the swing of right and left screws.

RAILROAD CAR SPITTOONS.—M. J. Beach, Nashville, Tenn.—This invention has for its object to furnish a spittoon for cars, which may be placed on and extended through the floor and allow the contents to be easily emptied upon the ground under the cars.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING June 28, 1870.

Reported Officially for the Scientific American

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104,683.—BELT BUCKLE.—Israel Alexander, San Francisco, Cal.
104,684.—ANIMAL TRAP.—Charles Angle, Hazel Green, Mich.
104,685.—QUILTING FRAME.—John Angus and John P. Angus, Mindenville, N. Y.
104,686.—MANUFACTURE OF IRON AND STEEL.—George F. Ansell, Bernard street, Russell Square, England.
104,687.—LAPPET LOOM.—William Aspinall, Philadelphia, Pa.
104,688.—PUMP.—Anson Balding, Wheeling, West Va.
104,689.—HAY AND COTTON PRESS.—Richard Ball, Petersburg, Va.
104,690.—SLEIGH BELL.—Wm. E. Barton, East Hampton, Conn.
104,691.—RAILROAD CAR SPITTOON.—William James Beach, Nashville, Tenn.
104,692.—STUMP EXTRACTOR.—Candidus Bilharz, Pittsylvania Court House, Va.
104,693.—CORN HUSKING MACHINE.—T. J. Burgess, Rondout, N. Y.
104,694.—LIME SPREADER.—W. C. Burnett, Burns' Mills, Pa.
104,695.—HARVESTER.—James Birch and Addison Crosby, Westfield, N. Y., and Thomas Birch, Meadville, Pa.
104,696.—STEAM HEATER.—George W. Blake, New York city.
104,697.—WATER WHEEL.—Oliver J. Bollinger, York, Pa.
104,698.—BAG HOLDER.—Edwin Boynton, Palmyra, Wis.
104,699.—BIRD CAGE.—Thomas H. Bradley, St. Louis, Mo.
104,700.—PREPARATION OF WHEAT FOR FOOD.—William S. Brewster, Chicago, Ill.
104,701.—STAMP CANCELER.—Franklin W. Brooks, New York city.
104,702.—SNAP HOOK.—George A. Brown, Kalamazoo, Mich.
104,703.—COMBINED HEARTH, GRATE, AND FENDER.—Geo. Buchanan, Washington, Pa.
104,704.—CAR COUPLING.—Samuel P. Carll and Amos Shute, Richmond, Ind.
104,705.—OFF-BEARING APPARATUS FOR BRICK MACHINES.—Cyrus Chambers, Jr., Philadelphia, Pa.
104,706.—DEVICE FOR TENDERING OR CHOPPING MEAT.—Fred. W. Codding, West Rutland, Mass.
104,707.—STREET SWEEPING MACHINE.—Alexander A. Consalvi, New York city. Antedated June 13, 1870.
104,708.—WASHING MACHINE.—G. W. Cottingham, Marshall, Texas.
104,709.—LAMP BURNER.—Robert R. Crosby, Boston, Mass.
104,710.—CHURNING APPARATUS.—Jas. P. Curtis, Wytheville, Va.
104,711.—MUSTACHE SHIELD FOR CUPS.—George P. Cutler, Lawrence, Mass.
104,712.—KNOB LATCH.—John Davis, Terre Haute, Ind.
104,713.—METALLIC ROOFING.—John B. Davis, Cleveland, Ohio.
104,714.—SEAT FOR VEHICLES.—P. F. Dean, Watsonville, Cal.
104,715.—BALANCE SLIDE VALVE.—Wm. Dillon, Wheeling, West Va.
104,716.—APPARATUS FOR CARBURETING AIR.—Antoine E. Dupas, Paris, France, and Arthur Barbarin, New Orleans, La.
104,717.—WINDOW BLIND.—Stephen Eich, East Toledo, Ohio.
104,718.—END FASTENER FOR CAR SPRINGS.—Geo. Elliot, St. Louis, Mo.
104,719.—COMPOUND FOR STUFFING AND TANNING HIDES.—Elihu England, Mossy Creek, Tenn.
104,720.—CLOTHES PIN.—G. K. Farrington, Alcatraz Island, Cal.
104,721.—LINIMENT FOR TREATING NEURALGIA, ETC.—Geo. L. Fearis, Connersville, Ind.
104,722.—WASH BOILER.—Benjamin G. Fitzhugh, Frederick, Md.
104,723.—GAS BURNER.—C. S. Ford (assignor to himself and Charles Young), Philadelphia, Pa.
104,724.—BOW FOR CARRIAGE TOPS.—J. F. Fowler, Alliance, Ohio.
104,725.—WASHING MACHINE.—Sam. C. Frink, Indianapolis, Ind.
104,726.—WATER WHEEL.—Olney Fuller, Bennington, Vt.
104,727.—MEDICAL COMPOUND.—George C. Furber, Yreka Cal.
104,728.—GRAIN CLEANER AND SEPARATOR.—Wm. Gardner, Catalpa, Ky.
104,729.—CORN PLOW.—Marcellus R. Goff, Delavan, Wis.
104,730.—COFFIN FASTENING.—Wm. Hamilton, Allegheny City, Pa.
104,731.—ELEVATOR.—William Hamilton, Allegheny City, Pa.
104,732.—NEEDLE SHARPENER.—Edgar K. Haynes, Boston, Mass.
104,733.—SHANK LASTER AND PUNCH.—Frederick Henderson, Marietta, assignor to himself and G. H. Bell, Portsmouth, Ohio. Antedated June 23, 1870.
104,734.—DEPILATING AND TANNING HIDES AND SKINS.—John Henry, New York city.
104,735.—ASH SIFTER.—Lewis G. Hoffman, Albany, N. Y.
104,736.—DUMPING MACHINE.—Geo. W. Hough and Wm. S. Hough, Galva, Ill.
104,737.—BURIAL CASE.—Ralph Hunt, Milford, N. J., assignor to D. M. Sprogle, Annapolis, Md.
104,738.—CAR BRAKE.—Reuben Hurd, Morrison, Ill.
104,739.—APPARATUS AND PROCESS FOR THE MANUFACTURE OF SOAPS.—Moses Hyde and Francis Hyde, Baltimore, Md.
104,740.—IRONING MACHINE.—William Jones, Oshkosh, Wis.
104,741.—TANNING.—James Kidder, Urbana, Ohio, assignor to himself and James F. Shumate.
104,742.—APPARATUS FOR ELEVATING BEER.—Albert H. Ladner and Thomas F. Fenlin, Philadelphia, Pa.
104,743.—TABLE CASTER.—C. H. Latham (assignor to Woods, Sherwood, & Co.), Lowell, Mass.
104,744.—ENGRAVING MACHINE.—John D. Lathrop (assignor, by mesne assignments, to Lippiatt, Maltby & Morse), New York city
104,745.—LANTERN.—Lemuel W. Leary, Norfolk, Va.
104,746.—ROTARY STEAM VALVE.—Geo. Leckenby, Western, Mo.
104,747.—SHEET-METAL CAN.—Joseph Le Comte and Geo. H. Perkins, Brooklyn, N. Y.
104,748.—FLAT OR SADIRON.—Luther Lincoln, Norton, Mass. Antedated June 9, 1870.
104,749.—DOOR LOCK.—Joseph Linder, Seneca Falls, N. Y.
104,750.—CAR COUPLING.—J. A. Mason, Keokuk, Iowa.
104,751.—LATHE.—F. B. Mattson, Rockford, Ill., assignor to himself and Wm. P. Dennis.
104,752.—STILL FOR SPIRITS.—Elijah Melton, Flemingsburg, Ky.
104,753.—CARPENTERS' PLANE.—C. G. Miller, Brattleborough, Vt.
104,754.—CULTIVATOR PLOW.—James G. Miner, Nashville, Tenn.
104,755.—PUNCHING MACHINE.—Charles S. Moseley, Elgin, Ill.
104,756.—SAFETY PINION FOR WATCHES.—C. S. Moseley, Elgin, Ill.
104,757.—DREDGING MACHINE.—Ralph Robert Osgood, Troy, N. Y.
104,758.—MEDICAL COMPOUND.—Edward Myers, Davis, Ill.
104,759.—BOILER-TUBE PLUG.—Robert L. Neill, Paterson, N. J.
104,760.—CASE FOR SCISSORS.—David B. Page, Henry, Ill. Antedated June 16, 1869.
104,761.—CLOTHES DRYER.—Asahel H. Patch, Hamilton, Mass.
104,762.—STREET-RAILWAY CAR TRUCK.—J. R. Perry, D. W Perry, and James Perry, Wilkesbarre, Pa.
104,763.—CULTIVATOR.—John Wesley Philip, Humboldt Tenn.
104,764.—TEAPOT.—Nathaniel Plympton, Boston, Mass.
104,765.—REFRIGERATOR RAILROAD CAR.—Joseph D. Potts, Philadelphia, and Benjamin P. Lamason, Milton, Pa., assignors to Empire Transportation Company.
104,766.—BOTTLE STOPPER.—Henry C. Pratt, Boston, Mass.
104,767.—WINDOW-SHADE RACK.—Joshua Pusey, Philadelphia, Pa.
104,768.—AUTOMATIC FAN.—David Ramler, Union Deposit, Pa.
104,769.—PUNCH.—Isaac P. Richards, Whitinsville, Mass.
104,770.—BAND SAWING MACHINE.—John Richards and W. H. Thorne, Philadelphia, Pa.
104,771.—STOVE AND FURNITURE LEG.—H. R. Robbins, Baltimore, Md.
104,772.—STEAM HEATER.—John J. Roeper, Philadelphia, Pa.
104,773.—HARVESTER CUTTER.—Francis E. Rogers, Paw Paw, Ill.
104,774.—INVALID BEDSTEAD.—A. J. Russell (assignor to himself and W. W. Rowles), Baltimore, Md. Antedated June 16, 1870.
104,775.—BREECH-LOADING FIRE-ARM.—Sven Rydbeck, Red Wing, Minn.
104,776.—IRONING MACHINE.—Alvah C. Sawyer, Canton, N. Y.
104,777.—MOLD FOR CAR WHEELS.—John K. Sax, Pittston, Pa.
104,778.—WOOD PAVEMENT.—Joseph J. Schroyer, Springfield, Ill.
104,779.—KNIFE FOR CUTTING SHEAF BANDS.—Henry Sears, and E. B. Sears, Rockford, Ill.
104,780.—MUFF.—R. M. Seldis, New York city.
104,781.—APPARATUS FOR BLEACHING PAPER STOCK.—Francis Sheiden (assignor to the Union Machine Company), Fitchburg, Mass.
104,782.—EXCAVATOR.—Benjamin Slusser, Sidney, Ohio.
104,783.—MILL GEARING.—Harlow M. Smith, Peoria, Ill.
104,784.—GRAIN-FANNING AND SEPARATING MACHINE.—J. I. Smith and W. H. Nicodemus, Frederick, Md.
104,785.—MANUFACTURE OF STEEL-HEADED HORSESHOE NAILS.—J. H. Smith, Allegheny City, Pa.
104,786.—PUMP.—P. M. Snell and Oscar Snell, Williamsburg, Ohio.
104,787.—BROOM HOLDER.—C. P. Snow (assignor to Sterne F. Aspinwall), Freeport, Ill.
104,788.—FRUIT DRYER.—George M. Sternberg, Fort Riley Kansas.
104,789.—FEED-WATER HEATER AND FILTER.—E. R. Stilwell, Dayton, Ohio.
104,790.—FLOOR CLAMP.—Oliver Taff, Whitestone, N. Y Antedated June 16, 1870.
104,791.—MEDICAL COMPOUND.—Wm. C. Tait, Alexandria, La.
104,792.—STEEL CAR WHEEL.—J. B. Tarr, Fairhaven, Mass. Antedated June 18, 1870.
104,793.—BRIDLE BIT.—Henry C. Thompson, Mount Sterling Ky.
104,794.—BOTTLE STOPPER.—Nathan Thompson, Brooklyn, N. Y.
104,795.—POTTERY MACHINE.—S. R. Thompson, Portsmouth, N. H.
104,796.—MANUFACTURE OF SOAP.—Joseph Treat, New York city.
104,797.—BORING MACHINE.—William Tucker, Fiskedale, Mass.
104,798.—INSTRUMENT FOR TESTING OILS.—Peter H. Vander Weyde, New York city. Antedated June 6, 1870.
104,799.—MACHINE FOR HULLING COTTON SEED, ETC.—A. J. Vandegrift, Covington, Ky.
104,800.—CHURN.—Stroud Van Meter, Henderson, Ill.
104,801.—HEATING STOVE.—C. E. Warring, Poughkeepsie, N. Y.
104,802.—HOT-AIR REGISTER.—Alfred Watson, Jersey City, N. J.
104,803.—EXTENSION LADDER.—Thomas Watson and Chas. Perry, Brooklyn, N. Y. Antedated June 23, 1870.
104,804.—TWEER.—Peter L. Weimer, Lebanon, Pa.
104,805.—LUBRICATING JOURNAL BEARINGS.—I. P. Wendell (assignor to himself and S. P. M. Tasker) Philadelphia, Pa.
104,806.—HARNESS.—Lewis Whitehead, Nunda, N. Y.

104,807.—COOKING STOVE.—J. B Wilkinson, Troy, N. Y.
104,808.—REED FOR LOOMS.—J. H. Williams, Pleasant Hill, Ohio.
104,809.—MOSQUITO-SCREEN FRAME.—W. W. Wooley, New York city.
104,810.—WASH BOILER.—Harrison Yost (assignor to himself and Henry Yost), Dayton, Ohio.
104,811.—FAUCET.—Emil Young, Cleveland, Ohio.
104,812.—EMERY SOAP FOR POLISHING AND CLEANSING.—D. D. W. Abbott (assignor to himself and Henry W. Peabody & Co.), Boston, Mass.
104,813.—FLOCK GRINDER.—Robert Aldrich, Forestdale, R. I., assignor to himself and E. D. Wilcox, Millville, Mass.
104,814.—REFRIGERTOR FOR CONDENSING VAPORS FROM FERMENTING VATS IN BREWERIES, ETC.—Lawrence Angster, Newark, N. J.
104,815.—METHOD FOR SECURING THE SEATS AND BACKS OF CHAIRS, SOFAS, ETC.—Lucas Baker, Templeton, Mass.
104,816.—FARE BOX FOR PASSENGER CARS.—Henry Baranger (assignor to himself and J. P. Bradley), St. Louis, Mo. Antedated June 16, 1870.
104,817.—MACHINE FOR PACKING FLOUR, ETC.—Wm. Bashor, Johnson City, Tenn.
104,818.—MACHINE FOR SCOURING AND WASHING FABRICS.—Wm. Bates and Frederick Bates, Sowerby Bridge, near Halifax, England. Patented in England, December 14, 1867.
104,819.—FULLING MILL.—William Bates and Frederic Bates, Sowerby Bridge, near Halifax, England. Patented in England, March 16, 1866.
104,820.—STEAM GENERATOR.—William Baxter (assignor to W. D. Russell and P. T. Speer), Newark, N. J.
104,821.—LUBRICATING JOURNAL.—Charles Bean, Providence, R. I.
104,822.—SPOON MOLD.—Luther Boardman and N. S. Boardman, East Haddam, Conn.
104,823.—DOOR KEY.—James Brady (assignor to the Branford Lock Works), Branford, Conn.
104,824.—HOLLOW METALLIC RIM OR FELLY.—S. R. Bryant, Waterford, Pa.
104,825.—FLUTING MACHINE.—Mary P. Carpenter, San Francisco, Cal.
104,826.—RUBBER ROLLER FOR WRINGERS, ETC.—D. H. Chamberlain, West Roxbury, Mass.
104,827.—RAKE ATTACHMENT FOR REAPERS.—M.C. Chamberlin, Plain View, Minn.
104,828.—METHOD OF LASTING BOOTS AND SHOES.—Wm. Chambers, Lynn, Mass.
104,829.—TEAPOT HANDLE.—Lucas C. Clark, Plantsville, Conn.
104,830.—MACHINE FOR GRINDING SAW TEETH.—Wm. Clemson, Middletown, N. Y.
104,831.—RUBBER ERASER.—M. D. Converse, London, Ohio, and F. A. Bates, Boston, Mass.
104,832.—BEE PROTECTOR.—J. Cory, Holden, Me.
104,833.—MUSIC-NOTE BLOCK.—C. J. Costello, Kingston, and John Costello, New York city.
104,834.—BROOM.—E. M. Crandal, Marshalltown, Iowa.
104,835.—DENTAL PIN.—Peter Crans, Jr., (Robert McKinley, Administrator), Philadelphia, Pa.
104,836.—FIREPLACE GRATE.—James A. Crawford, Newcastle, Pa.
104,837.—HOSE COUPLING.—Charles H. Cushman, Alexandria, Va.
104,838.—KEYHOLE ESCUTCHEON.—S. W. Drowne, Norwich, Conn.
104,839.—FRUIT JAR.—Timothy Earle, Valley Falls, R. I.
104,840.—BREASTPIN.—Theodore G. Eiswald, Providence, R. I.
104,841.—CORK PRESSER.—Jas. Ewing, New York city.
104,842.—HOT-AIR FURNACE.—M. G. Fagan (assignor to himself and A. C. Corse) Troy, N. Y.
104,843.—DRY DOCK.—G. H. Ferris, Brooklyn, N. Y.
104,844.—STOVE GRATE.—Lyman Gleason, Milford, Mass.
104,845.—TRACTION ENGINE.—Thomas F. Hall, Omaha, Nebraska.
104,846.—CORN HARVESTER.—George B. Hamlin, Williamantic, Conn.
104,847.—SAW FRAME.—Wm. Hankin, Williamsburgh, N. Y., assignor to himself and W. H. Hankin.
104,848.—SAFETY DUMPING CAGE FOR MINES.—W. Z. Hatcher (assignor to himself and W. L. Lance), Plymouth, Pa.
104,849.—ROCK DRILL.—W. Z. Hatcher and W. L. Lance, Plymouth, Pa.
104,850.—TOBACCO-PIPE MACHINE.—J. H. Hollely, Brooklyn, N. Y. Antedated June 17, 1870.
104,851.—FOLDING CHAIR.—F. M. Holmes, Boston, Mass.
104,852.—HARVESTER.—W. B. Johns, Georgetown, D. C., and W. J. Read, Cumberland, Md.
104,853.—PAPER-COLLAR BOX.—Salomon Kaufmann (assignor to Metropolitan Collar Co.), New York City.
104,854.—MACHINE FOR DISTRIBUTING FERTILIZERS.—J. F. Keller, Hagerstown, Md.
104,855.—DEEP-WELL PUMP.—H. K. Kenyon, Steubenville, Ohio, assignor to himself and Jarecki, Metz & Co.
104,856.—STEM-WINDING AND HAND-SETTING WATCH.—C. L. Kidder and F. A. Jones, Boston, Mass.; said Kidder assigns his right to said Jones. Antedated June 16, 1870.
104,857.—LANTERN GUARD.—Joseph Kintz, West Meriden, Conn.
104,858.—SECURING VENEERING TO WOOD.—W. H. Knight, Boston Highlands, Mass.
104,859.—CALL BELL AND SLOP BOWL.—Nathan Lawrence, Taunton, Mass.
104,860.—RAILWAY SWITCH.—G. W. Lee and J. A. Lafontaine, Barlow county, and A. L. Harris, Atlanta, Ga.
104,861.—WATER-PROOF SWEAT-BAND FOR HATS AND CAPS.—P. F. Lenhart, Brooklyn, N. Y.
104,862.—COMPOUND FOR PRINTERS' INK.—H. Loewenberg, New York city.
104,863.—MOVING CARRIAGE TOP.—O. E. Mallory, Batavia, N. Y.
104,864.—CARPET FASTENING.—J. J. Marki (assignor to himself and W. H. Lotz), Chicago, Ill.
104,865.—CONSTRUCTION OF PRISON WALLS.—Edwin May, Indianapolis, Ind.
104,866.—APPARATUS FOR CLEANING CESSPOOLS, VAULTS, PRIVIES, ETC.—W. C. McCarthy, Pittsburgh, Pa.
104,867.—BRIDGE.—David McCurdy, Ottawa, Ohio. Antedated June 17, 1870.
104,868.—BRIDGE.—David McCurdy, Ottawa, Ohio. Antedated June 17, 1870.
104,869.—BRIDGE.—David McCurdy, Ottawa, Ohio. Antedated June 17, 1870.
104,870.—MORTAR MILL.—John McIntyre, Syracuse, N. Y.
104,871.—SEWING MACHINE.—T. L. Melone, Mount Gilead, Ohio.
104,872.—WIRE CUTTER.—Edgar Murray, New York city, assignor to Henry Gerecke, Carlstadt, N. J.
104,873.—MANUFACTURE OF STEEL.—Charles Motier Nes, York, Pa.
104,874.—TONGUE HOLDER FOR DENTISTS.—F. M. Osborn, Port Chester, N. Y.
104,875.—HITCHING POST.—Josiah Oathoudt, Minneapolis, Minn.
104,876.—EQUALIZING BAR FOR RAILWAY CAR TRUCKS.—Addison Overbagh, Scranton, Pa.
104,877.—UMBRELLA.—T. B. Penicks, Philadelphia, Pa., and Joseph Heffly, Washington, D. C.
104,878.—MACHINE FOR CUTTING FAT, ETC.—Adolph Pfaff, Baltimore, Md.
104,879.—COMPOSITION AMALGAM FOR FILLING TEETH.—L. A. Plumb, Boston, Mass.
104,880.—FAUCET.—A. D. Puffer, Boston, Mass.
104,881.—SODA FOUNTAIN.—A. D. Puffer, Boston, Mass.
104,882.—SORGHUM STRIPPER.—D. A. Reid, Wayne township, Ind.
104,883.—HARVESTER ATTACHMENT FOR RAKING AND BINDING GRAIN.—H. A. Reid, Beaver Dam, Wis.
104,884.—SHAFT COUPLING.—P. W. Reinshagen, Cincinnati, Ohio.
104,885.—COAL SCUTTLE.—Henry S. Reynolds, New York city.
104,886.—SCRUBBER AND CLEANER.—Wm. G. Rhodehamel, Piqua, Ohio.
104,887.—MACHINE FOR MAKING COMPOSITION ROOFING.—I. L. G. Rice, Cambridge, Mass.
104,888.—STEAM ROAD VEHICLE.—Ira A. Sabin, Locust Lane, Pa.
104,889.—STOVEPIPE DAMPER.—David Saunders (assignor to himself and J. D. Pierce), Milwaukee, Wis.
104,890.—SHELVING FOR STORES.—W. E. Scott, Knoxville, Tenn.
104,891.—HORSE HAY FORK.—Geo. W. Shade, Shippensburg, Pa.
104,892.—SASH HOLDER.—Nathan Y. Shaw, Greenville, N.Y.
104,893.—COTTON-SEED SOWER.—Joseph Shearer, Timberville, Ill.
104,894.—SCALE FOR LAYING OUT SHOE PATTERNS.—Wm. Shell, Dayton, Ohio.
104,895.—FEED ATTACHMENT FOR THRASHING MACHINES.—D. F. Slane, Chillicothe, Ohio.
104,896.—ANIMAL TRAP.—Elonzo Sprague and Geo. C. Belt, Bridgeton, Ind.
104,897.—CAR BRAKE.—Joseph Steger, New York city.
104,898.—LAMP SHADE HOLDER.—Cornelius St. John, New York city, assignor to himself and James E. Underhill.
104,899.—LIFTING HANDLES FOR COFFINS, ETC.—T. M. Taylor, New York city, assignor to the Meriden Britannia Company, Meriden, Conn.
104,900.—DEVICE FOR OPERATING AWNINGS.—Andrew Thalhofer, South Bend, Ind.
104,901.—AXLE NUT AND AXLE.—Chauncey Thomas, Boston, Mass.
104,902.—IRON BRIDGE.—Lucius E. Truesdell, Warren, Mass.
104,903.—TASSEL HOOK.—Elisha Turner, Wolcottville, Conn.
104,904.—METHOD OF MANUFACTURING AXLE NUTS.—Sam'l Vanstone, Providence, R. I.
104,905.—WROUGHT-IRON COUPLING PIPE.—Samuel Vanstone, Providence, R. I.
104,906.—SCHOOL DESK SEAT.—A. S. Vorse, Des Moines, Iowa.
104,907.—RAILWAY CAR SPRING.—Richard Vorse, New York city.
104,908.—MANUFACTURE OF CAST PIPE ELBOWS.—John G. Weaver, Jr., Cincinnati, Ohio.
104,909.—COMBINED PISTON HEAD AND VALVE.—George Weinmann, Columbia, Ohio.
104,910.—BREAKING MACHINE.—James Davenport Whelpley, Boston, Mass.
104,911.—WINDOW FOR COAL STOVE.—Alex. White, Geneseo, Ill.
104,912.—CARTRIDGE.—Nathaniel Gilbert Whitmore, Mansfield, Mass., assignor to himself and Alfred A. Reed, Jr., Providence, R. I.
104,913.—PIPE WRENCH.—J. A. Wilcox, Rocky Hill, assignto himself and W. S. Wilcox, Hartford, Conn.
104,914.—IMPERMEATOR FOR STEAM ENGINES.—Henry Wilson, Stockton-on-Tees, Great Britain.
104,915.—TOOL FOR DRIVING GLAZIERS' POINTS.—Alfred Woodworth and E. W. Warren, Cambridge, N. Y.
104,916—PRESERVING WOOD.—A. B. Tripler, New Orleans, La.
104,917.—PRESERVING WOOD FOR RAILROAD TIES AND FOR OTHER PURPOSES.—A. B. Tripler, New Orleans, La.
104,918.—WIND WHEEL.—Charles H. St. Clair, New Orleans, La.
104,919.—STRAWBERRY HULLER.—Julia W. D. Patten, Washington, D. C.

REISSUES.

4,044.—SPIDER ARCH FOR BURNING BAGASSE.—John Amick, Ascension parish, La.—Patent No. 101,968, dated April 19, 1870.
4,045.—NON-CORROSIVE VALVE SEAT.—E. H. Ashcroft, Lynn, Mass.—Patent No. 81,576, dated Sept. 1, 1868.
4,046.—CORN MARKER, PLANTER, AND CULTIVATOR.—Elias Barto, Tiffin, Ohio.—Patent No. 89,843, dated May 11, 1869.
4,047.—COTTON GIN.—J. C. Du Bois, Millerton, Cal., assignee of John Du Bois.—Patent No. 20,051, dated April 27, 1858.
4,048.—PREVENTING THE CORROSION OF IRON EXPOSED TO WATER OR DAMPNESS.—Cornelius Godfrey, New York city, and Reuben Lighthall, Brooklyn, N. Y., assignees of Reuben Lighthall.—Patent No. 97,657, dated Dec. 7, 1869.
4,049.—WATER INDICATOR FOR BOILERS.—John D. Lynde, Philadelphia, Pa.—Patent No. 74,389, dated Feb. 11, 1868.
4,050.—APPARATUS FOR FILLING BOTTLES.—H. W. Putnam, Bennington, Vt.—Patent No. 33,602, dated Oct. 29, 1861.
4,051.—VINEGAR APPARATUS.—A. B. Strong, Ashtabula, Ohio.—Patent No. 97,987, dated Dec. 14, 1869.
4,052.—Division A.—FERTILIZER.—D. A. Ter Hoeven, Philadelphia, Pa.—Patent No. 79,160, dated June 23, 1868.
4,053.—Division B.—MANUFACTURE OF FERTILIZERS.—D. A. Ter Hoeven, Philadelphia, Pa.—Patent No. 79,160, dated June 23, 1868.
4,054.—FAUCET.—Wm. H. Trissler, Cleveland, Ohio.—Patent No. 102,624, dated May 3, 1870.
4,055.—Division A.—OVEN.—Joseph Vale, Beloit, Wis.—Patent No. 79,615, dated July 7, 1868; reissue 3,796, dated January 11, 1870.
4,056.—Division B.—OVEN.—Joseph Vale, Beloit, Wis.—Patent No. 79,615, dated July 7, 1868; reissue 3,769, dated January 11, 1870.

DESIGNS.

4,174.—PAPER BOX.—J. C. Bauer, New York city.
4,175.—ORNAMENTATION OF DISHES.—E. Bennett, Baltimore, Md.
4,176 and 4,177.—CARPET PATTERN.—Hugh Christie, Morrisania, N. Y., assignor to Israel Foster, Philadelphia, Pa. Two Patents.
4,178.—TRADE MARK.—Henry Fletcher (assignor to Fletcher Manufacturing Co.), Providence, R. I.
4,179.—FUR COLLAR.—John H. Kappelhoff and Samuel Rauh, New York city.
4,180 and 4,181.—CARPET PATTERN.—William Kerr (assignor to Israel Foster), Philadelphia, Pa. Two Patents.
4,182.—TRADE MARK.—Martin Landenberger, Philadelphia, Pa.
4,183.—COOKING STOVE.—Peter Low, Cleveland, Ohio.
4,184.—GATE.—Samuel Macferran and Elhanan Omensetter, Philadelphia, Pa., assignors to Samuel Macferran.
4,185.—SASH HOLDER.—J. H. Martin, Salem, N. Y.
4,186.—TRADE MARK.—Martin Landenberger, Philadelphia, Pa.
4,187.—STATUETTE.—Nicholas Mueller, New York city.
4,188.—PAIR OF STATUETTES.—Nicholas Mueller, New York city.
4,189 to 4,195.—IRON RAILING.—Elhanan Omensetter (assignor to Samuel Macferran), Philadelphia, Pa. Seven Patents.
4,196.—RAILING.—Elhanan Omensetter (assignor to Samuel Macferran,) Philadelphia, Pa.
4,197.—MOLD BOARD.—J. T. Wilson, Rochester, N. Y.

EXTENSIONS.

NON-ELASTIC BANDS FOR BALES OF COTTON AND OTHER FIBROUS MATERIALS.—Mary Ann McComb, of Memphis, Tenn., administratrix of David McComb, deceased.—Letters Patent No. 15,142, dated June 17, 1856.

ATTACHING PADS TO SADDLE-TREES.—James Ives, of Mount Carmel, Conn.—Letters Patent No. 15,077, dated June 10, 1856.

CARTRIDGE.—Edward Maynard, of Washington, D. C.—Letters Patent No. 15,141, dated June 17, 1865.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

MACHINERY FOR COMBING WOOL.—Michael H. Simpson, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing Aug. 31, 1870.

MANUFACTURE OF IRON AND STEEL.—Robert Mushet, Cheltenham, England, has petitioned for an extension of the above patent. Day of hearing Sept. 7, 1870.

OVENS.—Hosea Ball, New York city, has applied for an extension of the above patent. Day of hearing Sept. 7, 1870.

MACHINE FOR NOTCHING HOOPS.—Emily J. Lamson, of Weymouth, Mass., executrix of Daniel Lamson, deceased, has petitioned for the extension of the above patent. Day of hearing Sept. 7, 1870.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN ANNUAL CYCLOPÆDIA and Register of Important Events of the Year 1869, embracing Political, Civil, Military, and Social Affairs; Public Documents, Biography, Statistics, Commerce, Finance, Literature, Science, Agriculture, and Mechanical Industry. Volume IX. New York: D. Appleton & Company, 90, 92, and 94 Grand street.

This volume of a popular and well-known work, published annually, is of the usual size, and filled as usual with a large store of useful information. It is impossible that we should notice all the contents, but we observe that under the head of "Astronomical Phenomena and Progress," a very full account is given of the phenomena observed at different points during the eclipse of August 7, 1869. This department also contains a record of other interesting and important matters. The department of chemistry is not very complete, but contains some interesting articles and some useful practical applications of a novel kind. Of special interest are the articles on "Ammonium Amalgam," and the "Purification of Water by Chemical Ingredients." Under the head of "Metals," the most recent processes of manufacturing iron and steel are noticed. We find little or nothing upon engineering or mechanical industry. The tables and statistics are compiled with the usual care bestowed upon these things in this publication, and constitute the chief value of the present volume.

THE NEW ELEMENTS OF HAND RAILING. In Concise Problems, calculated to bring this most Useful Science within the reach of every capacity. By Robert Riddell, Author of "The Carpenter and Joiner," "Hand-Railing Simplified," etc. Illustrated with Forty Accurate Plates. Philadelphia: Claxton, Remsen & Haffelfinger. London: Sampson, Low & Co.

This is a large quarto—beautifully printed, illustrated, and bound—by a well-known, able, and popular writer who fully understands the subject he treats, and possesses the rare faculty of expressing himself with perfect clearness. The book is a valuable addition to technical literature, and will prove of great value to carpenters and builders.

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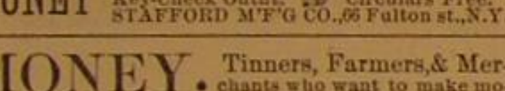
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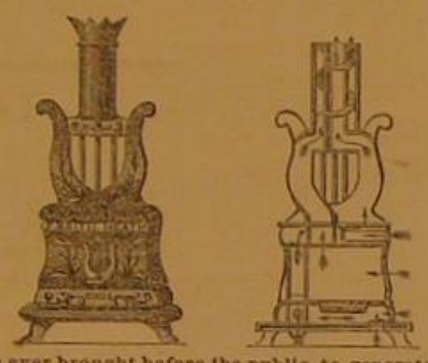
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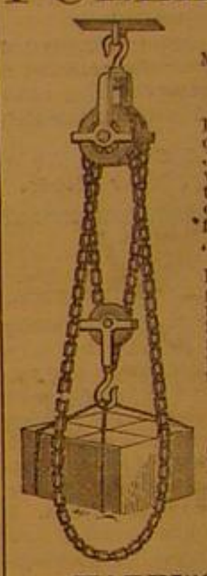
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T. A. Weston has never competed with Doyle's imitation Pulley for any Premium or Medal. Messrs. Hall's insinuation that they have taken premiums over Weston is contrary to the facts, like their assertions upon other points.
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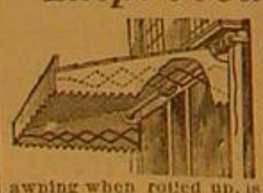
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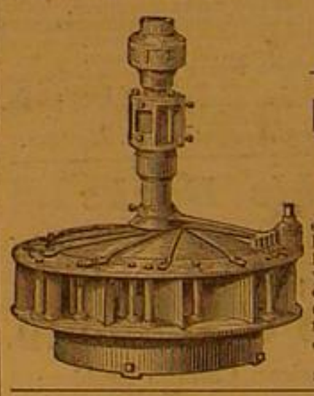
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SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 3. [NEW SERIES.]

NEW YORK, JULY 16, 1870.

$3 per Annum. [IN ADVANCE.]

MANUFACTURE OF ZINC OXIDE AND BARTLETT LEAD.

While the white lead of commerce is the pigment most extensively used, yet there has ever been an objection to it on account of its poisonous nature and tendency to darken from sulphurous fumes, and also of its carbonate to oxidize. In the endeavor for expedients to supplant it, the oxide of zinc was discovered. This pigment, though much whiter, has neither the body nor durability of the lead compound. Yet it is valuable for inside work, as being comparatively harmless and not liable to darken from the fumes of coal fires, etc., hence its use for almost all painting not exposed to the weather.

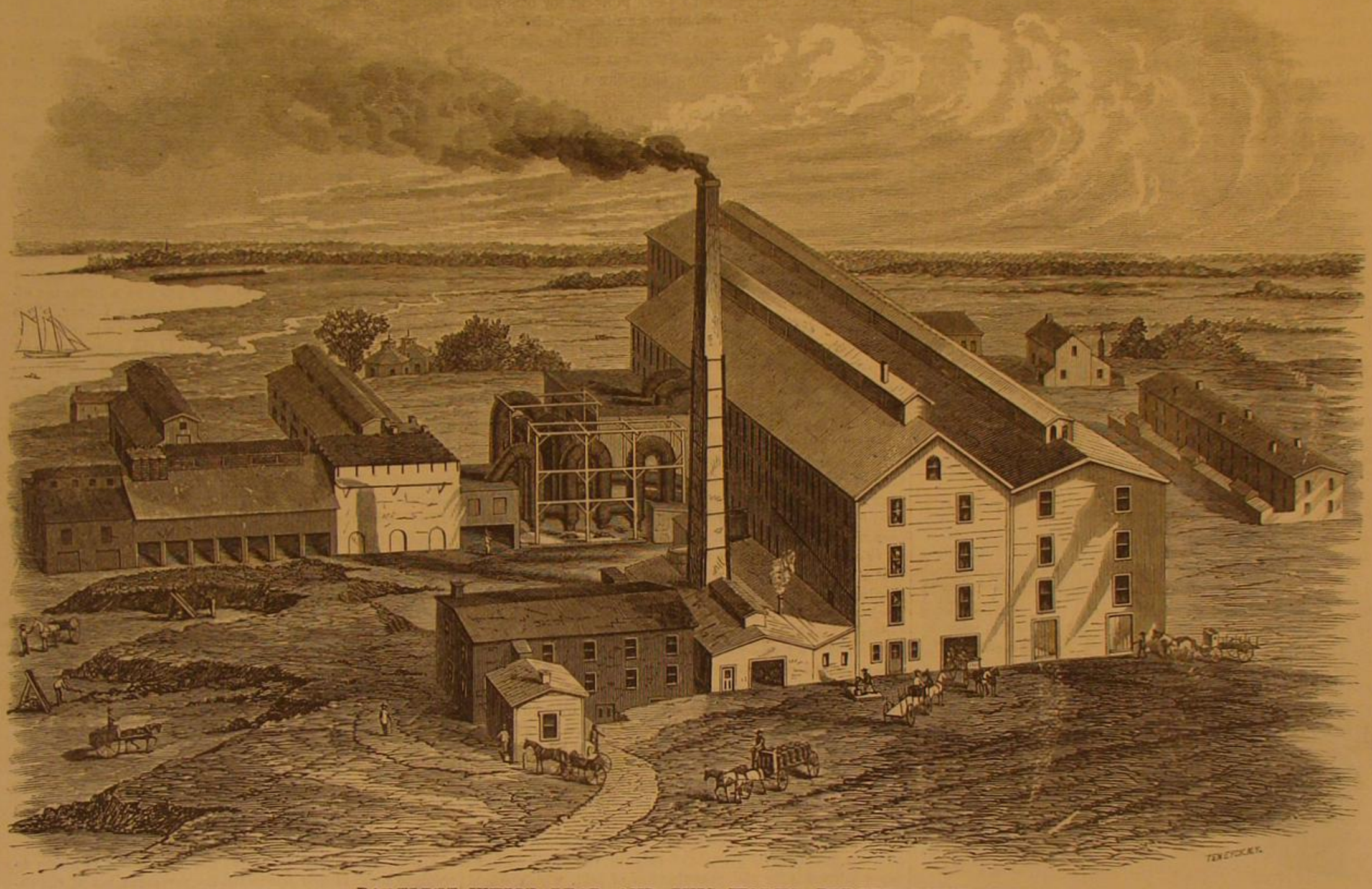
In chemical nomenclature there is but one oxide of zinc, which is composed of one atom of oxygen and one of zinc. It is a white powder with a slightly yellowish tinge. In its use as a medicine it is prepared by precipitation from solutions of the salts of zinc, or of pure zinc in dilute sulphuric acid. The precipitation is usually accomplished by carbonate of soda. The commercial article is made by a fire process. Muspratt states this last article to be "either anhydrous oxide, the hydrated oxide, or the hydrated basic carbonate of zinc." Certainly an ample range, yet it may be any one, or a combination of any two of them. It is not soluble in water, but is soluble in all the acids and under certain circumstances in the alkalies.

There are two varieties of the commercial article: the French, made from the metal; and the American, made from the ore direct. The first is intensely white. Both have the flocculent structure peculiar to the article which gave it the name of philosopher's wool. Under the microscope the oxide of zinc looks like a mass of small white rose leaves. An article made by the same process lately introduced to the trade and the scientific world, called the Bartlett Lead, has an entirely different structure, being amorphous. This seemed strange and was for some time disputed, but has been incontestably proved by numerous microscopic observations.

The invention of the process of manufacturing the oxide of zinc from the metal was made by Guyton de Morveau of France; its general introduction was due to Leblanc, and he first erected works for its production. His process is substantially the same as that now used in France.

The metal is put in retorts, and the flowery zinc is condensed in chambers or flues made of zinc wire gauze, to admit the passage of any injurious gases, air being admitted. The retorts are similar to those in use for the production of zinc metal, but the heat is much higher. The American system, for deriving the oxide direct from the ore, is accomplished in a furnace similar to a double reverberatory. The flowers are condensed in bags of woolen muslin.

To enable our readers, however, to more readily understand the interesting process of preparing the zinc oxide, we give herewith a series of illustrations of the Bartlett White Lead and Zinc Company's Works, situated at Bergen Point, N. J., the pigment of that company though, as we have stated, being entirely different from ordinary oxide of zinc, is yet made by the same process.



BARTLETT WHITE LEAD AND ZINC WORKS, BERGEN POINT, N. J.

Fig. 2

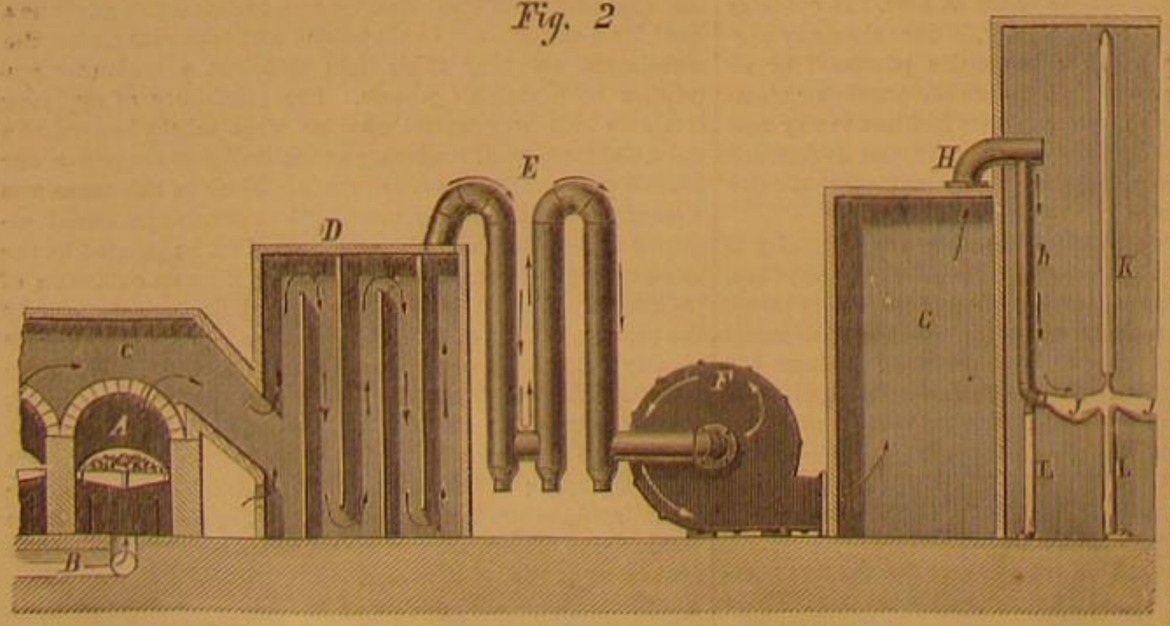


Fig. 3

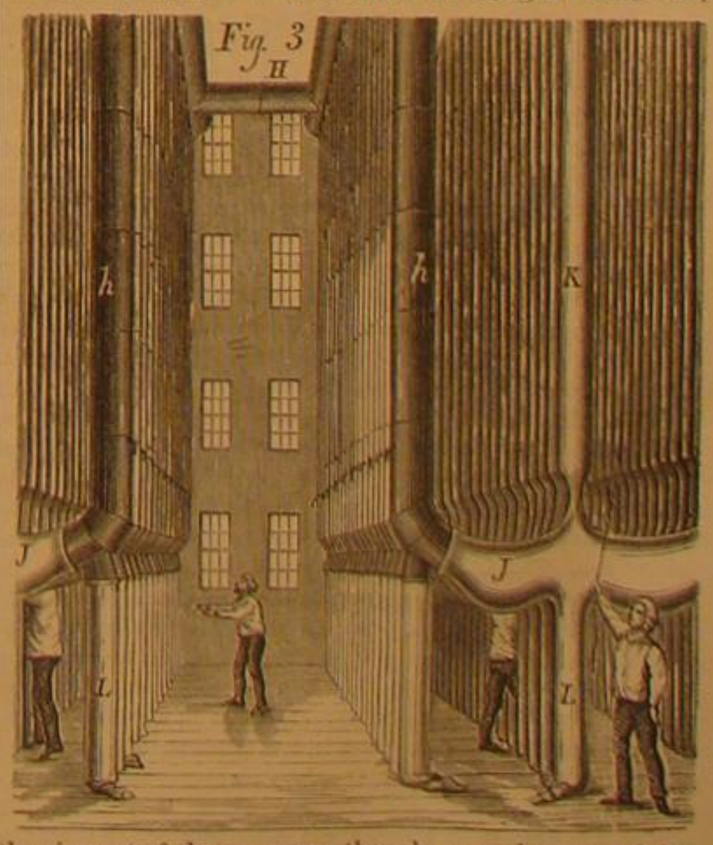


Fig. 1 is a bird's-eye view of the whole works, located between transportation by water on the Kill von Kull, and the

N. J. Central Railroad. The furnaces have a capacity for over 10 tuns a day, and are prepared to admit enlargement to twice that size.

Fig. 2 is a general section of the zinc works, showing the operation. A is the furnace ash-pit below; B is the flue or tweer for air blast; C is a flue between two furnaces.

The ore ground fine and mixed with its bulk or more of fine anthracite coal, is charged in A. It is first dampened by sprinkling with water. The fire and blast is then applied, and the process commences. The flue between the two furnaces serves to assist draft and also for passage of the vaporized metal. The furnaces of the Bartlett Company do not differ from any of the others, except being larger. Their ore, too, is different.

D is a chamber with partitions alternating from top or bottom, for checking passage of vapor and for settling any ash or coal which may be drawn over. Nearly pure oxide of lead sometimes collects in this chamber at the Bartlett Works.

E—Large iron pipes for cooling the vapor and gases.

F—Exhaust fan. This fan draws the vapor from the furnaces and forces it forward to the bags.

G—Large brick chamber for cooling and distributing the oxide.

H—Pipe to bag room.

h—Pipes in bag room.

The course of the oxide and gases is shown throughout by the arrows. The process is simple. Man throws in the material, and nature does the work with two of her great elements—fire and air. At one time the oxide was made to pass through a water spray, but this was abandoned at the Bartlett Works for some reason.

Fig. 3 is a view of the bag room, in which the oxide vapor is condensed, with its great tall rows of ghost-like flannel bags.

H *h*—Iron induction pipes, as seen in Fig. 2.

J—Balloons of flannel.

K—Flannel bags in which the oxide is collected or sublimated.

L—Bags for receiving the oxide shaken from bags above.

This room is constantly filled with more or less carbonic acid from the coal, and hence has very free ventilation. The bags alone in this room cost over $20,000, and it has size enough to condense 20 tuns of oxide per day. The engine which furnishes power is an excellent one from the Washington Iron Works, and the whole establishment, built two years ago, is excellently managed by Col. Charles Stebbins, General Director, and Dr. Johnson, Superintendent and Chemist.

Fig. 4.

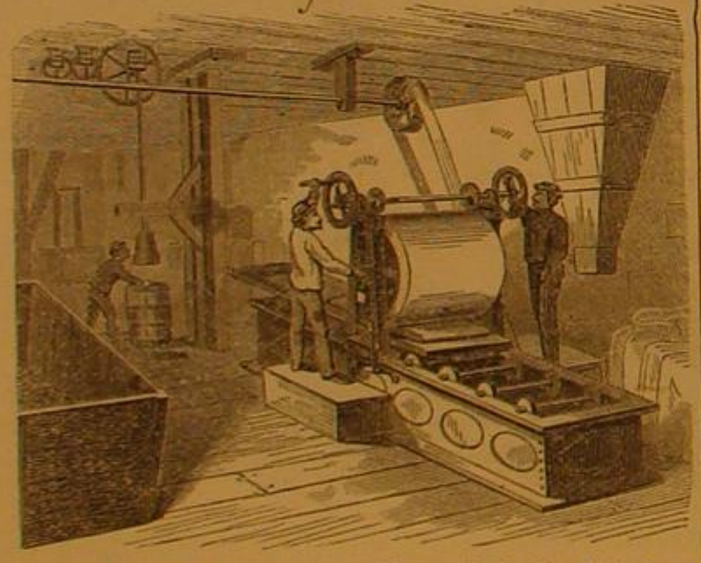


Fig. 4 is the packing room. The oxide is placed in bags and rolled in the machine shown—thence packed in barrels.

The invention of the American machinery marks an era in the history of the zinc trade of the world. The article produced is not so white as the French, yet the Lehigh Company have produced nearly as good a product from the carbonates and silicates of Pennsylvania.

The New Jersey Zinc Company was the first started in this country. They commenced operations in 1848. Their history is one of struggles and failures, but perseverance triumphed. They commenced with the retort process, and it is said made oxide which cost them $1 a pound. In 1850, disheartened, the stockholders were thinking of abandoning the enterprise, when the present style of furnace was erected by Mr. N. Bartlett, and the bag condensers invented by S. F. Jones. A new impetus was given to the business, and the trouble then was not to make the oxide, but to dispose of it after made. Two barrels of the first made were sent to the World's Fair of 1851. Now there are nine zinc companies at work in the United States, and the New Jersey alone produce about 5,000 tuns a year, of which nearly two-fifths is exported to Europe. Their profits have been immense, and the stock has sold, since the flush times of the war, as high as 200 per cent above par. The Lehigh Company was started in 1854.

The New Jersey Company use an ore of zinc and iron and manganese, called Franklinite, of which they control a large deposit. The carbonates and silicates of zinc are used by the Lehigh Company, but they are scarce of ore. This ore abounds in Virginia and Tennessee, and in the latter State works have been erected to use it, but as bituminous coal will not answer for the furnaces, they are at disadvantage in distance from anthracite.

The fire process by which these pigments are produced is very similar. The ores yield variously, that of the Bartlett Company nearly twice as much as the others. The product collected farthest from the furnace is the whitest. That falling in the cooling chambers is usually worked over.

It is only within two years past that it has been found practicable to use the most abundant ore of zinc, the sulphuret, called in mining parlance "black-jack." The use of this ore was made the subject of a patent, granted the Bartlett Lead and Zinc Company in October, 1868. A peculiar pigment was thereby produced, to the structure of which we have alluded. The properties of the pigment made by this company may be due in a great measure to the ore used, which is *sui generis*, as the ordinary "black-jack," while producing a pigment containing lead, certainly does not have it in near equal proportions, or the same chemical form.

This pigment probably deserves more than a passing notice. It is made from an argentiferous galena ore containing zinc, found in North Carolina. It contains about $15 of gold and silver to the tun of ore. Until lately the ore was "buddled" and concentrated; for ten tuns of raw ore one of concentration was obtained. This yielded from $150 to $225 in gold, silver, and lead. The rest of the 10 tuns was roasted in a peculiarly constructed furnace to get rid of sulphur, and then brought to Bergen Point, N. J., opposite New York, and oxidized. The owners found that their process of concentration did not get near all the lead or silver, and doubting whether it would not be better to improve their pigment by using the fresh ore merely roasted, without concentration, tried the experiment with such success that now they have abandoned the concentration, and produce a pigment containing over 40 per cent of lead, and weighing 500 pounds to the barrel—flour barrel size—same as would hold about 200 pounds of ordinary oxide of zinc, or 600 pounds of white lead. It has been rather a matter of dispute in what form this lead is contained. That it is an entirely new form all admit. Our theory is this: The roasted ore as received from the mine contains a certain percentage of basic sulphates, these are set free by the fire-heat; the lead is also oxidized and goes over as a peroxide, the zinc in its usual form; the sulphur of the sulphates is set free as sulphurous acid, this unites with peroxide of lead and forms a new character of sulphate, not being enough sulphurous acid to take up all the lead, the remainder, assuming its acid character, unites with the zinc as a *plumbate of the oxide*. Our theory is one derived from practical observation of the pigment from its first production.

This pigment was introduced to the public about two years ago by Messrs. C. T. Raynolds & Co., the oldest and one of largest paint houses in America, and though a new article, hence meeting with much opposition, while at the same time its singular nature was not understood, it has met with great favor and is firmly making its way into general use. And we are informed that Messrs. C. T. Raynolds & Co. sold in 1869 over 1500 tuns. It is claimed for it that it has more body and greater durability than white lead, and will not peel off as does zinc oxide. Its peculiarities are that when mixed with oil or spirits of turpentine it does not settle as other paints; that a building painted with it bleaches whiter instead of turning yellow; that when mixed and exposed to the air it thickens, and it has a peculiar gloss unknown in any other pigment. At least some of these peculiarities may be due to the fact that a large part of its oxygen is in the form of ozone.

The works of the company, of which we give a bird's-eye view, have now a capacity for production of over 10 tuns of pigment per day. The mines in North Carolina have been repeatedly pronounced inexhaustible by the most competent scientific and practical authorities. We occupy this much space with this pigment because we think, as with the first production of zinc oxide, that its introduction marks an era in the paint manufacture of this country.

It is singular that while the ore from their mines contains an average of over 30 per cent of sulphur, the company have never utilized it for the manufacture of acid, which would add greatly to their profits. In England such an ore would be worth $12 to $15 per tun for the sulphur alone.

As a paint, zinc oxide is generally used for inside work. For nice work of this kind French zinc ground in poppy oil alone, or in poppy oil and thinned with white Damar varnish is used; this last is classed by the trade as China Gloss, Enamel Finish, etc. American zinc is chiefly in use as an adulterant of white leads, and the production of a class of pigments called cheap "leads," which are mere mixtures of sulphate of baryta, zinc, and more or less—sometimes no—white lead. The Bartlett Lead is an inseparable mixture of some form of lead and the anhydrous oxide of zinc. It contains from 30 to 40 per cent of the former, is finer than any pigment known, and has peculiar properties possessed by no other pigment. It has now been before the public for about two years, and barring the disadvantages incident to any new article, has met with almost universal favor, and is increasing in popularity. It is a singular product and emphatically a new discovery in science and the manufactures.

The capital employed in this business in this country is over $12,000,000, and the annual product about 15,000 tuns. The Works of the Vielle Montaigne Company are very large, and are chiefly located in Belgium. The production of metal zinc is, however, a great part of their business. About 450 tuns were imported in 1869. The American article ranges in price from 6 to 8 cents per pound; the French sells at about 9½, gold. The duty is 1¼ cents per pound.

STEAM ON COMMON ROADS.

[From the Engineer].

What is the true reason that we nowhere see the steam engine used to any great extent for common road traffic? There is probably no problem in the whole range of practical mechanics, and there is certainly no other problem in steam engineering which has taxed ingenuity so long, so much, and yet with such comparatively slight results. Almost innumerable inventors, dating from Cugnot, have been trying their hands at it for more than a century. It is true that their work has not been without some fruition. Steam traction engines now carry themselves and their plowing tackle in farm operations; they are used for drawing heavy loads for short distances on special bits of road; but that is nearly all. Road engines have never yet found general application in England; and, after many different trials at various times, they have almost completely failed in France, in Germany, and America. The multiplicity of the proposals and attempts in this direction is remarkable. We have Savery, and later Dr. Robinson, ten years before Cugnot's trial, proposing the thing. Then Oliver Evans; in 1784 Watt patented the application of his engine to the purpose; William Symington tried it; and afterwards Murdoch. Oliver Evans actually propelled an engine of some size. The most ingenious attempts were made by Trevithick; and, after him, by Gurney, Gordon, Ogle, Dr. Church, and Dietz in France. The curious, and perhaps significant, point about the history of these attempts is that the principal ones were renewed with an interval of a generation between each. Thus, after the first schemes in 1759–69, we find Trevithick working in 1802–4; Gordon, Church, and many more in 1832–6; and, lastly, Boydell, Aveling, and others, from 1855–65. We now have another ingenious plan, but, in spite of all that we have lately heard from Edinburgh about Mr. Thompson's road steamers, we are not inclined—while we wish him every success—yet to make an exception in his favor. In the first place, they have not worked long enough; and, in the second, we do not know the proportion that the excellent roads in and about Edinburgh have contributed to his success. In fact, isolated cases of the partial success of steam power on common roads can generally be traced to the good state of the roads in the given locality.

Trevithick, the greatest genius among traction engine inventors, seems at first to have even believed that "railroads are useful for speed and for the sake of safety, but not otherwise; every purpose would be answered by steam on common roads which can be applied to every purpose a horse can effect." In this there is, of course, an evident fallacy. The only reason that greater speed is obtainable on a pair of rails, with a locomotive and its train, than if the locomotive and train were put on a road without rails, is that the rail offers a hard, smooth, unyielding surface, and that the ordinary road offers a soft, rough, and yielding surface. If we took an ordinary train of a locomotive and carriages, turned the flanges off the tires, and placed them on an iron road, made with one smooth level surface—one long metallic table, in fact—we could evidently get the same speed on such a road—which we may suppose perfectly straight and sufficiently wide to get over the difficulty of our want of flanges—as on an ordinary line of railway. As soon, therefore, as a locomotive and train were got to run on rails, it might have been seen clearly that the locomotive steam engine did not want improving, but that, in order to put steam power on roads, it was the roads that wanted improving. In fact, only a year or so after his patent for 1802, Trevithick came to the conclusion that steam carriages could not be placed on common roads before common roads were radically improved and rendered able to bear heavy loads without giving way and increasing the draft to an impracticable amount. Some of the more able later inventors of traction engines saw this, more or less clearly, and attempted to make the engine carry its own railway, though we are not aware that even Boydell's traction engine and endless railway are now anywhere in practical use. After making the most successful road traction engine of any, we now see Messrs. Aveling and Porter taking the lead in the production of steam road rollers.

Briefly, the whole future of the application of steam to common roads clearly lies in the improvement, not of the engine, but of the road. In the same way as rails must be laid down before running the locomotive, so must common roads be rendered able to bear heavy weights, and have given them a hard, level surface, one approaching as nearly as possible that of the rail table. The nearer this condition of hardness is approached, the more extended will be the use of steam on common roads.

These premises being granted, the solution of the old problem of applying steam to common roads is simply to be found in the general use of the steam road roller. The steam roller must precede the steam traction engine. Experience shows that this process of road-making and maintenance gives us a hard level surface, not liable to sink and take ruts under the wheels, and affording more than sufficient adhesion for propulsion with smooth wheels. The possibility of applying steam in this way would give us what might be termed a universal tram-road, rendering available for steam power our 200,000 miles of macadamized roads. Much in this sense was a passage in a late public speech of such an experienced engineer as Sir Joseph Whitworth, in which he pointed to the improvement of common roads rather than an extension of tramways. The roads are there, and their improvement by the process, instead of involving an outlay of capital, actually greatly reduces the cost of their maintenance. In our especial case the employment of an engine on common roads, able to move about with facility, also means the application of steam to the conveyance of stone from the various deposits along the road; to breaking it up and taking it to the required spots before rolling it down. Of extraordinary value would these applications of steam be in countries with such dear labor as that of America.

THE *Coach Maker's International Journal* suggests that if some inventive person could get up some better, simpler and neater arrangement for finishing the side lights in leather carriage tops, a good chance to "make stamps" would result to the inventor.

IS MAN A FEEBLE ANIMAL?

[From the London Spectator].

Glancing the other day over the Duke of Argyll's essay on "Primeval Man," it struck us, as it had often struck us before, that a little too much is made now-a-days of man's feebleness as a mere animal. We do not believe he ever was one, and the Duke's argument, that if he was one, he would have got stronger, and not weaker, is unanswerable; but his feebleness does not disprove the theory of his animal origin quite so conclusively as civilized writers, who know they could not get their living if turned naked in the fields, have a tendency to assume. That man, apart from his special intelligence, is one of the weakest of all animals for aggression is no doubt correct, he being almost the only beast of his size who has been left by nature totally unarmed. He has neither claw nor horn nor jaw capable of rending, nor hoof nor paw that of itself and untrained can strike a deadly blow; the natural man being, it is believed, with a possible reservation as to one or two tribes of negroes, entirely unaware of the power latent in his own fist, and striking always with the hand unclosed. But for defense, man in his savage state is probably as well provided as any but the most formidable beasts of prey. He certainly could not fight a tiger or a lion or a panther or an elephant, but it is by no means clear that he could not run away, and as he is one of the swiftest of animals, would probably escape. He is, however, possessed of a faculty, given to no other beast which can run as fast, of climbing up a tree. In a state of civilization he almost entirely loses this faculty, but in the savage state it remains almost unimpaired. An Eton boy can climb in a way, as he can go up a ladder, but a savage will go straight up a smooth pole, using his feet as if they were a second pair of hands, and crossing from tree to tree with a facility which, to the highly educated naturalist watching him, seems at once marvelous and degrading. *He* could not do it, because he has not only lost the use of his feet, partly from using shoes, partly from reliance on his hands and his intelligence for everything, but he has lost the power of looking downwards unconcernedly from a "giddy" hight, a power belonging to all savages, and, as we suspect, from some facts observed among Hindoos, to all men who neither eat meat nor drink alcohol. At all events, Hindoos untrained to the work will walk unconcernedly along walls thirty feet high to inspect workman, where any white man similarly untrained would turn sick and fall. A wild beast would not have an easy prey of an animal who could run a short distance as fast as an ordinary horse, who could climb like a squirrel, and who could swim as no other land animal can.

Nothing not amphibious swims like a man, not even a Newfoundland dog. Kanakas have been met fifteen miles out of sight of land, and can keep in the water six hours at a time, and there is at least a strong probability that a naked race, living, say, by a great lake, would acquire the facility which the South Sea Islanders under the same circumstances even now display. We suppose we must not urge the idea so strongly pressed by Hawthorne, in that astonishing exhibition of genius and weakness, *Transformation*, that man in his natural state would attract instead of repelling many animals—that dogs, for instance might have been friendly, and not hostile—for no such instance of alliance is known among the higher mammals, and there is doubt if the marmot and owl of the prairie are as friendly as they seem to be; but still we do not quite see why the mammal Homo should not have survived in the contest for existence as well as the monkey, who flourishes indifferently well in jungles frequented by the tiger, the boar, and the boa constrictor. He must be allowed on any fair theory to have at least a beast's intelligence, and that would teach him to combine for many purposes as monkeys, and wolves, and beavers do, to attend to any signal of danger as a stag does—for though man has no scent, he has an intense capacity of hearing—and even to set sentinels, a "faculty," whatever its origin, which belongs, it is believed, to many animals, and is exercised every day, as all naturalists will testify, by rooks. To deny to man as an animal the faculties of a rook is a gratuitous depreciation of his rank in nature not warranted by any evidence. We do not quite see either how scientific speculators should deny him so absolutely a right to use a weapon. He must have had a hand to hold one, and why deny him the instinct to use it?

The Duke of Argyll says that no animal save man ever employs an instrument to realize any object, but that is not the case. The only animal with a hand, so to speak, the elephant, will break off a branch to switch himself with when annoyed by insects. The idea, again, that in his early struggles man must have been liable to assault by much bigger animals than any now in existence may be true, but if true, is not germane to the speculation. The imaginative horror of that situation would not strike an animal, and the mastodon is no larger in proportion to man than the elephant in proportion to the little monkeys who, nevertheless, live in the jungle with him very comfortably.

Then it is argued that the extreme length of the period of childhood in man must have greatly enfeebled him in the struggle, and no doubt the length of that period is one of the most curious of many distinctions between man and all other mammals. He is not the longest-lived of them, but he takes much the longest time to grow. But in practice, we imagine, conceiving as far as one can the position of the human being without intellect, the effect of that sort of weakness would only be this—that the female's whole work in a natural state would be the care of her young, a necessity not imposed on any other animal, and accompanied apparently by this peculiarity, that in man almost alone—not quite alone—is the female decidedly the inferior of the male in strength and courage. We suppose our friends of the women's rights movement will allow that, even though they may think the inequality curable; but at all events, that is found to be the fact in all extremely savage races, with the possible, and only possible, exception of a single negro clan. It would almost seem, therefore, as if this kind of weakness had been met by a provision which counteracted it at the cost of a certain diminution of the defensive power, the female being comparatively useless in combat, a diminution, however, true of at least one other species which has lived—the stag. The similar weakness at the other extremity of life is not peculiar to man, and would make but little difference in the struggle, being equivalent, in fact, at the worst, to a universal deduction from natural longevity. The human race would die at fifty instead of seventy, and would even then be among the longest-lived of the mammalia. The want of clothes or of fitting food, which seems to the civilized writer so dreadful, is apparently no reason for extinction. An immensely large section of humanity, probably a clear half, does not wear clothes in any way conducive either to health or protection. The waist-cloth of the Indian peasant is assumed from motives of decency, not of hygiene; the naked castes, faquirs, muhunts, etc., do not suffer in health; and the negro, who wears nothing, is supposed by many observers to be exceptionally long-lived. Two races at least, the Tasmanians and the Fuegians, face severe cold without clothes, and it must not be forgotten that in tropical climates cold seems to strike as severely as in the temperate zone. The fall in the thermometer is comparatively as great and the suffering as acute. The question of food is more puzzling, but is not quite insuperable. Half the difficulty would disappear if man had no disgusts, which as an animal he would not have. If we suppose him remaining in the mild climates as long as he could, he would have fish, and the flesh of small animals and birds, and berries and fruit and some leaves, and may be credited with instinct equal to that of the dormouse, which lays in a stock against bad weather. That he could multiply enormously under such conditions is of course not possible; but then it is not a thick population, but a population which science desires to prove. It would not, it must be remembered, on this hypothesis, be diminished by disease any more than any animal population: it might not be seriously menaced by attack, for there are whole regions, like Australia, without wild animals, which—as we may see by the example of Palestine—do not multiply merely because of the absence of men; and it would not be thinned off much by war. War is said to be a natural state, but if we are to suppose man merely a gregarious animal, we must assign him the instincts of his kind, among which war in any true sense of that word cannot be counted. A horse will fight a horse, but he does not attack him persistently because he is a horse; and the only animal believed to make war on human principles, that is, in combination and for territory, the dog of Constantinople and Alexandria, leaves off the moment his adversary quits the special dominion he has invaded.

We rather doubt if man's weakness as an animal is a sound argument against development, and we do not see that it is needed. It is far easier and more satisfactory to fight the battle upon higher ground, and call for evidence to explain upon any materialist theory the unique position of man as the only being with accumulative intelligence. Where and when, if he ever was an animal, did he part company with his kind? as it is acknowledged by all observers that he has parted company; and why is there no trace of any other animal who has made a similar advance, if not in degree, then at least in kind? The true argument against the development theory is not the impossibility of the development of a hand, but the total want of evidence for the development of a mind—the admitted existence of a chasm between the lowest savage and the highest brute which even the imagination is unable to cross.

RESEMBLANCES AMONG ANIMALS.

[From Wallace on "Natural Selection."]

There is a general harmony in nature between the colors of an animal and those of its habitation. Arctic animals are white, desert animals are sand-colored; dwellers among leaves and grass are green; nocturnal animals are dusky. These colors are not universal, but are very general, and are seldom reversed. Going on a little further, we find birds, reptiles, and insects, so tinted and mottled as exactly to match the rock, or bark, or leaf, or flower, they are accustomed to rest upon—and thereby effectually concealed. Another step in advance, and we have insects which are formed as well as colored so as exactly to resemble particular leaves, or sticks, or mossy twigs, or flowers; and in these cases very peculiar habits and instincts come into play to aid in the deception and render the concealment more complete. We now enter upon a new phase of the phenomena, and come to creatures whose colors neither conceal them nor make them like vegetable or mineral substances; on the contrary, they are conspicuous enough, but they completely resemble some other creature of a quite different group, while they differ much in outward appearance from those with which all essential parts of their organization show them to be really closely allied. They appear like actors or masqueraders dressed up and painted for amusement, or like swindlers endeavoring to pass themselves off for well-known and respectable members of society.

What is the meaning of this strange travestie? Does nature descend to imposture or masquerade? We answer, she does not. Her principles are too severe. There is a use in every detail of her handiwork. The resemblance of one animal to another is of exactly the same essential nature as the resemblance to a leaf, or to bark, or to desert sand, and answers exactly the same purpose. In the one case the enemy will not attack the leaf or the bark, and so the disguise is a safeguard; in the other case it is found that for various reasons the creature resembled is passed over, and not attacked by the usual enemies of its order, and thus the creature that resembles it has an equally effectual safeguard. We are plainly shown that the disguise is of the same nature in the two cases, by the occurence in the same group of one species resembling a vegetable substance, while another resembles a living animal of another group; and we know that the creatures resembled, possess an immunity from attack, by their being always very abundant, by their being conspicuous and not concealing themselves, and by their having generally no visible means of escape from their enemies; while, at the same time, the particular quality that makes them disliked is often very clear, such as a nasty taste or an indigestible hardness. Further examination reveals the fact that, in several cases of both kinds of disguise, it is the female only that is thus disguised; and as it can be shown that the female needs protection much more than the male, and that her preservation for a much longer period is absolutely necessary for the continuance of the race, we have an additional indication that the resemblance is in all cases subservient to a great purpose—the preservation of the species.

In endeavoring to explain these phenomena as having been brought about by variation and natural selection, we start with the fact that white varieties frequently occur, and when protected from enemies show no incapacity for continued existence and increase. We know, further, that varieties of many other tints occasionally occur; and as "the survival of the fittest" must inevitably weed out those whose colors are prejudicial and preserve those whose colors are a safeguard, we require no other mode of accounting for the protective tints of arctic and desert animals. But this being granted, there is such a perfectly continuous and graduated series of examples of every kind of protective imitation, up to the most wonderful cases of what is termed "mimicry," that we can find no place at which to draw the line, and say—so far variation and natural selection will account for the phenomena, but for all the rest we require a more potent cause. The counter theories that have been proposed, that of the "special creation" of each imitative form, that of the action of "similar conditions of existence" for some of the cases, and of the laws of "hereditary descent and the reversal to ancestral forms" for others—have all been shown to be beset with difficulties, and the two latter to be directly contradicted by some of the most constant and most remarkable of the facts to be accounted for.

The important part that "protective resemblance" has played in determining the colors and markings of many groups of animals, will enable us to understand the meaning of one of the most striking facts in nature, the uniformity in the colors of the vegetable as compared with the wonderful diversity of the animal world. There appears no good reason why trees and shrubs should not have been adorned with as many varied hues and as strikingly designed patterns as birds and butterflies, since the gay colors of flowers show that there is no incapacity in vegetable tissues to exhibit them. But even flowers themselves present us with none of those wonderful designs, those complicated arrangements of stripes and dots and patches of color, that harmonious blending of hues in lines and bands and shaded spots, which are so general a feature in insects.

It is the opinion of Mr. Darwin that we owe much of the beauty of flowers to the necessity of attracting insects to aid in their fertilization, and that much of the development of color in the animal world is due to "sexual selection," color being universally attractive, and thus leading to its propagation and increase; but while fully admitting this, it will be evident from the facts and arguments here brought forward, that very much of the *variety* both of color and markings among animals is due to the supreme importance of concealment, and thus the various tints of minerals and vegetables have been directly reproduced in the animal kingdom, and again and again modified as more special protection became necessary. We shall thus have two causes for the development of color in the animal world, and shall be better enabled to understand how, by their combined and separate action, the immense variety we now behold has been produced. Both causes, however, will come under the general law of "utility," the advocacy of which, in its broadest sense, we owe almost entirely to Mr. Darwin.

A more accurate knowledge of the varied phenomena connected with this subject may not improbably give us some information both as to the senses and the mental faculties of the lower animals. For it is evident that if colors which please us also attract them, and if the various disguises which have been here enumerated are equally deceptive to them as to ourselves, then both their powers of vision and their faculties of perception and emotion, must be essentially of the same nature as our own—a fact of high philosophical importance in the study of our own nature and our true relations to the lower animals.

DYEING HORN BLACK.—According to C. Burnitz, of Stuttgart, horn may be dyed black by a cold process in the following way: The horn is first to be soaked in a solution of caustic potash or soda, until the surface is a little dissolved, and feels greasy. Then the article is to be washed and treated with Lucas' aniline black, after which it is to be slowly dried and again washed. By exercising a little care, we read that combs with fine teeth may be dyed in this way. The articles look of a dark brown color by transmitted light, but seen by reflected light they are deep black.

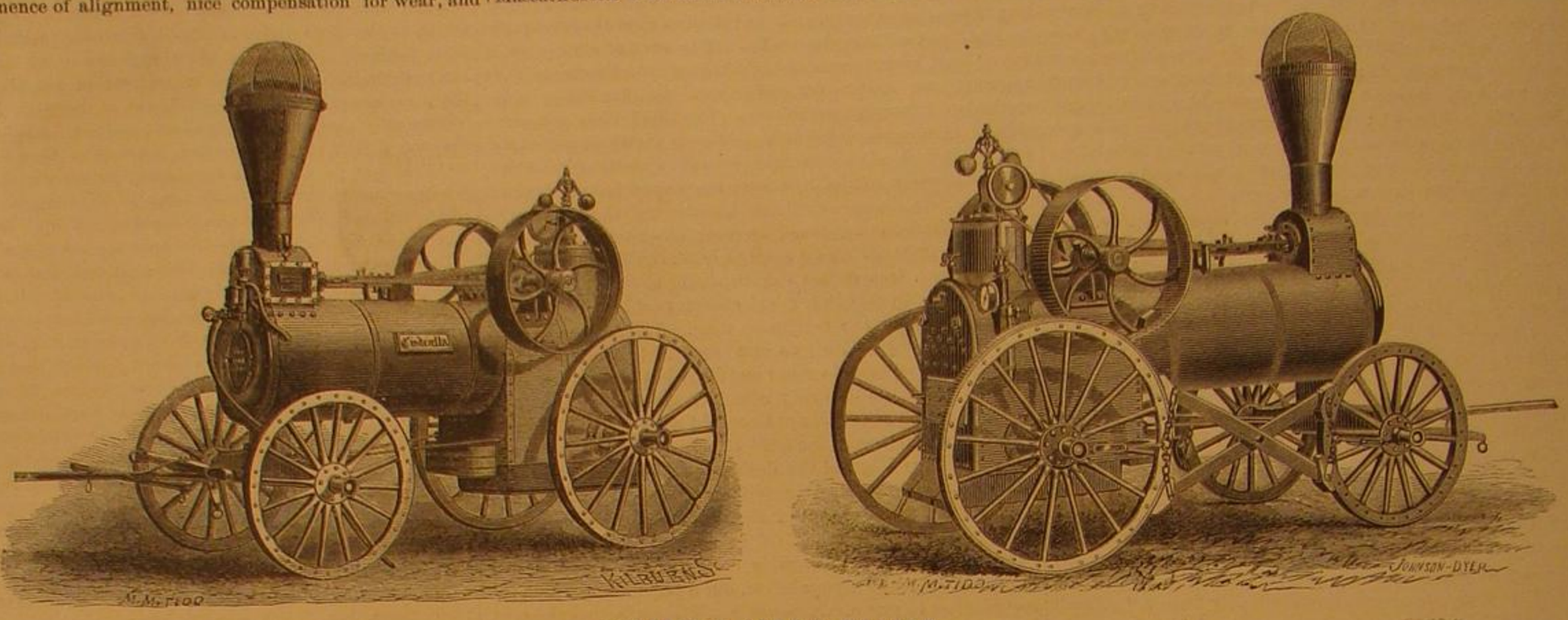
THE phosphorescent light of the sea is caused by a microscopical animal (the *noctiluci*) smaller than a needle's point.

Improved Portable Steam Engine.

Few things in the history of invention are more interesting than the manner in which specific improvements in working details, pushed forward in one direction by one man, and in other directions by others, meet at length, and cross and interweave, till at last the perfected invention embodies, in a form more or less modified, all real improvements, however diverse, or even apparently irreconcilable.

In adapting the power of steam to the numberless requirements of industry, ideas the most various have held the leading place in the minds of successive designers and inventors.

In stationary engines, strength of framing, perfection, and permanence of alignment, nice compensation for wear, and



PORTABLE STEAM ENGINE.

noiseless performance of work have been attained in a wonderful degree. In the locomotive engine, lightness, elasticity, efficiency, convenience of access and detachment for repairs, with total disregard of stability, have been carried to a remarkable extent.

In large engines, refinements of valve gear, for economical use of heat, have been introduced with admirable results. In small, portable, and self-contained engines, efficiency per pound in the weight of the machine, has been pushed almost as far as in the locomotive, but often with too little regard to efficiency per pound of fuel. There seems to be an effort, now, to combine these two qualities, which have hitherto been considered incongruous, if not adverse; but which will prove, we do not doubt, not only reconcilable but co-ordinate.

There is but one absolute condition: Simplicity.

All complication must be avoided. Promise what it may, yield whatever advantage it may be found to yield in larger engines, all complex mechanism is excluded here.

Better 600 pounds of coal per day in a 10-horse engine which a boy can run almost without possibility of derangement, than 300 pounds in an engine of similar power requiring the constant attendance of a skillful engineer, and perpetual repairing.

This condition observed, all improvements in economy of fuel are also improvements in efficiency compared with weight.

Several such improvements appear to us to be combined in the novel and interesting machine represented in the two illustrations accompanying this article.

We learn from a pamphlet sent us by the builders, Messrs. J. C. Hoadley & Co., that "an attempt is made in this engine to superheat the steam, mildly, yet effectually, and to secure all the advantages of a steam jacket around the cylinder, with the utmost simplicity and increased economy. The principal means employed are:

"*First.* Surrounding the cylinder by the waste gases, the products of combustion, on their passage from the smoke-box to the smoke-pipe; securing thus a 'smoke-jacket' instead of the well-known 'steam-jacket.'

"*Second.* Placing the feed water heater in the smoke-box, below the cylinder, so as to reduce the temperature of the gases to a safe point before they reach the cylinder.

"*Third.* Conveying the steam from the governor-valve, which is located within the steam dome, through the steam space, the whole length of the boiler to the flue-sheet, and thence by a curved pipe through the smoke-box to the steam-chest; by which means it is safely yet thoroughly dried and slightly superheated."

These objects seem to us to be attained in this engine, which has seven inches diameter of cylinder and ten inches stroke, weighs, exclusive of running gear, 4,500 pounds, and is capable of exerting permanently and economically 15-horse power. Indeed, it is said to have been run for several weeks to drive the machine-shop of its builders, which, with other work driven by the same water-wheel, is known to require from 25 to 33-horse power; a very creditable performance for an engine usually rated at 10-horse power.

The boiler is lagged with wood, and cased in sheet iron, with brass bands. This practice, universal in England where engines of this class are much more extensively used than in this country, has not been generally adopted, hitherto, by American engineers.

It adds something to the bulk of the boiler, a little to the weight, and considerably to the cost; but it adds in an equal or greater degree to its efficiency.

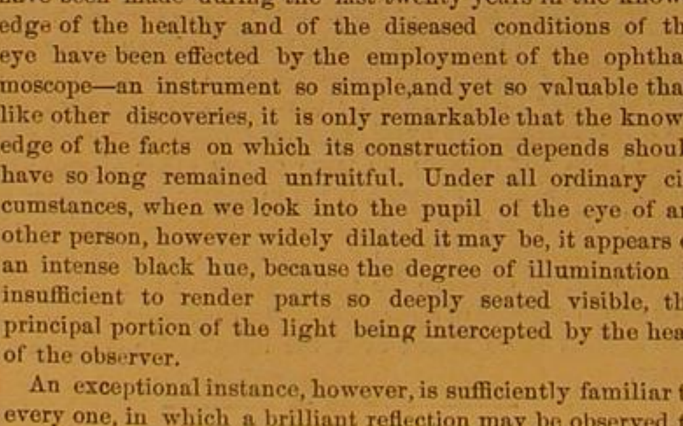
If a penny saved is as good as a penny earned, so a pound of steam saved is as good as a pound of water evaporated, or every thermal unit retained in the boiler by diminished radiation is equivalent to a thermal unit added to the evaporating power of the boiler, considered merely as to its efficiency. Perhaps the money expended in lagging the boiler adds as much to the steam supplying capacity of the boiler, as the same sum would add, if expended most judiciously, in enlarging the heating surface. The advantage in economy of fuel is wholly on the side of the lagged boiler.

The engine herein described was exhibited at the fair of the Massachusetts Charitable Mechanic Association in October last, and received a gold medal and high encomiums. The designers and builders, Messrs. J. C. Hoadley & Co., of Lawrence, Mass., are well known as among the earliest, if not the very earliest, designers of portable and self-contained steam engines in the United States, having started the business in 1857. During this long period of thirteen years, although they have made many minor improvements in matters of detail, they have preserved the general form of their engines almost unchanged. We are glad to see such a decided effort for improvement in this quarter, and such evidence that they intend to unite the refinements of scientific design to the sterling qualities for which their engines have been so long and so highly valued.

A New Form of Ophthalmoscope.

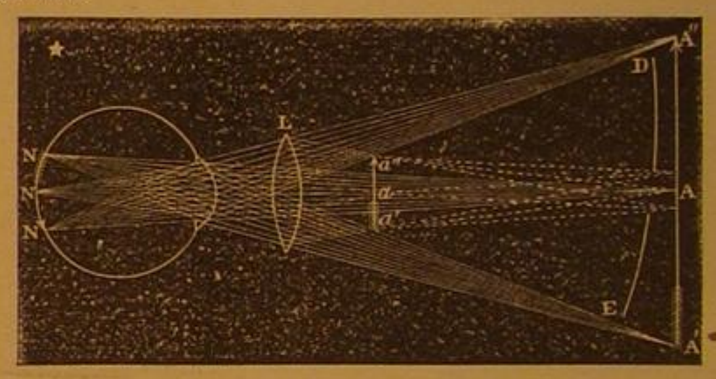
The principal steps, says Professor Power in *Nature*, that have been made during the last twenty years in the knowledge of the healthy and of the diseased conditions of the eye have been effected by the employment of the ophthalmoscope—an instrument so simple, and yet so valuable that, like other discoveries, it is only remarkable that the knowledge of the facts on which its construction depends should have so long remained unfruitful. Under all ordinary circumstances, when we look into the pupil of the eye of another person, however widely dilated it may be, it appears of an intense black hue, because the degree of illumination is insufficient to render parts so deeply seated visible, the principal portion of the light being intercepted by the head of the observer.

An exceptional instance, however, is sufficiently familiar to every one, in which a brilliant reflection may be observed to occur from the back of the eye. It is that of an animal crouching in the corner of a cellar, whilst the observer is standing at the door, or looking towards a window, to which the back of the observer is turned. The principle on which the ophthalmoscope is founded is identical with this, the eye under observation being illuminated by a pencil of light proceeding, as it were, from the eye of the observer. This is accomplished by placing a steady source of light at the side of, or above and somewhat behind the head of the person under observation, whilst the observer reflects its rays into the eye of the subject by means of a plane or concave mirror, the center of which is perforated by a small opening through which he looks. The back, or fundus of the globe, then comes into view, presenting a red, or grayish-red glare, the illumination being greatly increased by the use of a lens at L, as shown in the accompanying little woodcut, from the re-



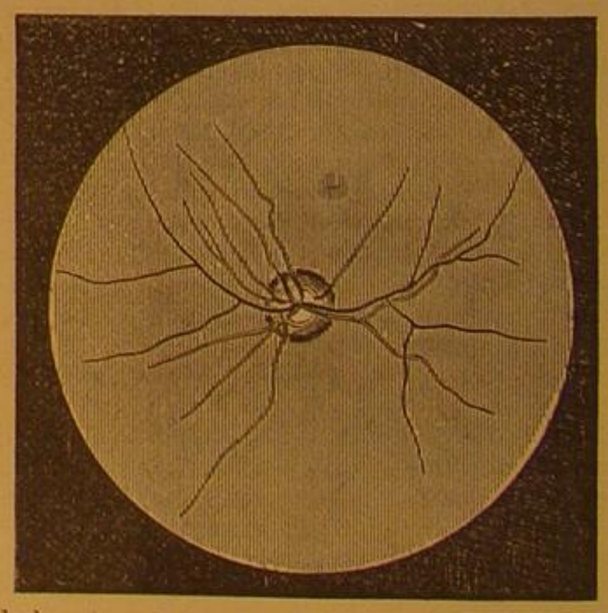
cent work of Dr. Williams in Boston, where the rays of light emanating from the star are reflected from the concave mirror, D E, and rendered convergent by the lens, L, lighting up the whole of the posterior surface of the globe; some of the rays returning from this pass through the opening in the mirror, and are seen by the observer at O. The precise mode in which the image is formed is shown in the second cut, borrowed from the same work. The rays returning from N, N′ N″, representing a portion of illuminated fundus, are brought to a focus by the convex lens, L, at A, A′ A″, and then form the inverted aërial image of the fundus, which is seen by the observer.

The image which comes into view under these circumstances, especially if, as is usual, the pupil be dilated by the employment of a little belladonna or solution of atropine, is represented in the third woodcut, which we have carefully drawn from a child of twelve years of age. The reader must imagine the general surface to be of an orange vermil



ion, or scarlet vermilion tint, though in the negro it is of a very dark vermilion; the color being produced by the reflection of the light from the capillary blood-vessels of the choroid.

In the center is a yellowish white spot, which is the optic disk, or point of entrance of the optic nerve. This is perforated by the branches of the central artery and veins of the retina, the lighter double lines representing the arteries, and



the darker the veins. Above and a little to the right is a spot which is the true center, and at the same time the most sensitive part of the eye; from its color it is sometimes called the *macula lutea*, or from its being slightly depressed below the surface it is termed the *fovea centralis*. The changes which the optic disk, the blood-vessels, and the retina undergo in disease can of course be readily followed, and may thus enable a positive opinion to be pronounced on cases which were formerly incapable of being distinguished even by the most acute observer. Nay, it has recently been suggested by M. Poncet to employ it as one of the most reliable means of ascertaining that *death* has really taken place. A great variety of forms of the instrument have been suggested, but the ordinary hand ophthalmoscope has proved the most convenient in practice, requiring only that the room should be darkened, and that there should be some steady source of light.

TO CLEAN BLACK CLOTH.—Dissolve one ounce of bicarbonate of ammonia in one quart of warm water. With this liquid rub the cloth, using a piece of flannel or black cloth for the purpose. After the application of this solution, clean the cloth well with clear water; dry and iron it, brushing the cloth from time to time in the direction of the fiber.

[For the Scientific American].

THE LANTERN FLY.

[By Edward C.H. Day, of the Schoolof Mines, Columbia College].

We recant fully and without condition, our heretical doubts of the scorpion's suicidal performances. We have received ample proof that, when he finds escape impossible, the scorpion hurries himself out of existence by means of his own sting, and we give credence to the strangest fact of all, that he does so especially when under the influence of alcoholic liquors! J. Parish Steele, in the *American Entomologist and Botanist* for June, is our authority for the last statement, and he adds that the Tennessee boys know scorpions consequently as "Teetotalers." This must be deemed conclusive evidence of scorpionic fortitude and virtue. Good reader, forgive us for having expressed the doubt; we ourselves have never had the opportunity of tempting the scorpion in his native haunts, and were dubious on what we supposed good authority, deeming it better to state our uncertainty than to retail a story, the antiquity of which was no guarantee of its truth. In fact, it does not appear to us even now quite clear that the scorpion designedly shuffles off this mortal coil. May it not be that in mortal agony at the approaching flames, from which it sees no escape, or at the irritating effects of the alcohol, it strikes convulsively with its tail, and stings itself without intent. We are inclined still to acquit the scorpion of being a *felo de se*, but as only laboring under temporary insanity.

Be this as it may, the really interesting fact remains incontestably proved that its poison is death to the scorpion itself; a fact, however, that is implied in what we already knew, that it is fatal to its fellow scorpions. But what are we to say of the insect now before us—the Chinese lantern fly (*Pyrops candelaria*), or of its American representative, the great Surinam lantern fly (*Fulgora lanternaria*)? Are the odd-looking membranous extensions from the heads of these creatures really luminous? Or are the statements from which the above names are derived but the baseless fabrics of a strange delusion?

About one hundred and seventy years ago, an enthusiastic lady and her two daughters spent three years in the unwholesome climate of Surinam, drawing figures of the remarkable insects of that region, chiefly in illustration of their metamorphoses. "Crazy women," we fancy we hear some money-making old cynic remark. "Much better have done something useful." True, sir, these ladies probably did not make a good monetary speculation of the undertaking for themselves or for anybody else; but it is to such enthusiasts as these that the world is indebted for much of that natural knowledge which helps so greatly to elevate and purify the groveling, grasping tendencies of this too practical age. Such workers as these may be but the hod-carriers and bricklayers of science, but without such patient gatherers of facts, the architects, the great generalizers of scientific truths—such as Humboldt, as Faraday and Bunsen, as Tyndall, as Lyell, as Cuvier and Darwin—could not carry on the building of that glorious edifice of knowledge wherein we read each day more clearly the material works of the Creator by the light of the all-wise laws that control them. Therefore all honor to the name of Madame Merian and her daughters; and would that we had more such ardent admirers of nature and of its marvels and beauties!

On her return to Europe, Madame Merian informed the world that the lantern-fly gave such a brilliant light at night as to surpass the luminosity of all known fire-flies, circumstantially stating her own observations on it. Some subsequent and credible observers have confirmed the fact in terms as precise; others, however—and these, too, like Madame Merian and her corroborators, had lived in the regions where the insects occur—just as positively denied that the insects ever gave any light at all. Even the natives of the countries flatly contradicted each other on the point.

The Chinese species has had luminosity attributed to it, and it is represented as luminous in the accompanying engraving taken from Prof. Blanchard's work; but competent observers have not merely questioned, but have given the statement a distinct denial! One would imagine that these savans were medical experts giving evidence in a lunacy case! What are we to believe amid such conflicting statements? With Kirby and Spence, we agree, "that negative evidence ought not hastily to be allowed to set aside facts positively asserted by an author who could have no conceivable motive for inventing such a fable;" and we the more readily assent to this rule in this case because a far more incredible tale of Madame Merian's, after having been long discredited and positively denied, has, within the last few years, been confirmed by the disinterested evidence of living and most trustworthy eye-witnesses. We would rather suppose that these insects are only luminous at times or under certain circumstances, or, as others have suggested, that it is only one sex that is luminous, and that the ladies who originally made the statement had the good fortune to see a phenomenon which other observers have failed to witness, than believe that a number of respectable individuals have foolishly united in maintaining an unmeaning falsehood. We may ask, how many persons who have turned up out of the ground the grubs of our common fire-flies could tell us whether they were luminous or not?

The lantern flies, whether rightly or wrongly so named, are no relatives of the European glow-worm, of our own "lightning bugs," or of the larger tropical fire-flies; these all belong to the order of beetles, whereas the lantern fly is a bug in the strict entomologist sense of the word.

The bugs are subdivided into two groups, both characterized by a mouth adapted to both piercing and suction, but differing in the characters and arrangement of the wings.

The squash bug (not the various beetles so miscalled, but the *Coreus tristis*) will give you an example of the one group; its anterior wings or "wing cases," when at rest, lie flat on the back and across each other; when spread out you see that the basal half is thick, opaque, and colored, while the outer half is thin and translucent. Hence the name of *Hemiptera* or "half-winged" applied to the whole order. In the second group notice the cicada, commonly called the locust; the wings here lie on the sides of the body, sloping like the roof of a house, and both pairs when opened are evidently translucent over their entire extent. Hence these are termed the *Homoptera*. Excepting the curious projection from the head of the lantern fly you will see that it is not unlike the cicada, and they are closely allied homopterous bugs. The cicadas are characterized in one sex by possessing a drum-like organ, by means of which they produce the well-known stridulating sound, "the so-called song," as Vander Hoeven quaintly remarks, "which is peculiar to the males, whence Xenarchus extolled the fortune of these animals, whose wives are dumb." In the lantern flies this drum is absent in both sexes, and if the auditory organs of these bugs have susceptibilities at all akin to our own, we suspect that the females rather rejoice in possessing silent husbands

Otherwise the cicadas and lantern flies are closely related families, in fact, some authors make them subdivisions of a single family. They are mostly inhabitants of the hottest climates, and the lantern flies are especially remarkable for their large size and striking coloring



THE CHINESE LANTERN FLY—*Pyrops candelaria.*

The South American fulgora is between two and three inches in length, and its wings expand more than 5½ inches. It has a large yellow eye-like spot, ringed with black and white bands, on each of its hind wings. The Chinese species is a smaller insect, but still sufficiently conspicuous, and, wanting the eye-like spots, is marked with greenish bands spotted with black upon a yellowish-fawn ground; so that, even if it be not luminous, it must be a remarkable insect, from its grotesque form and peculiar garb.

CURCULIO EXTIRPATION POSSIBLE.

Under the above heading, we recently copied from the St. Joseph (Mo.) *Herald* some details of a new method of catching curculios. We have since then seen a commentary on the same article in the *American Entomologist and Botonist* for June, in which the editor of that journal says: "We are really sorry to damp the ardor and enthusiasm of any person or persons when enlisted in such a good cause, but truth obliges us to do so nevertheless. Of course curculio extermination is possible, but not by the above method alone, as our Michigan friends will find to their sorrow. For a short time, early in the season . . . we have succeeded in capturing the curculio under chips of wood and other such sheltered situations; but we have never been able to do so after the fruit was as large as a hazelnut, and the little Turk had fairly got to work."

A passage from *Moore's Rural New Yorker*, of January 28, 1865, is furthermore quoted to show that the process suggested cannot be called a discovery. From all this and the general tenor of the article, we infer that it is of paramount importance to the community to have ably-conducted journals on such specialties as entomology; that, as a fact, the extirpation of the circulio is a possibility, and that the process suggested is a valuable aid to this desirable end; and that, if this be only a rediscovery, the fact that such men as Dr. Le Baron and Dr. Hule had not heard of it previously, proves that the original discovery had not attained the publicity it deserved, and we therefore cordially indorse the statement, that "in demonstrating that so great a number of the little pests can be entrapped in the manner described, Mr. Ransome has laid the fruit growers of the country under lasting obligation to him." Finally, we are delighted to hear, on such good authority, that "we are fast becoming masters of this scourge," and that there is at least one insect parasite that has taken up our cause against the foe. Labor on, good entomologists! and find out the secrets of these and similar little enemies of mankind, and we will heartily aid your cause by disseminating the knowledge you acquire as widely as we may, for we deem the subject of insect pests to be the most important question now before the agricultural community of this country.

The Astronomer Entrapped.

We find in a recent number of the *Eclectic* the following amusing anecdote, which occurred some years since at a celebrated observatory in the suburbs of London. A visitor was desirous of observing a celestial object which was nearly overhead, and having the run of the observatory at the moment, he directed the telescope towards the star, set the clock-work in motion, and placed himself on his back in the observing frame attached to the floor of the observatory. This frame is so constructed that the observer can fix the head rest in any position, and as the whole frame revolves round an upright in the middle of the observatory floor, it is easy to place the frame so that the observer can look in perfect comfort at any object on the celestial vault. In the present instance, as we have said, the observer lay on his back, the object being nearly overhead. But while the frame remained, of course, at rest, the clock-work was slowly driving the telescope after the star, and as the star happened to be approaching the point overhead, the eyepiece of the telescope was being brought continually lower and lower. Intent on observing the aspect of the star (a celebrated double) our astronomer failed to notice that this movement of the eyepiece was gradually imprisoning him. His head was fixed by the head-rest, and the eye-tube was beginning to press with more and more force against his eye. The telescope was a very heavy one, the very slowness of the movement made it irresistible, and the observer's position prevented him from helping himself. Fortunately his cries for assistance were quickly heard, the clock-work was stopped, the head-rest lowered, and the prisoner released; otherwise he would undoubtedly have suffered severely. He would, in fact, have had as good reason to complain of his telescope as the celebrated astronomer Struve had in the case of the Pulkova refractor, "which," Struve said, "was justly called a 'refractor,' since it had twice broken one of his legs for him."

IMPORTED INSECTS AND NATIVE AMERICAN INSECTS.

[From the Report of Charles V. Riley, State Entomologist of Missouri].

If we examine into the history of the imported currant worm and the native currant worm, we shall find a very curious state of things. These two insects both produce sawflies, which are so closely allied to each other, that although they are referred to distinct genera by entomologists, it may be doubted whether the genus (*Pristiphora*) under which the native species is classified be not a mere subgenus of that under which the imported species is classified. Reasoning *a priori*, therefore, we should expect to find a very great similarity in the destructive powers of these two worms, especially as each of them infests the leaves both of the red currant and of the gooseberry. But what are the actual facts? On the one hand we see a native American species—which must have existed here from time immemorial, feeding on our wild gooseberries and perhaps on our wild red currant, and which yet has troubled our tame gooseberries and tame red currants so very slightly, that it cannot be proved with absolute certainty to have ever done so at all, except in Rock Island County, Ill., and in Scott county, Iowa.

On the other hand we see a species, only introduced into this country, from Europe, some twelve years ago, which has already almost put a stop to the cultivation of the gooseberry and red currant throughout a large part of the State of New York, the northern borders of Pennsylvania, and the whole of Canada West, and is slowly but surely extending itself in all directions from the point where it was originally imported. What can be the reason of such a wide difference in the noxious powers of two such closely allied insects, feeding on exactly the same plants, but one of them indigenous to America and the other imported into America from Europe? Nor is this the only case of the kind. We can point out at least three other such cases. The imported onion-fly (*Anthomyia ceparum*), is a terrible pest to the onion-grower in the East, though it has not yet made its way out West. On the other hand, the native American onion-fly (*Ortalis arcuata*, Walker), which is a closely allied species and has almost exactly the same habits, has only been heard of in one or two circumscribed localities in the West, and even there does comparatively but little damage. Again, the imported oyster-shell bark-louse (*Aspidiotus conchiformis*) is a far worse foe to the apple and certain other fruit trees than our indigenous Harris' bark-louse, (*Asp. Harrisii*), though each of them infests the same species. Finally, the imported meal-worm beetle (*Tenebrio molitor*) swarms throughout the whole United States, and is a great pest; while the native American species (*Tenebrio obscurus*), which has almost exactly the same habits, belongs to the same genus, and is of very nearly the same size, shape, and color, is comparatively quite rare among us, and is scarcely known to our millers and flour-dealers.

On a careful and close examination, it will be found that almost all our worst insect foes have been imported among us from the other side of the Atlantic. The Hessian fly was imported almost ninety years ago; the wheat midge about half as long ago; the bee moth at the beginning of the present century; the codling moth, the cabbage tinea, the borer of the red currant, the oyster-shell bark-louse, the grain plant-louse, the cabbage plant-louse, the currant plant-louse, the apple-tree plant-louse, the pear-tree flea-louse, the cheese-maggot, the common meal-worm, the grain weevil, the house fly, the leaf-beetle of the elm, the cockroach, the croton bug, and the different carpet, clothes, and fur moths, at periods which cannot be definitely fixed. Even within the last few years the asparagus beetle has become naturalized in New York and New Jersey, whence it will no doubt spread gradually westward through the whole United States, while the rape butterfly was introduced about a dozen years ago, and is rapidly spreading over some of the Eastern States. And only a year ago the larva of a certain owlet-moth (*Hypogymna dispar*), which is a great pest in Europe, both to fruit trees and forest trees, was accidentally introduced by a Massachusetts entomologist into New England, where it is spreading with great rapidity. It is just the same thing with plants as with insects. We have looked carefully through Gray's *Manual of Botany*, and we find that—excluding from consideration all cryptogams, and all doubtful cases, and all cases where the same plant is supposed to be indigenous on both sides of the Atlantic—no less than *two hundred and thirty-three* distinct species of plants have been imported among us from the Old World, all of which have now run wild here, and many of which are the worst and most pernicious weeds that we have to contend against. In the United States *Agricultural Report* for 1865 (pp. 510-519) will be found a list of ninety-nine of the principal "Weeds of American Agriculture," by the late Dr. Wm. Darlington. Of this whole number no less than forty-three, or nearly one-half, are species that have been introduced among us from the Old World. Among these we may enumerate here, as the best known and the most pernicious, butter-cups (two species), shepherd's purse, St. John's wort, cow-cockle, May-weed or dog-fennel, ox-eye daisy, common thistle, Canada thistle, burdock, plantain, mullein, toad-flax, bind-weed, Jamestown (Jimson) weed, lamb's quarter, smart-weed, field garlic, fox-tail, grass, and the notorious cheat or chess. And to these we may add the common purslane, which, through some strange oversight, has been omitted in Dr. Darlington's catalogue.

It will be supposed, perhaps, since there are about as many voyages made from America to Europe as from Europe to America, that we have fully reciprocated to our transatlantic brethren the favors which they have conferred upon us, in the way of noxious insects and noxious weeds. It is no such thing. There are but very few American insects that have become naturalized in Europe, and even these do not appear for the most part to do any serious amount of damage there. For example, on one or two occasions single specimens of our army-worm moth (*Leucania unipuncta*) have been captured in England; but the insect has never spread and become ruinously common there, as it continually, in particular seasons, does in America. Our destructive pea-bug (*Bruchus pisi*) has also found its way to Europe; but although it is met with in England, and according to Curtis has become naturalized in the warmer departments of France, Kirby and Spence expressly state that it does not occur in England "to any very injurious extent," and Curtis seems to doubt the fact of its being naturalized in England at all. Again, the only species of white ant that exists within the limits of the United States, (*Termes frontalis*), has been known for a long time to be the guest at the plant-houses of Schönbrunn, in Germany; but is not recorded to have ever as yet spread into the surrounding country. As to our American meal-worm (*Tenebrio obscurus*), Curtis states that it has been introduced into England along with American flour, and that it is sometimes abundant in London and the provinces; but Kirby and Spence say not one word about it, and it seems to be confined to the English seaports, and the places where American flour is stored, without spreading into the adjacent districts.

A very minute yellow ant, however, (*Myrmica molesta*), which is often very troublesome with us in houses, has, according to Frederick Smith, "become generally distributed and naturalized" in houses in England; and Kirby and Spence state more specifically, that "it has become a great pest in many houses in Brighton, London, and Liverpool, in some cases to so great an extent as to cause the occupants to leave them." As to our chinch bug, our curculio, our plum gouger, our two principal apple-tree borers, our canker-worm, our apple-tree tent-caterpillar, our fall web-worm, our peach-tree borer, and our other indigenous pests among the great army of bad bugs, nobody ever yet found a single one of them alive and kicking on the other side of the Atlantic. And with regard to plants, the only two American plants that we know to have become so firmly established in Europe as to be a nuisance there, are an American aquatic plant, the common water-weed (*Anacharis canadensis*), which has choked up many of the canals in England, and our common horse-weed, or mare's tail as it is called in the West (*Erigeron canadense*), which has spread from America nearly over the whole world.

Since then, it can be demonstrated by hard, dry facts, that American plants and insects do not become naturalized in the Old World with anything like the facility with which the plants and insects of the Old World are every day being naturalized in America, there must be some cause or other for this singular state of things. What is that cause? It is, as we believe, a simple fact which is pretty generally recognized now as true by modern naturalists, namely, that the plants and animals of America belong, as a general rule, to an old-fashioned creation, not so highly improved and developed as the more modernized creation which exists in Europe. In other words, although this is popularly known as the New World, it is in reality a much older world than that which we are accustomed to call the Old World. Consequently, our plants and animals can no more stand their ground against European competitors imported from abroad, than the red Indian has been able to stand his ground against the white Caucasian race. On the other hand, if by chance an American plant or an American animal finds its way into Europe, it can, as a general rule, no more stand its ground there against its European competitors, than a colony of Red Indians could stand their ground in England, even if you gave them a whole county of land and an ample supply of stock, tools, and provisions to begin with. For throughout animated nature, as has been conclusively shown by Charles Darwin, there is a continual struggle for existence, the stronger and more favorably organized species overpowering and starving out from time to time their less vigorous and less favorably organized competitors. Hence, it is as hopeless a task for a poor puny, old-fashioned American bug to contend against a strong, energetic, highly-developed, European bug, as it would be for a fleet of old-fashioned wooden ships to fight against a fleet of our modern iron-clads.

Let not "Young America," however, be altogether discouraged and disgusted at hearing, that our animal and vegetable creation is more old-fashioned than that of what is commonly known as the Old World. The oldest geological formations, in which the remains of mammals occur, contain the remains of such mammals exclusively (*Marsupialea*) as bring forth their young only partially developed, and carry those young about with them in a pouch, till the day of complete development and physical "second birth" arrives. In America we have a single genus—the opossums—that belongs to this antediluvian type. In the three ancient continents they have absolutely none at all. But if in this respect America is more old-fashioned than Europe, Australia is still more old-fashioned than America; for there almost all their mammals possess this remarkable peculiarity; so that if the American creation is somewhat old-fogyish, that of Australia is the very concentrated essence of old-fogyism itself. Consequently, if Europe crows over us as altogether "behind the times," "Young America" can take its revenge by crowing over Australia, as the land of the kangaroo and the wombat and other such exploded absurdities of the Mesozoic epoch.

Professor Seely on Ammonium Amalgam.

The *Mechanics' Magazine* contains the following criticism on Professor Seely's recent papers upon this subject: "We referred so many times to Mr. Graham's experiments on the absorption of hydrogen by palladium, and his views on the metallic nature of hydrogen, that we may give a passing notice of the latest objections to Mr. Graham's theory. Professor Seely, of New York, has made some experiments with the so-called ammonium amalgam, and has come to the conclusion that it is no amalgam at all in the ordinary acceptation of that term, but merely a froth produced by the entanglement with the mercury of the mixture of ammonia and hydrogen set free on the decomposition of chloride of ammonium. The strongest evidence in favor of the correctness of this view is to be found in the fact, that when the so-called amalgam is subjected to pressure, its volume changes apparently in accordance with Marriotte's law of gaseous volume. Thus, at all events, it must be considered as proved, that admitting the existence of ammonium in the amalgam, it is neither a solid nor a liquid, but a gas. Professor Seely contends that the expansion of palladium on the absorption of hydrogen is analogous to the swelling of the mercury on the hydrogen is analogous to the swelling of the mercury on the absorption of the two gases named; and that if the particles of palladium were as free to move as those of mercury, a palladic froth would be produced. There may be something in this objection, which does not, however, touch Mr. Graham's strongest point. In another sentence the American Professor goes decidedly wrong when he asserts that oxygen is more readily absorbed by metals than hydrogen, and yet no one has a theory of oxygenium. Mr. Graham found that oxygen was less readily absorbed; and he distinctly announced his belief in the existence of the metal oxygenium.

Transformation of Cast Iron.

"Transformation of Cast Iron, Wrought Iron, and Steel by means of the Vapors of Alkaline Metals." Such is the title of a patent taken in France by MM. Charles Girard and Jules Poulain (date 17th August, 1869, No. 86,784), the particulars of which we extract from our excellent cotemporary, the *Moniteur Scientifique*:

"In order to cause the vapors of sodium and potassium to act on cast iron in fusion, we heat one of the former metals in an iron retort to 392° or 482° under a pressure of five or six atmospheres. When this heat is reached we direct the vapor thus obtained into the heart of the iron in fusion; the mass swells, and an alloy of the iron is the result. These alloys, although very hard, are malleable, and may be forged and welded. They oxidize rapidly in air or water, and are easily decomposed if a current of air, steam, or carbonic oxide is injected into them when in fusion. By these compound effects of the vapor of sodium and of air, for example, the whole of the metalloids in the iron are attacked, and the final result is pure wrought iron that can be hammered and welded with ease. Under certain circumstances the metal resulting from the operation may present the properties of steel. Finally, to facilitate the production of the metallic vapors carburets rich in hydrogen may be added to the sodium or potassium in the retort.

"In place of sodium or potassium an alloy of the two may be used, as, for instance, one composed of four parts of potassium (melting at 122°) and 2·5 parts of sodium (melting at 194°). This mixture, which has the appearance and consistency of mercury, has its point of solidification at 47·4°, and is consequently liquid at ordinary temperatures. It is prepared under naphtha

"It has been remarked that, besides the direct transformation of cast into wrought iron or steel, by means of the metals, their action produces other advantages; they allow of the employment of cast iron, which, although containing manganese, are reputed as bad, and cannot be converted by the Bessemer process, on account of the quantity of carbon, sulphur, or phosphorus which they contain. It is, in fact, now proved that the Bessemer process, far from eliminating the sulphur and phosphorus, tends rather to augment the proportion of these metalloids.

"The cast irons known as *chaudes*, and which contain silicium and magnesium, owe a part of their superiority to the calorific power of the silicium (7800), the produce of the oxidation of which, silica, requires but little heat to disengage it, so that the liquefaction becomes more complete. On the other hand, carbon, under the same conditions, gives rise to the disengagement of masses of sparks produced by the gases carbonic acid and carbonic oxide, which traverse the mass; these take from the molten matter a considerable quantity of caloric, and are thus unfavorable to liquefaction.

"In our process this latter inconvenience is partly dispelled, for the gases produced by the combustion of the carbon, sulphur, and phosphorus, combine with the soda or potash are mechanically carried through the mass of metal by the oxidation of the sodium of potassium. The direct action of the sodium or potassium, in the form of vapor, on the melted iron, may be replaced by adding to the mixture of ore, fuel, and flux, either chloride of sodium, carbonate of soda, a corresponding salt of potash, or a mixture of these.

"Acting thus on any given ore, and using coke or coal as fuel, a result analogous to that obtained with charcoal under the ordinary system is obtained. We must add, however, that in the former case the current of hot or cold air should be longer maintained than when charcoal is used; this prolonged application of hot or cold air in the blast furnace may present inconvenience, which may be avoided by directing the alloys of cast iron with sodium or potassium into a converter, in which they may undergo the final action of the current of air; with this process the working of the blast furnace is the same as in ordinary cases.

"We arrive practically at an assimilation of the coke or coal with alkaline salts corresponding to those furnished by wood charcoal, either by watering the fuel with the alkaline solutions above-mentioned, and then allowing it to dry in sheds by introducing the salts into the mass of molten iron, or, lastly, by pouring a concentrated solution of the various salts on the fuel or the ore at the moment of charging the furnace. "We intend to continue our experiments on the alloys and combinations of sodium and potassium with most of the other metals."

A CHILL ROOM IN A MEAT PACKERS' ESTABLISHMENT.

We condense from the N. Y. *World* the following graphic account of a mammoth ice room in a meat packers' establishment in this city:

Yesterday afternoon, about four o'clock, while the rest of mankind hereabouts were weltering and sweltering in perspiration, the writer spent one minute—only one minute, that sufficed—in a place that was so cold, that struck such deadly chills through him, that it would have taken four pretty strong men to have held him there one minute longer. This fearsome place was the "chill room" of a large pork-packing establishment.

As the writer sauntered up one of our very uninviting north-running streets, in the scorching sun, it seemed impossible to conceive that there could be a really cold place this side of the North Pole. Entering the great building to which he had been directed, he was referred to the very intelligent foreman as being the person best able to give the desired information.

Owing to the present high prices of ice the packing of pork in this city has nearly or quite ceased, and the entire ice supply of the establishment was contained in a room. It is 20 by 40 by 10 feet, and capable of holding 100 tuns. On opening the heavy door, it was found to contain ice to the depth of three feet. It is customary to keep these receptacles completely full, but the firm have stopped "cutting up" for fear they should be caught with a house full of meat and no ice to chill it.

R.—"Well, how does the ice help you to pack pork? I see no meat here."

F.—"We send a current of air through the ice, which is then carried down into our chill-room beneath. This place is not very cold, neither is any common ice house. But if you went down in our chill-room you would not want to stay long."

R.—"I would like to try it."

F. (to a laborer).—"William, take him down. Don't let him stay there over a minute. That will be a dose for him."

THE CHILL-ROOM.

Thus warned, the inquirer, who is making it his business to see "what becomes of all the ice," descended into the cellar. One whole side of the vault—60 by 60 by 10—was inclosed like the ice house above. His guide pushed open a door and let him into the dimly-lighted room, not venturing in himself. Two men, dressed as heavily as Esquimaux were there. They greeted him, dressed as he was in a linen suit, with warning voices: "You can't stay here long. It will kill you." "Oh; bring him on," said the other. "Show him the best of it."

The place contained some 300 hogsheads of pork in double tiers. The reporter walked swiftly forward, determined to see what he could in a minute. He folded his arms, gathering his scant raiment closely about him, for he felt as if he had "fallen overboard" into an icy river. Dante's description of the ice hells he visited, in company with Virgil, would not do justice to his sensations. The ice fiends seemed to be feeling their way into his vitals. His clothes, dampened by perspiration, seemed stiffening with frost. Everywhere was a sound of dripping water. When he reached the place which the men at work considered the coldest spot, his sensations were so alarming that he turned and hurried towards the heavy door. He kicked it open with all possible vim, and without any very ceremonious leave-taking. The upper air, which had before seemed unendurably hot, was "just right" with him the rest of the afternoon. He felt the effect of that ice bath until sundown.

The colloquy with the foreman was resumed.

R.—"What is all this freezing for? Are you afraid your pork will spoil before you can get it into the brine?"

CHILLING MEAT.

F.—"Did you never notice that farmers, when they 'put down' their barrel or so of pork, do it in the winter? Meat cannot be cured thoroughly unless all the animal heat is removed before the brine is put on; and the brine itself must be cold. The meat is cut up on this floor; the hogsheads are put empty into the chill-room, and filled there, one tier at a time. The work of the men you saw is to keep changing the meat from one hogshead to another, that every portion may be thoroughly chilled, and that the pickle may reach every fiber. A piece is sometimes moved six or seven times before the pickling is pronounced perfect. You observe that the same men do not work inside and outside the chill-room at random. No employer who values his good men or the lives of his men will ask this of them. A man who tries it seldom lives a year. The heat of puddling furnaces is a trifle compared with this cold."

R.—"How do small dealers chill their meat? They have no such apparatus as this."

F.—"They simply pound up ice and mix it with the meat."

R.—"Is this one of the largest packing houses?"

F.—"No; there are some whose ice houses hold 200 tuns. Some of these have a cellar and a sub-cellar. They begin the curing in the sub-cellar and finish in the upper one."

IMMENSE CONSUMPTION OF ICE BY PACKERS.

R.—"How much ice do you use a week?"

F.—"About 75 tuns. Say under 2,000 tuns a year."

R.—"I do not understand how that fearful chill is created."

F.—"I will explain. The floor under the ice room consists of timbers two inches apart. Beneath them are the 'dripping shelves'—which look like mammoth gutters—four feet wide at the top, and placed at intervals of four feet. But the real gutters hang beneath these—they being open an inch or two at the bottom. The water flows through the gutters to the sewer. Here we have then the greatest possible surface of freezing water for the air already chilled by the ice (and for that reason passing down through the open floor) to encounter. It was when standing directly under these dripping shelves that you felt that intensest cold. There is a large opening at the back of the ice-room, up which the warm air is always passing, to be brought down again by the chill of the ice and the great surface of ice-water on the shelves."

A Catholic Scientist on Vital Correlation.

The lecture by Professor Barker on the "Correlation of Vital and Physical Forces," published on page 48, Vol. XXII., of the SCIENTIFIC AMERICAN, has, according to the Yale College *Courant*, received the honor of being translated in full and published at length in three consecutive issues of *Les Mondes*, a weekly record of science, including its application to the Industrial Arts, by the Abbe Moigno. According to that journal the Abbe is a scientific authority and was for some years editor of *Cosmos;* he is at the same time a Catholic of unquestioned orthodoxy, which last act adds significance, both to his publishing this work of our Professor, and more especially to the following notes addressed to his readers, which precede and follow the text of the lecture. We translate:

"This American lecture will seem to many to take very advanced ground; those of our readers who do not sufficiently reflect upon it, will see in it too many concessions to materialism; we do not hesitate to publish it, however, because, on the one hand, it is a very remarkable lecture, and on the other, it is in spirit (*au fond*) truly orthodox. Man is not, as the ultra-spiritualistic school would make him, an intelligence served by organs, like the archangel Raphael, the companion of young Tobias; his mind is not simply united to his body, it has the form of the body, it is completed by the body as it completes the body; everything which acts upon the body reacts therefore upon the mind, as all which acts upon the mind, may react upon the body. It is then in no wise astonishing, it is on the contrary very natural and necessary that the operations of the mind, thought, will, joy, fear, should interpret themselves in the body by a physical or physiological effect which can be estimated, and which becomes, up to a certain point, the measure, or at least the expression of the psychical phenomenon. Do not separate that which God and nature have united. Man is, at once, a physical, physiological, and psychical being."

At the close of the article he makes the additional remarks:

"As I said at the commencement, although in appearance hazardous enough, yet in spirit, this American lecture is entirely orthodox: certain expressions, however, are incorrect and should be modified. Instead of *vital force, thought-force*, it should say *physical force acting in the phenomena of physiological life*, or *physical force acting in the phenomena of thought or psychological life*. It is perfectly certain that the forces in action in physical phenomena, are also at work in physiological and psychological phenomena. But beyond this physical world extends the world of thought, of will, of free agency, which no reasonable intelligence can disregard, or can disregard only through self-deception."

In view of the antagonism developed in some quarters against scientific investigation as tending to infidelity, these expressions of one confessing a faith so conservative, are of interest. The grounds upon which Christian scientific men can stand secure, were admirably stated by Professor Dana in his recent lecture before the seniors, in which the subject of Darwin's theory was considered. In the course of his remarks he stated that belief in a development theory was not atheism. That the facts of science clearly indicate some plan of development; that Darwin's book was a work of great merit, and that his theory accounts for the origin of some species. As for genera and higher groups there will probably be found other laws to account for them. Let no one fear scientific investigation, for its results were only another name for God's truth. If atheists discovered *facts* in science, the facts were still God's truth, and to be revered and accepted as such. As for atheism itself, give it no quarter! It is death to man's highest hopes. There is no limit to scientific investigation, and there need be no fear in prosecuting discoveries. Such belief, enunciated by distinguished men of science whose position as men of Christian faith is unquestioned should calm the fears of those who tremble before every new discovery, and show no faith in the strength and majesty and unity of truth.

Malleable Properties of Chinese Bronze.

The *Journal of Applied Chemistry* thinks the unsuccessful attempts made to manufacture Chinese gongs and bells in Europe and the United States, are due to the mistake that was made of hammering the Chinese alloy at the ordinary temperature, instead of working it at a high temperature according to the recent discovery made by Professor Riche, of Sorbonne, who has been perfectly successful in his experiments made on a large scale at the Paris Mint.

The different analyses have shown that the Chinese alloy was formed of a certain proportion of tin and copper, in the proportion of 20 parts of tin to 80 of copper. Ingots of bronze were cast containing 21·5, 20·0, 18·5, per 100 of tin; these were afterward submitted to the action of the hammer, at temperatures varying from the ordinary temperature to a red heat. At the ordinary temperature the metal was as brittle as glass, but approaching 300° to 350° Centigrade a sensible amelioration was noticed. At a dark red heat it appears that the condition of the metal is quite different, as this alloy can be worked as easily as iron or bronze of aluminum.

The metal flattened without cracking, under the most powerful blows of enormous hammers, and can be reduced without the slightest difficulty to sheets of one millimeter thickness. These sheets have exactly the appearance of the Chinese bronze, and possess great flexibility.

The action of the laminating is more striking, because, under the hammer, the metal is so soon cooled; that is, it has to be reheated from time to time, which operation complicates the work; in using a laminating machine the work is done with extreme rapidity, especially if care is taken to heat the alloy to a red heat. At an ordinary temperature a single passage under the laminators would break the sheet in thousands of pieces. This alloy can be cut at a high temperature like iron and steel, and presents the fine and homogeneous grain of the latter; it is soldered without difficulty with the ordinary jewelers' solder.

The following tests will demonstrate that the density of the bronze suffers very little modification by the hammering or laminating process:

Chinese Bronze.	Density after Smelting.	Density after Hammering
Bronze at 21·5 per cent tin,	8·938	8·929
Bronze at 18·5 per cent tin,	8·882	8·938
Bronze at 20·0 per cent tin,	8·924	8·920
Bronze at 20·0 per cent tin,	8·918	
Bronze at 20·0 per cent tin,	8,912	

FACTS AND RECIPES.

To Septimus Piesse, the celebrated London chemist and perfumer, we are indebted for the following recipes and facts, received by last steamer. The distinguished source from which they come is guarantee of their reliability:

TO CLEAN GILT JEWELRY.—Take half a pint of boiling water, or a little less, and put it into a clean oil flask. To this add one ounce of cyanide of potassium, shake the flask, and the cyanide will dissolve. When the liquid is cold, add half a fluid ounce of liquor ammonia, and one fluid ounce of rectified alcohol. Shake the mixture together, and it will be ready for use. All kinds of gilt articles, whether Birmingham ware or "Articles de Paris," which have become discolored, may be rendered bright by brushing them with the above-mentioned fluid.

TO HARDEN A POKER.—The fire poker, by constant use, becomes soft, and is generally more or less bent. This arises from its being left in the fire and becoming red hot, then being put on the fender, where it slowly cools—an operation which softens even the best steel. When a poker has thus become soft and bent, it may be again hardened by making it hot two or three times, and plunging it every time that it is hot into a pail of cold water. The rapidly cooling of steel makes it again hard.

INK ON BOOKS.—To remove ink-stains from a book, first wash the paper with warm water, using a camel's hair pencil for the purpose. By this means the surface ink is got rid of; the paper must now be wetted with a solution of oxalate of potash, or, better still, oxalic acid, in the proportion of one ounce to half a pint of water. The ink stains will immediately disappear. Finally, again wash the stained place with clean water, and dry it with white blotting paper.

LAUNDRY PAPER BLUE.—This is a new and useful invention by M. Binko, which will supersede the well-known blue bag of the laundry. A piece of the paper blue being put into water, colors it rapidly to the required rinse tint. Thus the trouble of keeping a blue bag from one wash to another will be avoided, as well as some expense saved.

A TEST FOR COLORS.—M. Nickles has found that fluoride of potassium will discharge a Prussian blue color, and not affect the indigo and aniline colors. This information will interest calico printers and dyers. A fact of more general interest is, that fluoride of potassium will remove ink stains from cloth.

A SEA weed, found abundantly on the coast of France, is now used in that country for clarifying beer, as being much more economical, and better suited to the purpose than gelatin. The weed referred to belongs to the genus *Chondrus crispus*, that is, the Irish or Carrageen moss.

THE brittlewort, or single cell plants, visible only by the microscope, are so numerous that there is hardly a spot on the face of the earth where they may not be found.

IT is estimated that America, when her productive power is fully developed, will be able to feed four times as many persons as there are now on the face of the earth.

ALL other conditions being the same, the vigor and richness of vegetation are proportionate to the quantity of light and heat received.

ONE pound of coal in the hands of a good chemist can by its consumption be made to evaporate, or convert into steam, 14 pounds of water.

THE first gas meter was invented by Mr. Samuel Clegg, in 1815, and was used at the Gas Works in Westminster, Great Britain.

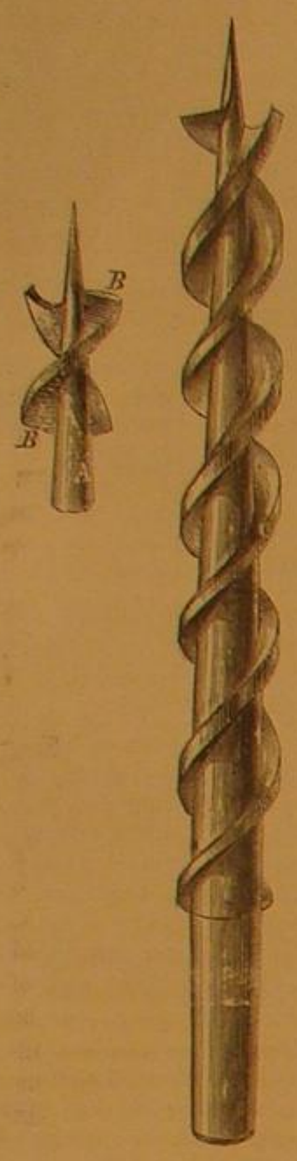
ABOUT 15,000 tuns of ammonia-alum are made annually in England. It is principally consumed in the dye works of Manchester and Bradford.

GRAHAM ascertained that the rate of diffusion of gases is inversely as the square root of their densities. Dr. Piesse was a pupil of Graham.

So many kinds of steel are now manufactured that an exact and permanent nomenclature for them is needed. Dr. Wedding, of Berlin, has endeavored to supply the want. He classes all kinds under two heads, "Raw Steel" and "Fine Steel." Of the former he distinguishes five varieties; while fine steel has a much larger number, each of which is named according to its mode of preparation, or after its inventor.

KELLY'S LASTING MACHINE BORING BIT.

We illustrate herewith an improvement calculated to secure a great saving in the expense of bits for machine boring. It will, however, be seen that the principle is capable of extension to bits designed to be used in the brace as well in boring machines.



The ordinary bits for boring machines are capable of being worn only from about one sixteenth to one eighth of an inch, when they become useless, and have to be laid aside. This bit, on the contrary, may be worn four inches or more, before it is thrown aside as useless, according to the length of twist. The advantages of this construction are so obvious that we need not dwell upon them.

The bit is particularly adapted to car-manufacturers' use, and for agricultural implement, furniture, carriage, sash and blind manufactures, etc., and will supply a want long felt.

The bit, it will be seen, consists of a central shaft, A, around which are formed the spiral blades, B. The lower point of the shaft, A, is pointed, as shown, and the opposite end is made to fit and be held by a boring machine chuck. The lower ends of the spiral blades carry cutting edges essentially like the ordinary center bit, a lip on one and a cutter on the other.

In sharpening, these edges of course retreat, but always maintain their relative distance from each other.

The spiral blades give also much greater rigidity to the bit, so that higher speeds may be employed. Specimens of its work have been shown us, and it is of the most satisfactory character. Patented, May 10, 1870, by Daniel Kelly, whom address at Muskegon, Mich.

Adams' Improved King-Bolt and Whiffletree Plate for Vehicles.

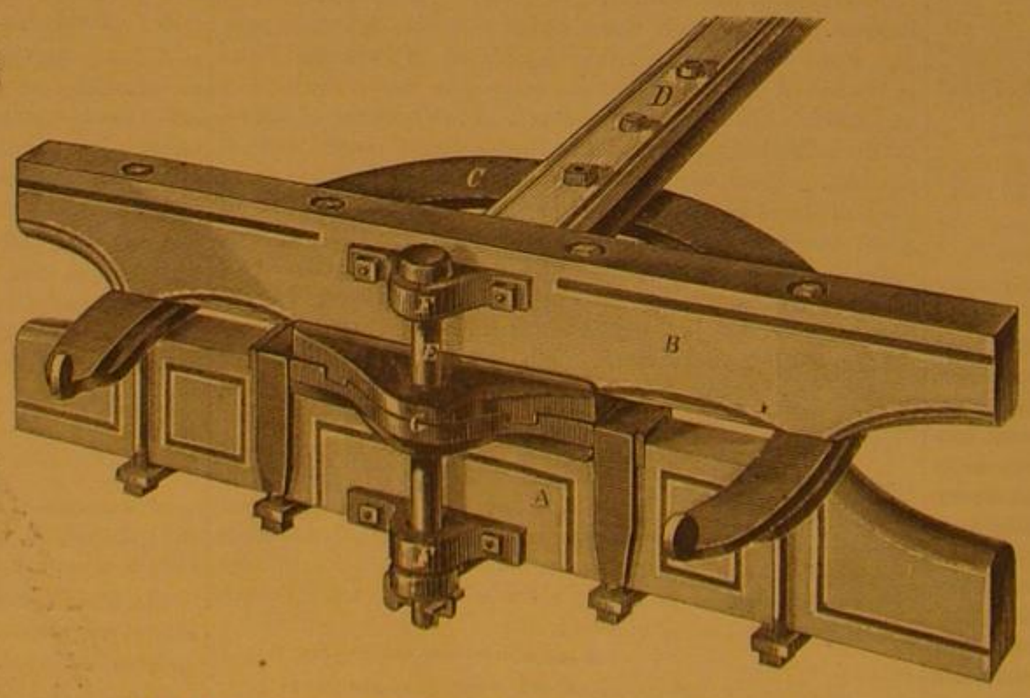
Our readers have had their attention called quite frequently of late to improvements in draft vehicles. Most of these have been real and practical advances over the old style of construction. The one of which we herewith give an engraving also merits attention, and has, we think, the advantages claimed for it by the inventor, of which we give a summary below.

A is the axle tree; B, the bolster; C, the sway-bar; D, the reach; E, the king-bolt; F, brackets through which the king-bolt passes; G, the iron plates on the bolster and axle-tree through projections in which the king-bolt also passes. The plates, G, are secured by clips and parallel ledges which fit against the front and back of the bolster and axle-tree respectively, and the one which is attached to the axle-tree has a semi-circular groove made in its upper surface, in which a corresponding ledge formed upon the plate attached to the bolster fits, so that the draft is sustained by these plates, and the king-bolt is subjected to very little strain.

The king-bolt is placed, as shown, in front of the axle, so that the full strength of the axle is retained, instead of being bored through as in the old method.

The inventor claims that by this construction the plates, G, receive the whole draft, leaving the king-bolt free at all times. The plates are so attached to the axle as not to weaken the wood work. Greater strength and less friction are secured than in any method hitherto employed. The improvement is adapted to all wagons, whether light or heavy.

Patented, through the Scientific American Patent Agency, October 20, 1868, by Levi Adams. Address for further particulars J. Adams & Sons, Amherst, Mass.



ADAMS' KING-BOLT AND WHIFFLETREE PLATE.

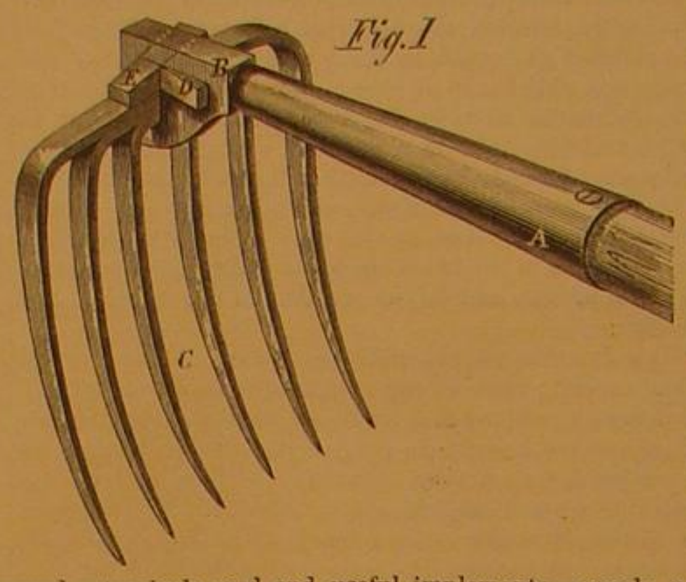
A New Theory of Sleep.

Dr. E. Sonnier has contributed to the *Zeitschrift für Rationelle Medicin* for 1869, a paper in which he promulgates the doctrine that sleep is nothing else than the result of a *deoxygenation* of the organism. According to this theory, the blood and the tissues possess the property of storing up the oxygen inhaled, and then supplying it in proportion to the requirements of the economy. When this store of oxygen is exhausted, or even becomes too small, it no longer suffices to sustain the vital activity of the organs, the brain, nervous system, muscles, etc., and the body falls into that particular state which we call sleep. During the continuance of this deep repose fresh quantities of oxygen are being stored up in the blood, to act as a supply to the awakened vital powers. Rest produces, though in a less degree, the same effect as sleep in reducing the expenditure of oxygen.

FOSTER'S CONVERTIBLE CULTIVATOR, HOE, FORK, RAKE, AND SPADE.

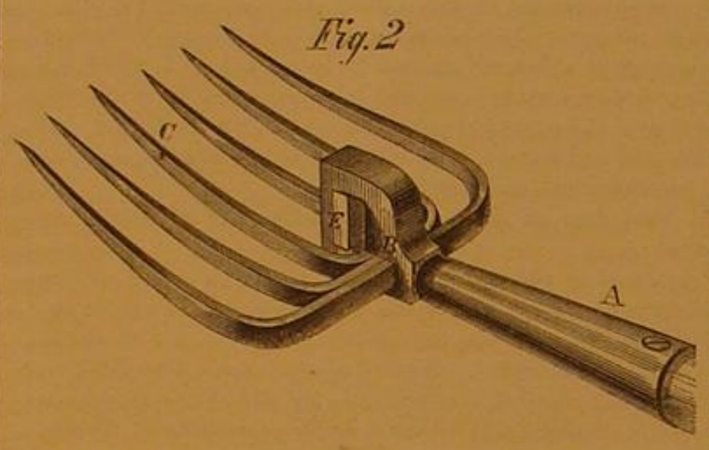
Our engravings illustrate an improvement by which a single agricultural tool may be made to perform the office of several extensively-used and useful implements—namely, a cultivator, hoe, potato hook or rake, and a fork for handling manure, and for forking or spading up garden beds, etc.

Fig. 1



The adjustment by which the transformation is effected is quickly performed, and the construction of the implement is is strong and simple.

Fig. 2



At the lower end of the handle, A, is formed a head, B, as shown, having an L-shaped slot. The tines, C, are made in pairs; each pair being united in the form of the letter U, but each successive interior pair forming a narrower U than the next pair exterior to it.

The tines being placed in one leg of the L-shaped slot, as shown in Fig. 1, form a cultivator hoe. When placed in the other leg they form a fork. In either position they are firmly held in place by a metallic block, D, which fills the vacant part of the slot, and a wedge, E, which firmly secures the tines.

This implement was patented, through the Scientific American Patent Agency, August 17, 1869, by John H. Foster, of Charlottesville, Va. Address as above for further information.

Fallacies of Statistics.

Archbishop Whately remarks upon the overrated importance of statistics:

"Increase of a thing is often confounded with our increased knowledge of it. When crimes or accidents are recorded in newspapers more than formerly, some people fancy that they happen more than formerly. But crimes, especially (be it observed) such as are the most remote from the experience of each individual, and therefore strike him as something strange, always furnish interesting articles of intelligence. I have no doubt that a single murder in Great Britain has often furnished matter of discourse to more than twenty times as many persons as any twenty such murders would in Turkey. Some foreign traveler in England is said to have remarked on the perceptible diminution in the number of crimes committed during the sitting of Parliament as a proof of our high reverence for that assembly; the fact being, as we all know, that the space occupied in the newspapers by the debates causes the records of many crimes to be omitted. Men are liable to form an over-estimate of the purity of morals in the country as compared with a town, or in a barren and thinly-peopled as compared with a fertile and populous district. On a given area, it must always be expected that the absolute amount of vice will be greater in a town than in the country, so also will be that of virtue; but the proportion of the two must be computed on quite different principles. A physician of great skill and in high repute, probably loses many more patients than an ordinary practitioner; but this proves nothing till we have ascertained the comparative numbers of their patients. Mistakes such as this (which are very frequent) remind one of the well-known riddle, "What is the reason that white sheep eat more than black ones?"

About Canes.

Since 1851 commerce in ordinary walking sticks has more than quadrupled. In Hamburg, Berlin, and Vienna—the present central depots for export—the manufacture employs many thousands of work people. Its control is in the hands of the Jews. A writer in *Harper's Magazine* for July says that the Meyers, members of one family of German Hebrews, are at its head in Austria and Germany proper, and by management peculiar to their race have absorbed all competition. First gaining ascendancy at home by the style and cheapness of their wares, they next assailed foreign markets. In Bombay they undersold the Chinese dealers. Scattering thin light bamboo rods along the overland route to India, the native productions in Egypt and Arabia gave place to the more convenient Viennese manufacture. The French occupation of Algiers introduced their graceful walking sticks to the Moorish gentry of Northern Africa. Paris began to adopt them. Madrid, Naples, and even London followed. They drove the English canes out of the Brazils, and on the Western coast of South America, where Belgian manufactures had enjoyed immemorial monopoly, they found a demand which it taxed all their resources to supply. Curiously enough, California, in the use of the Viennese walking cane, preceded the Eastern States. Mine explorers and gold diggers of the Sierra Nevada country gave *ton* to fashion in New York and Chicago. The importation of the Meyers' cane at the present time into the United States has swallowed up, like Aaron's serpent, all other. They are found everywhere. No Jew clothes man fails to keep them among his stock of goods. Light French ratans, heavy English crab sticks, curiously carved Brussels thorns, and even the choice Alcasian orange sticks, have disappeared. The Jew specialty always succeeds and the walking stick, manufactured now for thirty years by the Meyers, millionaires, furnishes no exception.

In the present manufacture of canes great quantities and varieties of materials are consumed. There is scarcely grass or shrub, reed or tree, that has not been employed at one time or another. The black thorn and crab, cherry tree and furze-bush, sapling oak and Spanish reed (*Arundo donax*), are the favorites. Then come supple-jacks and pimentoes from the West Indies, ratans and palms from Java, white and black bamboos from Singapore, and stems of the bambusa—the gigantic gross of the tropics—from Borneo. All these must be cut at certain seasons, freed from various appendages, searched to discover defects, assorted into sizes, and thoroughly rid of moisture. A year's seasoning is required for some woods, two for others. Then comes the curious process of manufacture. Twenty different handlings hardly finish the cheapest cane. The bark is to be removed after boiling the stick in water, or to be polished after roasting it in ashes; excrescences are to be manipulated into points of beauty; handles straightened and shanks shaped; forms twisted and heads rasped; tops carved or mounted, surfaces charred and scraped, shanks smoothed or varnished, and bottoms shaped and ferruled. Woods, too, have to be studied, lest chemical applications that beautify one might ruin another kind. Some are improved under subjection to intense heat, others destroyed. Malacca canes have frequently to be colored in parts so that stained and natural surfaces are not distinguishable; heads and hoofs for handles are baked to retain their forms; tortoise shell raspings are conglomerated by pressure into ornamental shapes, and lithographic transfers, done by hand, are extensively used upon walking sticks for the Parisian market.

INSECTS OF MISSOURI.—We are in receipt of the "Second Annual Report on the Noxious, Beneficial, and other Insects of the State of Missouri," made to the State Board of Agriculture pursuant to an appropriation for the purpose from the Legislature of the State. The report was prepared by Charles V. Riley, State Entomologist, and is an able and instructive document. We give an extract from the work on another page.

CHOCOLATE BLANC MANGE.—A quarter of a pound of sweet chocolate, two ounces of gelatin, one quart of milk, one teacupful of sugar candy. Put it all into a jug, set it in a saucepan of water, and let it boil an hour. When nearly cold turn it into the mold.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

GAS STOVES FOR ORDINARY DOMESTIC USE.

In a recent article we took occasion to show that, for steady use, either for domestic purposes or for the generation of steam for motive power, gas could not compete with coal in economy, but that, in summer, when fire is only needed, while temporary culinary or other domestic work is in progress, the fact that gas can be instantaneously kindled or extinguished, enables it to compete with coal on the score of economy, while, on the score of cleanliness, comfort, and convenience, it is vastly superior.

We are greatly surprised to see the loosest statements upon this subject in journals that ought to know their assertions are not based upon fact.

Thus, we find in an English engineering paper, the statement that gas may be economically used for the production of steam. Another scientific English journal broadly asserts, that "the economy of a coal fire is *far outbalanced* by the economy which results from the use of coal gas, *both for warming and cooking*." Has the author of this absurd statement ever heard of the axiom that "a part cannot equal the whole?" It would seem not.

Nothing is more certain than that the perfect combustion of a given weight of an element produces a constant amount of heat. Gas consists of only a portion of the combustible elements of the coal from which it is distilled, and this portion costs more than the total weight of the coal from which it is obtained. If, then, it be more economical in constant use, than coal, it must be because a much greater proportion of heat generated from the combustion of gas is utilized than is the case with coal. There may be some difference in favor of the gas in this particular, but we unhesitatingly assert, that nothing like such a difference as will make good the difference in cost per heat unit, in these materials, exists.

The assertion above quoted, in regard to the superior economy of gas, occurs in an introduction to a description of a gas stove, which will do cooking for one thousand persons, recently made by a London firm for a charitable institution. This stove is "sixteen feet in length, six feet six inches in hight, and two feet six inches in depth, and weighs about three tuns. It is divided into twelve compartments, in two tiers of six each, being only half the width of the four central compartments, although of the same hight. The top range consists of a roasting or baking compartment at each end, the four central compartments—which, however, only appear to be four from the outside, having four sets of doors—form one spacious hot closet. The lower range consists of six roasting compartments around the bottom of which the gas burners are placed; they are simply gas tubes with perforations, from which the jets of gas issue. At the top of each compartment is a sliding frame, from the bars of which the joints are suspended. The dripping falls into a pan below, which slopes from all sides toward the center, where there is an outlet, through which the dripping runs into a trough beneath, which is withdrawn and emptied as required, without lowering the heat of the oven. The doors are fitted with sight glasses, through which the progress of the cooking and the state of the burners can be observed without opening the doors and thus letting down the heat."

No provision is made for boiling or steaming, as there is already an apparatus for that purpose at the institution for which the stove was built.

The gas is used admixed with atmospheric air, the arrangement for that purpose being placed beneath the apparatus. It is calculated to consume 150 feet of gas per hour, which is very small considering the size of the apparatus and the work done. The hot chambers, forming the upper row, are heated by the waste heat from the ovens beneath, and have no direct supply of gas. The products of combustion and the fumes of the cooking are conveyed away by flues at the back of the stove to a common flue, and thence to the outer air.

The journal referred to asserts, that "from a variety of experiments, made from time to time, it has been definitely settled that—apart from the advantages of superior cleanliness, economy, and convenience—gas stoves effect a saving in weight of eighteen lbs. against thirty-four lbs. on 184 lbs. of meat, as against cooking by coal fires."

We do not consider this as definitely settled. On the contrary, we believe it a crude statement, without a shadow of of basis in fact. If such a saving has been effected, it depends upon the construction of the apparatus, and not upon the nature of the fuel, although we grant that the use of gas *may* render possible a form of oven whereby meats may be cooked with less waste than can be the case when coal is used. We do not, however, regard this as by any means demonstrated.

The fact is, that a large majority of gas stoves sold and used in this country do not bake meats at all, or, at least, very imperfectly. At least, we are so informed by those who sell these stoves, and to whom we have recently applied to obtain one for this purpose.

The reason is quite evident. The greater number of such stoves are made of thin sheet iron, and have not the power to distribute the heat with sufficient equality throughout the oven space, to do such work, or to bake properly, even a loaf of bread, although some of them will bake pastry or biscuits quite well.

It is obvious that if the plates be made of sufficient thickness, then a loss of heat must take place whenever the gas is extinguished by the radiation from the plates of the heat accumulated in them, so that a gain in efficiency, obtained in this way, would be attended by a lessened economy.

The problem then is this: to devise some way of equally distributing and confining heat in the ovens of gas stoves without the use of thick plates of iron, soapstone, or other material. The inventor who solves this problem, in a cheap and effective manner, will stand as good a chance to make money from his invention as by the production of any other improvement in present demand.

STATICS AND DYNAMICS OF FRICTION.

That mere pressure is not power seems a truth hard to be generally understood. Of course a general assent to the proposition will be given by nine out of every ten mechanics; the tenth—being at heart a perpetual-motion man on principle, or on what he considers principle—will perhaps deny that there is any distinction between the terms. But while most will admit the fact that mere pressure cannot perform work, and is therefore not mechanical power in the sense in which the latter term is generally used, it is obvious to the careful observer that, in their reasoning, the majority of men fail to keep the distinction in view, and thus arise a great number of popular errors.

Among these errors stands most conspicuous that in the belief in the possibility of the so-called perpetual motion, in the pursuit of which many minds and fortunes have been wrecked.

When one body rests upon another body, a certain force or weight is required to move it or to overcome the friction. This weight or force is found to be independent of the extent of surface, or the rate of motion, and is called the co-efficient of friction. This would seem a plain law and easily understood, yet few men, comparatively, are clear upon the subject. They say "the greater the velocity the greater is the expense of power in overcoming friction," forgetting entirely the relation which the meaning of the word "power" has to space and time, and that the word "power" as well as "velocity," involves the ideas of space and time. Velocity is motion through a definite space in a definite time. Mechanical power is the overcoming of a definite resistance through a definite space in a definite time, when it is considered as a mathematical quantity expressed in units of work.

A body moving at inconceivable velocity through space, and meeting no resistance, exerts no power, but the power it is capable of exerting should it meet a resistance may be computed from its velocity and its mass or weight. A body of sufficient weight moving at a velocity inconceivably small, may exert an enormous power, but one thing is certain, it must move. Power is inseparable from the idea of mass motion. No matter what may be the weight of a body or what may be the static pressure it exerts, it will develop no mechanical power till it moves as a mass.

Now let us apply these conceptions of power and velocity to the consideration of friction. The co-efficient of friction is a constant, for a given pressure, and is independent of extent of the surface of the bearing, or its velocity, but this does not imply that the expenditure of power to overcome friction does not increase with the velocity where the latter *is maintained through a given time*, as many seem to think. On the contrary the expenditure of power will increase directly as the velocity increases, and this not in spite of, but *in consequence* of the fact that the co-efficient of friction is a constant.

Suppose the weight of a body to be one thousand pounds, and that its co-efficient of friction is five per cent of its weight when resting upon a surface of given material. Five per cent of one thousand pounds is fifty pounds. The friction is therefore a constant resistance of fifty pounds to motion at any velocity, but as velocity implies space traversed, and as every foot of motion, through which the fifty pounds of frictional resistance are overcome, requires an expenditure of fifty foot pounds, for two feet accomplished there would be one hundred foot-pounds expended, and so on. But velocity implies more than mere space traversed; it implies definite space traversed in definite time. If, then, the velocity be doubled the space traversed in the same time will be doubled, and the expenditure of power to overcome frictional resistance through this increased space will also be doubled.

The frictional resistance expressed by the co-efficient of friction is static, but when it is overcome through space the power required to perform the work must be estimated according to the laws of dynamics.

The principle of all dynamometers is, that they measure the static pressure of a resistance, which is considered in connection with the distance through which that resistance is overcome in a definite time. Hence friction of machinery may be—and is best—measured by one of these instruments and when thus determined the co-efficient of friction for a particular combination of mechanism may be found by describing the power expended per minute by the number of foot-pounds of work expended in overcoming it.

The friction of any machinery, however, is increased while performing work, and will be a varying quantity so long as the work is not constantly uniform in its resistance; so that while the friction due to machines when running idly may be accurately measured, their friction when performing work can be only determined as an average of the varying friction during a given time.

THE DARIEN CANAL SURVEY.

The U. S. Government expedition sent to survey the Darien Isthmus has returned. Owing to unavoidable causes the expedition did not reach the Isthmus till about April 1st. They immediately landed at Caledonia Bay and made a careful exploration of the route proposed by Dr. Cullen. They found the lowest mountain pass to be over 600 feet about the sea level. About the 1st of May the party proceeded to explore the San Blas route from Mandinga Bay, on the Atlantic, to Chepo, at the southern end of Panama Bay on the Pacific. This route, Com. Selfridge thinks, is available. The rainy season commenced before he landed at San Blas, and all the country was flooded with water, yet from his reconnoissance he thinks that a careful survey will develop a route whereby a canal can be made with only twenty seven miles of cutting. We are pleased to see that he is already ordered to re-organize his expedition for a renewal of the survey next winter. The route favored by Com. Selfridge is the narrowest point of the whole Isthmus. It is said that the tidal waters of the two oceans there come regularly within seven miles of each other, and it is there that the tradition exists that the Indians and buccaneers drew their canoes across. It was there, too, that Vasco Nuñez di Balboa landed, and journeying toward the Pacific first saw the waters of that ocean from the hights south-east of Panama. The harbors on both sides are good. This route was brought before the public by Mr. Oliphant in a lecture before the British Geographical Society. It was reconnoitered for F. M. Kelly, Esq., of New York, in 1864, and, while having many favorable points, was reported against on account of a proposed tunnel. The engineers at the same time stating that they believed a better route could be found.

One of the great objections urged to this part of the Isthmus has been supposed unhealthiness. Com. Selfridge reports his men had good health, and only one died. This from a crew numbering fully 600 men does not indicate a very unhealthy climate.

As Com. Selfridge is to proceed again to the Isthmus next winter, and we suppose not only make a thorough survey of the San Blas, but also of the Panama route, some definite information may at last be expected as to an American inter-oceanic canal. Then, too, we notice that Congress is about to appropriate $35,000 for the survey of the Tehuantepec line. Let the work be placed in hands of such a man as Selfridge, and it will be executed without fear or favor, and a result reached of which Americans may be proud.

A DENUNCIATION OF WATER METERS.

We were about to entitle this, "Arguments Against the Use of Water Meters," but the article, the fallacy of which we propose to show up, and which we find in the *Baltimore Underwriter*, has so much more the character of denunciation than of argument, that we changed our minds and chose the above heading as more appropriate.

The article in question commences with the following bit of rhetoric: "The latest iniquity of the political economists who manage our system of tax gathering is the determination manifested in some of our large cities to impose unwarrantable charges upon the use of water by the introduction of meters into private households as well as into hotels and manufacturing establishments."

Then follows an enumeration of the great benefits of water in general and particular, a subject so trite that we will not weary our readers by a review of this part of the article—the burden of which is to show, what needed no showing, that health and good morals greatly depend upon an ample supply of water, but we cull a couple more specimens of rhetoric, which will serve us as texts for what we have to say upon this subject.

"Next to air and light, no element of primal necessity is so indispensable to the sanitary condition and comfort of society as water, and any restriction upon its use is an injury

to the public health, which calls for severe condemnation.

"The value of life is highest wherever sanitary regulations are best and social evils fewest, and no municipal management that would sanction impediments to the public health can escape censure."

One might suppose from these expressions that the adoption of meters would engender malaria, or that the annual rainfall upon the water sheds from which our cities derive their supplies would be greatly decreased by their use. We can assure our readers, however, that the writer of the quotations only means that the water will cost more to the consumers, and that consequently they will go unwashed, and take their whiskey straight rather than incur the increased expense.

Let us see what foundation there is for these fears.

First, the water furnished to any city costs a given amount, which aggregate cost will not be increased by the use of meters, except upon the money invested in them, and their depreciation, a mere trifle, scarcely worth considering in comparison with the entire cost, provided meters can be found having the proper degree of durability.

The aggregate cost of the water is provided for by taxation, which always falls directly or indirectly upon consumers. This taxation is at present notoriously unequal upon individuals when compared with the amounts they respectively use or waste; and what is more, it is equally notorious that those who are best able to pay, really do pay least in proportion to the amounts used.

Large manufactories, breweries, livery stables, hotels, etc., probably, on the average, pay less than half the price per cubic foot for the water used, than private establishments, under the present system. Meters, instead of increasing the aggregate taxation, would distribute it equally, so that the tax would fall lighter upon the poor than it now does, and the water instead of being made dearer would actually become cheaper to them.

As it is, the provident now pay for the wasteful, and the smaller consumers contribute to pay for what is used by the larger, an injustice so great that did the public appreciate its magnitude it would clamor for meters as the plain and obvious remedy.

In a question of simple purchase—for such it really is—it would seem there could not be two opinions as to whether the commodity purchased should be "sold by the grab" or accurately measured; and all the talk about the great value and utility of water only makes this more evident. If air or natural light had to be obtained by purchase the same rule would apply; but as these things do not cost money, and as they cannot be wasted, the comparison of water supply to the supply of air and light, is simply an absurdity. How would the public tolerate the general taxation plan in the distribution of gas? Yet that would be no more absurd than our present system of distributing water in cities and making the poor pay for what the rich consume.

No amount of blind denunciation can alter these facts, and no argument against the use of meters, except the fact that none in market have been found to answer the requirements of general use, can be brought forward, that does not equally apply to the use of weights and measures generally.

A GLANCE AT AERONAUTICAL SCIENCE---REVIEW OF A PAPER READ AT A MEETING OF THE AERONAUTICAL SOCIETY IN LONDON, BY W. CLARE.

If it be true that all sound knowledge is attained with difficulty, and that human progress is of necessity slow, certain it is that in the science of aeronautics—if it be yet proper to use the term science in this connection—this truth finds a remarkable illustration. It takes, it would seem, a very long time for mankind to get fledged. So far, every time he has attempted to try his wings, either their immaturity or his want of skill has rendered his attempts to fly unavailing.

If words and theories could take the place of wings, we should long ago have been disporting in the air like swallows; but the truth is that the fine spun theories which form the bulk of what is said and written upon this subject, lead rather towards failure than success. We are of those, however, who believe in the utility of the "study of failure," and there are few intelligent minds that can review the long list of devices, proposed or experimented with to enable man to navigate the air, without benefit.

But our purpose was to review a paper recently read by Mr. W. Clare, before the Aeronautical Society, in London, and to give in condensed form an expression of his opinions rather than our own upon this subject.

Passing over a somewhat lengthy introduction, in which he sought to prove that the problem of flight had occupied the attention of mankind from remote ages, we pass to a consideration of the errors which, according to that gentleman's statement, have hitherto prevented success, and the avoidance of which he is confident will insure the success of an apparatus of his own devising.

The first error which he points out is the supposition that heavy wings or heavy machinery must necessarily retard or render flight impossible. He thinks there is very little difference between flight in water and flight in air, and that such difference as exists, is purely a mechanical one. All that is necessary to flight is that our wings shall displace sufficient air in proportion to the weight of the apparatus, and there need be no apprehension of making them too heavy. In birds, the amount of wing surface, in proportion to weight, decreases as the weight increases.

The second error which, according to Mr. Clare, inventors are entertaining, is that air cells help the flight of birds. Upon this we will quote his own language.

"If, as is reasonable to suppose, these cells are fitted with an extremely rare gas, a power of buoyancy would of course be the result; but what a power! under the most favorable circumstances bearing something like the enormous ratio of circumstances bearing something like the enormous ratio of ¼ per cent (·025) to the weight. Were, however, a bird thus buoyed up, as many still suppose, flight would be rendered impossible by that very buoyancy, as impossible as the flight of a balloon—by flight I mean of course controllable flight. This air-cell business is by far the weakest argument yet brought forward."

Models are denounced by Mr. Clare, who thinks pure theory can alone solve the problem of flight, and claims that most valuable discoveries and improvements have been made without their aid; a statement which we think he fails to substantiate.

He does not believe in steam as a motor for flying machines, and regards the steam engine as far too wasteful a machine ever to meet the requirements of aerial navigation. On this head he remarks:

"Birds feel the air and seem to guide their flight by nervous sensation; machinery, I fear, will never accomplish this, though man undoubtedly will. Dr. Smyth, in his experiments with the wings of a pigeon dried in an extended position, found that, however cleverly and closely he imitated the motions of a pigeon by means of a spring, he could raise no weight except very occasionally, and then by jerks, which proves that great power is not required so much as a successful manipulation of a small power.

"Will it be considered superfluous here to remind you that, though birds of the struthious or ostrich order do not fly, weight is by no means the cause of their failure? You will perhaps allow me to quote in a parenthesis the quaint old naturalist Buffon's contrary opinion on this subject. He says, 'The ostrich is generally considered as the largest of birds, but its size serves to deprive it of the principal excellence of this class of animal—the power of flying. The medium weight of this bird may be estimated at 75 lbs. or 80 lbs., a weight which would require an immense power of wing to elevate into the atmosphere; and hence all those of the feathered kind which approach to the size of the ostrich, such as the cassowary, the dodo, neither possess, nor can possess, the faculty of flight.'"

Mr. Clare regards this explanation of Buffon as very unsatisfactory, and says he has been unable to reach any satisfactory reason why ostriches and some other large birds cannot fly.

He thinks the cause of the stand-still in the Aeronautical Society is that men do not consider the subject of "aerostation" or "aviation" to be a real science, but bring forward wild, impracticable, unmechanical, and unmathematical schemes, wasting the time of the society, and causing it to be looked upon as a laughing stock by an incredulous and skeptical public.

Somewhat inconsistently he thus gives a description of an apparatus as impracticable as any yet reported as having been exhibited before the Society, in the use of which men shall be taught to fly by suspending them at the end of long ropes.

Finally, he exhorts the brethren with still greater inconsistency (after having maintained that theory was equal to all emergencies) to *do something*, and not let another year pass in "dreamy speculation and unprofitable theorizing;" which advice we hope they will be able to follow, and that the personal risk which their efforts entail may not largely thin the ranks of the Aeronautical Society.

THE HISTORY OF A DEFUNCT HORSE.

A young gentleman just out of college, once remarked that it was exceedingly insalubrious to inhale the obnoxious effluvia arising from the cadaverous carcass of a defunct horse. He was undoubtedly right, and science has found a way of remedying the evil. They now make so many things out of the dead body of a horse that the animal must be a remarkably fine one if he is worth as much when alive as he is in the retorts and kettles of the chemist. As soon as the horse is dead, his blood is sought by the manufacturers of albumen, and by sugar refiners, and by the burners of lamp black. Not a drop of it is allowed to go to waste.

The mane and tail are wanted for hair cloth, sieves, bow strings, and brushes. The skin is converted into leather for cart harness, for boots and shoes, and strong collars. The hoofs are used for combs, horn work, glue, and in old times were the chief source of the spirits of hartshorn, now obtained from the gas house. The flesh is boiled down in the rendering vat, and much oil and fat is obtained from it. Some of the choice bits may find their way into cheap restaurants, and play the part of beef steak, or help to enrich the hasty plates of soup of those establishments. The flesh left after all has been extracted from it that is of any service, is sometimes burned to be used as a manure, or is worked up into nitrogenous compounds such as the cyanides, to be used by the photographer for taking our pictures.

The stomach and intestines make valuable strings and cords for musical instruments, and out of the bones so many useful articles are manufactured that it is almost impossible to make out a complete list of them. Among them are buttons, toys, tweezers, knife handles, rulers, cups, dominoes, balls, and the residue from all these things is burnt into bone black to be used by the sugar refiner, who thus puts in a second claim upon the dead horse; and some part of the bone black is burned white to be used by the assayer in testing for gold; and when the refiner and assayer have finished with it, it is converted into super-phosphate to serve as a valuable manure on our land. The teeth are used as substitutes for ivory; and the iron shoes if not nailed up over the door to ensure good fortune to the household, are worked up into excellent wrought metal. Some portion of the bone black is converted into phosphorus for the manufacture of matches, and lately a valuable bread preparation is made of the phosphate, and medicines are prepared for the cure of consumptives.

ICE BY MACHINERY.

The excessive heat of the present season and the enhanced price of ice invite attention to a subject that has been frequently discussed in these columns, but which does not appear to have been practically settled by the companies who have undertaken to manufacture ice by machinery. The question is, Can ice be made artificially in a northern climate so cheaply as to come into competition with the natural crop of the winter? We believe that it can, and in this belief are sustained by the opinions of all scientific men who have studied the subject as well as by the facts and figures of actual application. The reason why we have not refrigerating machines as common as stoves, and as cheap as cast-iron can make them, is that there has been no demand for them and consequently no regular manufacture. Stoves are a necessity, and we have as many patterns and varieties as there are days in the year; and yet patents on them have not ceased, and will not cease to be taken out as long as man continues to heat his house or cook his food. But cooling stoves, if we may be allowed the expression, are not an absolute necessity and have not therefore been so generally studied and improved upon as our heating apparatus.

It is not necessary for us to report what we have frequently published concerning the various methods resorted to for the artificial production of cold, but we can confine ourselves to what appears to be the most successful machine of any thus far invented. The production of cold by the liquefaction of a gas and the subsequent absorption of that gas by the action of chemical affinity, is the most philosophical of any method thus far proposed. The gas that fulfills both these conditions is ammonia. It is easily converted into a liquid at seven or eight atmospheres of pressure, and it has such an affinity for water that it is rapidly absorbed without the necessity of any further application of heat. It is only necessary to heat aqua ammonia in one end of a closed U-shaped apparatus to soon find the other limb filled with the liquid gas; and as soon as this takes place, if the heat be removed the gas returns to its original water so rapidly as to produce intense cold. The particular machine by which this result is accomplished was exhibited in Paris in 1867, by M. Carré, and has been largely imported into this country. Dr. Barnard, the learned President of Columbia College, says of this invention that a machine of the annual productive capacity of thirteen hundred thousand pounds of ice can furnish ice at less than a quarter of a cent a pound. "It is here assumed, however, that the manufacture will be carried on in the country, where the rent of premises will not be a heavy charge, and the expense of distribution is not allowed for. One thousand tuns of ice may therefore be manufactured at an outside expense, loss and waste being included, of ten thousand dollars or less; and this may be delivered to customers at twenty dollars per tun, or one cent per pound, with an annual profit of ten thousand dollars." This estimate of Dr. Barnard's covers all of the necessary outlay for rent, wear and tear of machinery, and permanent investment, and still leaves an ample margin of profit for the company. The agent for the sale of the Carré apparatus in this country, M. Bujac, states that at the Louisiana Ice Manufacturing Company's Works at New Orleans, six No. 1 machines are now producing from 72 to 76 tuns of ice daily at a cost of $3·00 a tun, and at the works of Messrs. J. P. Morris & Co., Philadelphia, by improved machinery it is calculated that eight pounds of solid ice can be made for one cent. We thus have the testimony of experts, and the actual results of practice, going to show that, by the ammonia process, ice can be made at a cost far below the price at present demanded by our monopolizing ice companies. Why is it, with these facts so prominently presented to us, that so few capitalists have been found to place their money in an enterprise that would confer a great boon upon the community while it at the same time yielded a handsome profit upon the capital invested. Ice has become a necessity, and there is no reason why we should not have it in unlimited quantity and at a reasonable price.

SCIENTIFIC INTELLIGENCE.

NAPHTHALINE AND ITS USES.

Naphthaline is one of the products of the distillation of coal tar. It is commonly associated with anthracene, and until recently there were not sufficient uses known for it to render its manufacture and preservation worthy of notice. Now that its associate anthracene is likely to come into demand, more attention is bestowed upon napthaline, and the inquiry arises for what uses is the substance applicable. We have on a previous occasion spoken of a fine dye that is made from it, and we hear that this pigment is meeting with much favor. Naphthaline is a pure white substance similar to alabaster. It crackles like sulphur in the hand, and also becomes negative electric when rubbed with silk. It can be used as a solvent for indigo and for the sulphides of arsenic, tin, antimony, also for phosphorus, sulphur, iodine, benzoic and oxalic acids. This property can be taken advantage of for the purpose of adding these substances to other mixtures and may be applicable to india-rubber, collodion, etc.

Even when purified, naphthaline possesses a strong persistent odor, recalling the smell of coal tar creosote, and this has suggested its use as a disinfectant and as a remedy against the ravages of moths and other insects among woolens, plants, and objects of natural history. Where its somewhat disagreeable odor does not stand in the way it can be very advantageously substituted for camphor.

Now that we are likely to have this interesting substance

in larger quantities than formerly it will probably be applied for the preservation of meat, very much as has been done with paraffine. Its melting point is too low for candles, but mixed with other hydrocarbons it may possibly be used as a source of light. When burned in its pure state it gives rise to copious clouds of fine lamp-black.

ARTIFICIAL INDIGO.

We have mentioned the discovery of a method for the artificial production of the madder dye, alizarine, from a coal tar product known as anthracene. There is now talk of a way of making indigo by the action of chloral on aniline. The preliminary steps have been taken, and enough has been learned to admit of the taking out of a caveat, but the dye itself is not yet in the market. We shall watch with interest the development of this new industry, and shall not fail to communicate the results to our readers.

NEW USES OF COLLODION.

Collodion is now used as a substitute for india-rubber for the setting of false teeth. The solution of gun cotton in alcohol and ether is poured out in thin layers until it sets, and while still moist the impression for the mouth is made with it. It is colored in imitation of flesh by organic dyes, thus avoiding the poisonous mercury salts usually employed for that purpose.

Sets of teeth mounted upon collodion are said to be more agreeable to the mouth on account of the lightness of the material. They are also as permanent as any made from india-rubber.

Collodion is also used in the manufacture of billiard balls, and of a variety of toys. For this purpose the gun cotton need not be made of such expensive material as is required in photography.

Now that gun cotton is used for so many purposes it may be well to caution manufacturers against the dangers of explosions. Recently at a billiard manufactory in Albany the establishment was destroyed by the ignition of the cotton by mice nibbling some matches that had been carelessly left near it. There is also danger of the spontaneous decomposition of the gun cotton.

It is somewhat curious that, although gun cotton has been in use a good many years, our knowledge of its properties is still quite limited, and from recent researches it appears that what we call collodion is a complex body capable of further subdivisions by water and other agents, so that its various constituents will hereafter be sought out and adapted to their various uses. Such researches are now going on, and will add to the value of collodion in photography.

THE CULTURE OF THE TRUFFLE.

There is a curious natural production about which very little is known, and to which we give the name of fungus, which appears to grow spontaneously among the roots of certain oaks, its existence being detected by the grubbing of the pigs that run wild in the forests of France, and is a favorite appetizer among Paris gourmands. It was at one time thought to be disappearing, but of late years, in Perigord and other departments of France, methods have been found to cultivate it, and it is becoming a valuable article of export. As many as 3,000,000 pounds of truffles were raised last year, weighing from a few ounces to two pounds.

The proper variety of oak is planted, and in the course of eight or ten years the truffle reaches its most perfect state. It will not bear rich soil or any interference, and reaches maturity in the winter, at which season the crop is gathered. We are not aware of the occurrence of the truffle as indigenous in the United States or of its having been anywhere cultivated in our country.

VASSAR COLLEGE.

This institution, located at Poughkeepsie, N. Y., is devoted to the education of young women, who, in accordance with the will of the founder, the late Matthew Vassar, receive instruction equal to that bestowed upon young men in the best of other colleges. A regular collegiate course of four years is followed at Vassar, with professorships filled by some of the ablest persons in the country. The college is also supplied with a fine collection of scientific instruments and apparatus.

The classes bear the usual names of Freshman, Sophomore, Junior, and Senior. The buildings are numerous and extensive; everything about the college is conducted in the most systematic and excellent manner. During the past year nearly four hundred students have attended. At the recent annual commencement the poems, essays, and other exercises by the young ladies were highly creditable.

It is a prevailing impression that young women are naturally unfitted to endure and benefit by the disciplinary courses of study which a first-rate education involves; but the result at Vassar conclusively proves the contrary. It would be difficult to find in any college for young men of equal numbers a greater amount of intellectual vigor and activity than is to be observed among the students at Vassar. Judicious attention is paid to physical cultivation. The young ladies are required to take considerable outdoor exercise, and by way of variety, they ride on horseback, roll nine pins, play base ball, row boats, and go through a variety of gymnastic exercises. Domiciled in the college they have little opportunity to form habits injurious to health, such as late hours, late suppers, rum and beer drinking, smoking and chewing tobacco, with other bad practices, not uncommon among young men collegians.

The Vassar students enjoy remarkably good health, although they are required to study hard. Their proficiency is excellent. The preparatory class of candidates for admission to Vassar must pass through a preliminary examination, which begins September 14th. They are examined in arithmetic, grammar, modern geography, and History of the United States.

Candidates for the Freshman class are examined in introductory Latin grammar, Cæsar (four books), Cicero (four orations), Virgil (two books), ancient history, Otto's French course, Williams' English into French (fifty pages), Fasquelle's Colloquial Reader, Robinson's Universal Algebra (to equations of second degree), Quackenbos' Rhetoric, and Physical Geography. It will thus be seen that girls must know a little something before they begin at Vassar. Many of them, after having passed through the ordinary private schools find themselves obliged to spend a year in the preparatory class before they are enabled to enter as Freshmen.

The entire charge at Vassar is $400 a year for each student, except the ornamental studies, such as piano, painting, etc. Education at Vassar is therefore not very expensive, but it is complete and thorough in every department.

John H. Raymond, LL.D., is the President of Vassar College, who should be addressed by those desiring further information.

A SEWING MACHINE-PATENT EXTENSION---AN IRATE OPPONENT.

In the SCIENTIFIC AMERICAN of June 25th, we published the fact, that the sewing-machine combination were endeavoring to secure the extension of the Bachelder Patent. It is hoped to accomplish this, either by direct action of Congress, or to have the case heard, upon evidence, by the Commissioner of Patents. A correspondent of the *Sun*, whose respectability is vouched for by the editor of that terrestrial luminary, charges that "the new Commissioner of Patents has been long known as a lawyer for the sewing-machine combination, and is using all his influence to get the Bachelder patent extended for ten years." He also states, that the Singer Sewing Machine Co., with a capital of $250,000, made, last year, upwards of $2,000,000. The Wheeler & Wilson made over $1,000,000. The Grover & Baker, no doubt, did as well as either of the above companies. The Howe, with a capital of $500,000, made over $500,000. He might mention others, but these suffice. Three of the above companies form what is now called the combination, which means, a combination not to exceed eight or ten men, against forty millions of American people.

Not content with his charge against the Commissioner of Patents the irate correspondent calls the Patent Office a "shaving shop, a flunkey's office, where evidence is prepared and manufactured regardless of truth, for the benefit of a few monopolists who want their patents extended from time to time," and Bachelder, the patentee, is set down in the low category of "a catspaw, poor devil," etc.

We are not aware upon what ground the *Sun* correspondent bases his charges against the Commissioner, but it appears to us that he is laboring under a fit of "black bile." His primary motive in this attack on the Patent Office is aimed against the extension of the Batchelder patent, and he writes like one who wants to make sewing machines without paying the "poor devil" for a right to do so. We are opposed to the extension by Congress or otherwise of the Bachelder patent. We regard it as an unjust measure, not intended to benefit the inventor, but to perpetuate and enrich a combination which seeks to control the entire sewing machine interest of this country.

We suggest, however, that abuse of the Commissioner of Patents, the Patent Office, and the inventor, is not the way to defeat the measure.

CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.

The London Underground Railways—The Tower Subway—The Pneumatic Railway System—Railway Shifts and Signals.

LONDON, June 24, 1870.

Since my arrival here, I have visited several public works, and have been given every facility to inquire into the plans of construction, etc. In the office of Mr. Fowler, the Engineer-in-Chief of the Underground Railway, I was shown all the plans of the works.

Mr. Baldrey, Chief-Assistant, Mr. Baker, and Mr. Cooper, received me with the greatest cordiality. They were well posted in regard to the need of rapid transit in New York, and had read of the various propositions to meet it. They are constantly receiving calls from Americans visiting London for permission to examine their works, and they freely give every information to such as apply in the right way. Mr. Cooper good-naturedly informed me that some of the Americans who called were queer fellows; they pitched into everything, and could not find anything to please them. I told him we had Englishmen who visited New York and were just as bad, and that grumbling and bragging was a complaint to be found as much in one country as the other. I was taken by Mr. Cooper over the new line just opened. We got off at all the stations, and he explained to me the various methods employed in the works. At some of the stations the rail level is four feet below high-water mark. They have constructed drains to receive the water at certain points. There is no evidence of dampness or water collecting anywhere along the line, which, I should mention, commences at Blackfriars Bridge, running under and along the Thames embankment to Westminster Bridge, passing close to the Houses of Parliament and Westminster Abbey, and connecting with the line first opened on the north district.

At Victoria and other stations they have pumping engines and boilers in duplicate; they pump at Victoria a thousand gallons per minute; if the pumps were stopped five hours they would have water on the rail level, consequently they are prepared, in case of accident to one engine and boiler, to operate the others.

The stations are all very much alike in appearance and size, being very commodious, and having every convenience. The roofs are constructed of iron and glass, the iron being of the lightest and most elegant form, as also the supporting posts, which are very light in appearance, although capable of sustaining a great weight. On Whit-Monday the number of passengers carried was 217,000, and for the week over 1,500,000.

There are two underground railway companies—the Metropolitan and the Metropolitan District; but by a mutual arrangement they are practically one company. The same engineers and contractors have built the lines, but the money has been furnished by two organizations.

I find that the works of the underground railroad are constructed in the very best manner, and taken altogether reflect the highest credit on the engineers and contractors. While we in New York have been talking about the difficulties and expense of an underground road, they have here been constantly extending their lines without any more fuss than we would make to build a brown-stone house in New York. On telling Mr. Cooper, as we passed along the line, that I thought such and such parts must have been very difficult, he seemed to treat the whole work as quite a matter of course and nothing to boast about. I spent nearly a whole day in the office and on the works.

THE TOWER SUBWAY.

The Tower subway was recently opened for a short time under the Thames, and has been closed for the purpose of making some changes in the wire rope machinery by which the car is operated. A request to visit the works as a New Yorker was granted at once, and every facility given for examining it. The method of construction is almost identical with that of the pneumatic tunnel under Broadway; but they have tried to operate the car with a wire rope, and it does not work well; it is believed that they will have to adopt pneumatic propulsion, and that it will then succeed.

THE PNEUMATIC RAILWAY SYSTEM.

I called at the office of Sir Charles Fox & Sons, and was given every information in reference to the Whitehall and Waterloo Pneumatic Railway, which was commenced some time since, but is now languishing from want of funds, not from any want of faith in the principle. I have spoken to all the engineers with whom I have been brought in company, with a view to get their opinions on the pneumatic railway, and I find they all believe in it as the best system for underground transit, and that it only needs some company with means to build and put in operation a line two or three miles in length to get the pneumatic system the support of capitalists. Sir Charles Fox & Sons are well acquainted with the topography of New York Island, and believe that a pneumatic railway is the only one that will answer all our requirements.

THE GREAT WESTERN RAILWAY STATION.

I have visited the Great Western Railroad Station at Paddington, and find that an immense saving of time and labor is achieved by the use of hydraulic machinery for changing the cars from one track to another, turning the tables, hauling cars back and forth to make up a train, etc. The whole is worked by one engine, and by unseen machinery. When it is necessary to change the cars from one track to another a lever is inserted in a small hole; and car or truck moved bodily across; the cars are hauled up and down the station track by attaching a rope to them, giving a couple of turns of the rope round a capstan, and, touching a lever, the capstan flies round and pulls the cars in the direction required. Over three hundred trains a day arrive and depart from this station. The tracks are both broad and narrow gage.

The Station Inspector, Mr. Craig, who has been twenty-three years in the employ of the Company, took considerable trouble in showing me about the place and explaining the signal machinery, etc. By the way, on the lines that I have traveled, I find that all of the signaling, switching, and shunting of trains is done by telegraph and lever in covered signal boxes, in some cases one man works as many as sixty levers, besides the telegraph signals.

JOSEPHUS.

A Sewage Phenomenon.

According to the *Engineer* a singular optical phenomenon has presented itself in connection with the purification of sewage.

On a day when the sea was calm and the sky was clear the effluent water from the "A. B. C." works at Hastings was seen to flow away like a dark current amid the general azure of the salt water. The appearance was somewhat as if a reef of rocks came within a few inches of the surface of the sea. To most persons the appearance was conclusive that some temporary failure had occurred at the "A. B. C." works, and that the sewage was flowing into sea in its original state of impurity. Even the parties who were conducting the works became perplexed. A boat was put off in order to investigate the state of affairs, and samples were taken from the black stream as well as from "the bright, blue sea." On examination it was found that the black water was the clearer. The fact was that the same phenomenon had been repeatedly witnessed before, but never carefully investigated. The eye of an intelligent observer would often perceive—particularly on such a day as that to which we now refer—that the sea on the verge of the horizon was of a deep indigo blue, tending to blackness, whereas near the shore the tint was much paler. The gradation of tints between the distant water and that which lay close to the shore diminished the effect of contrast. But the effluent water from the sewage works brought the deep blue into the midst of the light blue, so that the former looked most suspiciously dark.

The sea near the shore held particles of sand in suspension

These particles reflected the light, and gave the water a paler tint, in consequence of their own sandy hue. Far out, the sea was tolerably clear from this suspended matter, and therefore the pale reflection was absent. The more free from mechanical impurity, the less able was the water to reflect light. Hence an apparent darkness.

Every one knows how a dark room is often lit up by a passing cloud, simply because the cloud reflects more light than the sky. So in like manner cloudy water may at a distance look brighter than clear water. Thus it came to pass that the clear water resulting from the "A. B. C." process was unable to reflect so much light as the sandy fluid into which it was ejected, and consequently the clear stream appeared comparatively black. To the fishes gazing upwards the effect must have been reversed, the clear stream transmitting a greater proportion of light than the sandy sea.

The phenomenon was the same as that of Newton's rings. When one lens is pressed down upon another the eye gazing from above sees in the center a black spot. But if the eye gaze up from beneath, so as to catch the transmitted instead of the reflected light, the black spot becomes white.

It is hoped that the "local authorities" of our sea-coast towns are either acquainted with the laws of optics, or will take a few lessons in this interesting science, lest they should fall into the mistake of pronouncing water as black as ink which in reality is as clear as crystal. In the absence of the necessary scientific knowledge, these gentlemen will perhaps be ready to declare that our argument is an attempt to prove that black is white.

Statue of Professor Morse in Central Park.

The Commissioners of the Central Park are understood to have given their consent for the erection of the statue of Professor Samuel F. B. Morse upon the Mall, and an appropriate site will be selected. This is the first acknowledgment ever proposed by Americans to Mr. Morse for his great invention. From the sovereigns of Europe, however, he has received numerous honors. By the Sultan of Turkey he has been presented with the Order of Glory; from France, the cross of the Legion of Honor; from Italy, the cross of a Chevalier of the Order of St. Maurice and Lazarus; from Portugal, the cross of Chevalier of the Order of the Tower and Sword; from Spain, the cross of a Knight Commander of the Order of Isabella; from Denmark, the cross of a Chevalier of the Order of Dannebroge and Knight Commander; from Austria, Prussia, and Wurtemburg, the National Scientific Gold Medal; and from the Special Congress of ten nations in 1858 an honorable gratuity of 400,000 francs. It is proposed to unvail the statue on the 27th of April next, his eightieth birthday.

THE first medical degrees conferred in America were by Kings College, New York, in 1769. The first medical work published in America, was "A Brief Guide on Small-pox and Measles," by Thomas Thatcher, of Massachusetts, in 1667.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,357.—STEAM VALVES OR COCKS.—G. S. Redfield, E. A. Rock, and J. S. Ill Ludlow, Vt. May 12, 1870.

1,361.—WINDOW FASTENER.—W. L. Clark, New York city. May 12, 1870.

1,383.—SEWING MACHINES.—E. G. Marshall, Rochester, N. Y. May 14, 1870.

1,393.—WASHING AND RINSING APPARATUS.—G. G. De L. Byron, New York city. May 16, 1870.

1,394.—RECOVERING SULPHUEIC ACID USED IN REFINING PETROLEUM AND OTHER OILS.—M. Barrett, M. D., Toronto, Canada. May 16, 1870.

1,401.—BEARINGS, SLIDES, AND PACKINGS FOR STEAM ENGINES, ETC.—E. D. Murfey, New York city. May 16, 1870.

1,412.—SHUTTER HOLDER.—S. L. Loomis, South Byron, N. Y. May 17, 1870.

1,413.—STEAM PUMPING OR BLOWING ENGINES.—J. R. Maxwell and Ezra Cope, Cincinnati, Ohio. May 18, 1870.

1,417.—INKS.—Lewis Francis, New York city. May 17, 1870.

1,428.—CIGAR MACHINE.—American Cigar Machine Co., New York city. May 18, 1870.

1,428.—KNITTING MACHINES.—D. McC. Weston, Boston, Mass. May 18, 1870.

1,437.—LOOMS.—E. B. Bigelow, Boston, Mass. May 18, 1870.

1,451.—LAPPING COTTON, ETC.—R. Kitson, Lowell, Mass. May 19, 1870.

1,465.—MODE OF SUPPLYING AIR TO LAMPS.—J. H. Irwin, New York city. May 23, 1870.

1,491.—MACHINERY FOR SEWING SHOES, ETC.—C. Goodyear, Jr., New York city. May 24, 1870.

1,458.—PILES FOR ENGINEERING PURPOSES.—T. W. H. Moseley and F. A. Leigh, Boston, Mass. May 24, 1870.

1,557.—MODE OF PRODUCING ROTARY MOTION.—M. W. Robinson, New York city. May 27, 1870.

1,566.—CORRUGATING AND MOLDING SHEET METAL.—A. Johnson and W. Thornton, Brooklyn, N. Y. May 28, 1870.

1,569.—SOCKETS AND FERRULES.—R. Briggs, Philadelphia, Pa. May 30, 1870.

1,569.—APPARATUS FOR DRAWING TUBE SKELPS.—R. Briggs, Philadelphia, Pa. May 30, 1870.

NEW BOOKS AND PUBLICATIONS.

PROTECTION TO NATIVE INDUSTRY. By Sir Edward Sullivan, Bart., Author of "Ten Chapters on Social Reform." London: Edward Stanford, No. 6 and 7 Charing 'Cross. Chicago: Bureau Printing Co. New York: S. R. Wells, 389 Broadway.

This is an argument in favor of an English protective system, written by an Englishman, who, to use his own language, sees clearly that "protection o native industry is not a question of sentiment or theory, but of fact and common sense." It is evident that the policy of protection is daily gaining avor in England, and as an expression of this growing opinion, Sir Edward Sullivan's book will be sought for, and read with interest on both sides of the Atlantic.

THE PRESENT AND LONG-CONTINUED STAGNATION OF TRADE. Its Causes, Effect, and Cure: Being a Sequel to an Inquiry into the Commercial Position of Great Britain, etc. By a Manchester Man. Revised and Large Edition. Manchester: John Heywood, 141 and 143 Deansgate. London: Simpkin, Marshall & Co. New York: S. R. Wells, 389 Broadway.

CITY SUBSCRIBERS. — The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Wanted.—Situation as Superintendent or foreman in Machine Works. Fifteen years' experience. Address P.O. Box 1016, Worcester, Mass.

Foundery and Machine Shop for sale, with fine lot of patterns. Is doing a good business; excellent location for general jobbing, and for m'f'g agricultural implements. Address S. Moore & Bro., St. Peter, Minn.

Patent Water-proof Building Paper for Carpet for halls and stairways, shoe stiffening, walls, ceilings, and roofs, manufactured by Mc Nell, Irving & Rich. Patentees, Elwood, Atlantic Co., N.J., or 59 Duane st., New York, 520 Commerce st., Philadelphia, Pa.

Wanted.—A man of thorough knowledge or practical experience in casting white metal, buffing, burnishing, and silver-plating, to go West. Address, with references, P.O. Box 5302, New York city.

Wanted.—A Partner, with capital, to help manufacture and introduce a new safety steam generator, patented. One in successful operation. Economical and durable. Address S. T. Russell, Springfield, Ohio.

Double Steam Engine, Boiler, etc., for a small pleasure yacht, hand lathes, slide rests, drop and foot presses, just finished, first-class, and ready for shipment, at the works of J. Dane, Jr., Newark, N. J.

White Brass Wanted.—Address Jas. Jacobs, Maysville, Ky.

Wanted.—A good and cheap 4 or 6-horse locomotive boiler. Address, with price, S. Dickey, Mercersburg, Pa.

Important to Patentees.—The undersigned desires the General Agency for New England States, or Massachusetts, for salable patent articles, through agents and retail dealers. Address Hosmer & Co., 30, Old State House, Boston, Mass.

The best hand shears and punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

The best boiler tube cleaner is Morse's. See cut inside page.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

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

Wanted.—A second-hand back-geared No. 3 or 4 Stiles' Power Punching Press. Address P. O. Box 701, N. Y. city, giving full particulars.

The entire Right of the best Wrench ever Patented, for sale. For Drawings, address J. F. Ronan, 36 Orchard st., Boston, Mass.

John Dane, Jr., 61 and 63 Hamilton st., Newark, N. J., builds drop, power, screw, and foot presses, lathes, improved jewelers' rolls, watch & jewelers' machinery, new inventions perfected, and any work to order.

40,000 to 60,000 good tempered clay brick per day, made by "Winn's Portable Steam Brick Machine." Responsible parties furnished machines on trial. Address Wright & Winn, Lock Haven, Pa.

$15 for the best Saw Gummer out. Address The Tanite Co., Stroudsburg, Pa.

Pictures for the Parlor—Prang's latest Chromos, Hart's Seasons. Sold in all Art Stores throughout the world.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

Carpenter Planes, the best quality, made by Tucker & Appleton, Boston. Send for list.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

For foot-power engine lathes address Bradner & Co., Newark, N.J.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery rom two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 12 years in use. Beware of Imitations.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO., 37 Park Row, New York

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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

All reference to back numbers should be by volume and page.

H. A. S., of Me.—The U. S. Dispensatory gives the following recipe for phosphorus paste to kill rats. Triturate six parts of phosphorus and one part of sulphur with six parts of water till they liquefy Then mix in two parts of flour of mustard, eight parts of sugar, twelve parts of rye flour, and ten more parts of water, and stir to form a soft paste, which must be kept in pots thoroughly stopped. Oil of rhodium, and oil of anise, are sometimes used to scent phosphorus paste, as most animals are attracted by their odor. Care should be taken in its use, as there are instances of children being poisoned by it, on record. The antidote for it, should such an accident occur, is magnesia, given freely in sugar and water.

W. J. Y., of N. Y.—There is a market in New York for sumac. The kinds popularly known as the staghorn, and the smooth sumac, are the kinds most common in this country, affording marketable products. The parts of the tree which are gathered are the leaves, the peduncles, young branches, and panicles. They are dried, and may be sold in an unground state, but the market is uncertain for the product unless ground. Gifford, Sherman & Innis, 120 William street, New York, are dealers in this commodity, and will, we presume, give information to those who desire to find a market for it.

G. G. K., of Mo.—To sweeten and purify moldy casks, wash them thoroughly with hot water. Then dip linen or cotton rags in melted sulphur, set them on fire and put them into the casks, so that they will be suspended by the bungs when the latter are driven in. The burning will continue for a time after the bungs have been driven in, and will fill the casks with sulphurous acid gas. This will destroy all the germs of the mold vegetation, and effectually purify the cask. Remove the bungs after two or more hours, and rinse the casks with pure cold water, and the casks will be found perfectly free from all musty smell.

D. D. R., of Ca.—The arched form of the rainbow, as seen by any particular person, is due to his position, the hight of the sun above the horizon, the globular form of the refracting and reflecting drops, and the fact that all the rays by which vision is produced converge toward the eye of the observer. For a more perfect explanation of this phenomenon, we refer you to elementary works on physics, all of which discuss this subject fully.

A. A., Paris, France.—Mr. Charles Hodgson is the inventor of the wire rope tramway alluded to in your letter. By addressing him, to the care of the editor of the *Engineer*, 163 Strand, London, England, you will probably get full information. *Scientific Opinion* is published by Charles William Henry Wyman, 74 & 75 Great Queen Street, London.

P. C. G., of Me.—If your desire is to learn mechanical and geometrical drawing only, we recommend you to obtain the Cyclopædia of Drawing, published by D. Appleton & Co., of New York. If you wish to learn free hand sketching, you had better employ a skilled teacher, but next to such a teacher we believe Ruskin's Elements of Drawing the best work ever published upon this subject for a beginner.

S. H. K. sends us from Arkansas, a dried specimen of centipede, which is quite perfect, though of small size, being two inches long. It has nineteen pairs of legs and formidable nippers, double-hooked extremities, etc. Our correspondent states that he lately killed one in his bed that measured five inches in length. We wonder if such bed-fellows are common in Arkansas.

H. L. C., of Mich.—Your question cannot be answered as you put it. There is no constant coefficient as you suppose. You will find all the information you need in "Box's Practical Treatise on Heat," published by Henry Carey Baird, 406 Walnut street, Philadelphia.

R. C., of N. Y.—The valves of large marine engines are generally balanced, that is, some device is used to counteract the pressure to which they are subjected and reduce the friction that would otherwise result.

C. D. L., of Ohio.—To clean alabaster ornaments, take out grease with spirits of turpentine, then wash with soap and water, and rinse with clean cold water. Are you sure the ornaments are alabaster? From your description we think there may be a mistake.

J. R. M., of N. H.—Wash the red spots on your harness with soap and water to remove the oil, rinse and then wash them with a solution of copperas (sulphate of iron). This will turn the red spots black, after which the leather may be again oiled.

J. K. P., of Cal.—Gesner's "Practical Treatise on Coal, Petroleum, and Other Distilled Oils," published by Henry Carey Baird, 406 Walnut street, Philadelphia, contains the information you desire.

D. K. V., of Tenn.—Silica has been used for filling teeth. It was mixed with plaster of Paris iron filings, and mastic or copal varnish. We don't believe any one uses it now.

J. A. C., of Mass.—The term "mudsill" is properly applied to the sills of bents which support the superstructure of wooden bridges.

C. H. S., of Pa.—Silver steel has in it a proportion of silver which ordinary cast steel does not have.

Recent American and Foreign Patents.

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

STEERING APPARATUS.—C. M. Hayden, South Thomaston, Me.—This invention relates to a new and useful improvement in apparatus for steering marine vessels, whereby the power applied to the hand wheel is greatly increased by means of gearing, and the invention consists in the use of bevel wheels, pinion wheels, and sector gears.

MILK CAN BOTTOMS, ETC.—T. M. Bell, New York city.—This invention has for its object to improve the means of securing the bottoms in milk cans, and the heads in metallic barrels, which shall be simple in construction, and will make said cans or corks strong and durable.

LIBRARY SHEARS.—Louis Prang, Boston, Mass.—This invention has for its object to furnish an improved library shears, which shall be so constructed as to serve as a shears, paper knife, eraser, letter folder, and seal, thus comprising within itself many of the tools that a librarian or clerk most frequently requires, and which shall be so constructed as to be as conveniently used for each of its uses as if that particular use was the only one for which it was intended.

STEAM HAMMER.—O. C. Ferris and F. B. Miles, Philadelphia, Pa.—This invention relates to certain improvements in the construction of the frame and valve gear of steam hammers, which are used in the original manufacture, and in the subsequent forging of iron and steel. The object of the invention is to simplify the construction, and at the same time increase the efficiency of the steam hammers, and to thereby facilitate the handling of the same in every respect.

HARVESTER RAKE.—C. B. Brown, Springfield, Mo.—This invention has for its object to furnish an improved self-raking attachment for harvesters, which shall be simple in construction, and effective and reliable in use.

COMBINED CART, WHEELBARROW, AND TURNIP-DRILL.—A. M. Newland, Olivet, Mich.—This invention has for its object to furnish a simple and convenient machine, which shall be so constructed and arranged that it may be easily and quickly adjusted for use as hand cart, wheelbarrow, and turnip drill.

CHURN.—Cyrus A. Maltby, Roland, Ill.—This invention has for its object to furnish an improved churn, simple in construction, and effective in operation, bringing the butter in a very short time; and which shall be so constructed that it may be conveniently taken apart to be washed.

MEAT CHOPPER.—J. H. De Poe, Boonton, N. J.—This invention relates to improvements in hand meat chopping, and consists in the arrangement of the meat holding vessel and the operating gear for the cutters on a platform side by side, and in working the cutter, which is mounted on a bent arm pivoted to the said platform, and the pawl for turning the meat holder by one crank on a short shaft provided with a balance wheel, and driven by a large wheel and pinion.

SAWING MACHINE.—F. Rhoad, Liberty Center, Ohio.—This invention relates to improvements in sawing machines for cross cutting logs or timber and consists in improved arrangements of feeding apparatus both for feeding the log lengthwise in front of the saw, and to or from the saw.

ROLLING STEEL, IRON, AND OTHER METALS.—James Horner, New York city.—This invention relates to a new and useful improvement in the process of rolling steel, iron, and other metals, more especially designed for steel in the round form, but applicable to other forms, whereby such steel or other metal is produced free from scale, in the most rapid manner, without the use of oleaginous or lubricating substances, as in the ordinary process pursued in rolling these metals.

COMBINATION LOCK.—William Kock, Cincinnati, Ohio.—This invention relates to a new combination safe lock, of that class in which a series of circular tumblers are hung upon a spindle, which is connected with an outer knob to be revolved by the same, the tumblers being carried around by a pin that projects from a disk on the spindle, so that, by regulating the motions of the knob in accordance with the figures or marks on a fixed dial notches in the tumblers may be brought in line with the locking lever, to permit the withdrawal of the bolt.

HAND SUPPORT.—Daniel A. Sanborn, Brooklyn, N. Y.—The present invention relates to a new and useful device for supporting and forming a rest for the hand while writing or drawing, and is also intended to be used in schools for the purpose of training or teaching persons to hold their pens in a proper position.

STEAM GENERATOR.—Joseph A. Miller, New York city.—This invention has for its object to largely increase the heating surfaces of steam boilers, with a view of obtaining greater evaporating power in a boiler of comparatively small dimensions, and also to increase the evaporating surface of a comparatively small quantity of water.

SPOOL PRINTING MACHINE.—Gardiner Hall, Jr., South Willington, Conn.—This invention relates to a new machine for imprinting labels directly to the ends of spools. The invention consists chiefly in the employment of rotary printing blocks, which operate in conjunction with a spool guide, that carries the spools in a straight direction between the said printing blocks.

AUTOMATIC WASH BOILER.—Henry R. Robbins, Baltimore, Md.—This invention has for its object to produce a circulation of the water within a wash boiler in a continuous current by means of a pipe placed underneath the boiler and opening at its ends into the same; and to keep such pipe always in contact with the fuel in the fire-box, whether the quantity of fuel be large or small.

SADDLES.—George Horter, New Orleans, La.—The object had in view in making this invention was the production of a very cheap and, at the same time, a very durable saddle, mainly for use in districts like the Southern and Southwestern parts of the United States where horseback riding is the chief means of locomotion, and where most of the inhabitants are very poor.

MECHANICAL MOVEMENT.—E. Melton, Flemingsburg, Ky.—This invention consists in an apparatus for communicating motion from a motor shaft to a driving shaft through the agency of an intermediate system of leverage instead of by direct circumferential contact of the wheels.

PLANTATION BRIDLE.—George Horter, New Orleans, La.—This invention consists in making the headstall check rein or any other part of a common plantation bridle, which can be so made of webbing instead of leather for the purpose of combining durability and cheapness.

PROPELLING VESSELS.—E. T. Ligon, Demopolis, Ala.—The object sought to be effected by this arrangement is to diminish friction, render the vessel more buoyant than she would otherwise be, and directly assist in her propulsion.

PINS FOR CURLING HAIR.—Paul Ceredo, Dusseldorf, Prussia.—This invention consists of a device composed of a short piece of ductile wire with a textile fabric envelope or covering to be used in place of pieces of paper in dressing the hair in curls. The ordinary way of dressing hair in curls, as is well known, is by pieces of paper formed in the shape of pins, around which the hair is wound; these are at once untidy, and disfigure the head of the user, and also being irregular in shape do not give that uniform and graceful bend of finish to the hair which the present invention is capable of.

CHURNING APPARATUS.—James Letort, Wytheville, Va.—This invention has for its object to furnish a simple, convenient, and effective churning apparatus, which shall be so constructed and arranged as to do its work quickly and thoroughly, and with a comparatively small outlay of power.

COTTON SEED PLANTER.—Jordan Riggsbee, Chapel Hill, N. C.—This invention has for its object to furnish an improved cotton seed planter, simple in construction and effective in operation.

COTTON AND HAY PRESSES.—Charles J. Beaseley, Petersburgh, Va.—This invention relates to improvements in power presses for hay, cotton, and other like articles, and consists in an arrangement of jointed arms, cords, and pulleys, whereby the follower is made to move by the cords mainly, and at a quick motion at the beginning, and by the lifting action of the arms, and at a slower motion, and more powerfully at the latter part of the movement, when the resistance increases. The invention consists in an improved arrangement of the belt tightener for being automatically raised to let the belt slip and stop the motion when the follower is raised to the required hight, also for action as a brake to regulate the fall of the follower.

ARBOR FOR TURNING CLOTHES PINS.—B. B. and A. J. Ockington, Stratford, N. H.—This invention relates to improvements in machinery for turning clothes pins, and consists in a hollow arbor with roughing cutters at one end for reducing the stick fed in thereat, and with a finishing and heading cutter arranged in a longitudinal slot in the side of the arbor, and provided with a spring to cause it to act on the stick, and a sliding wedge to throw the knife up for the discharge of the pin when finished.

BUNGS.—David M. Cumings, Newburyport, Mass.—This invention relates to improvements in bungs for beer and other casks, and consists in an arrangement for clamping the cover down upon a ring of packing placed on a flange at the bottom of a bush by a cam lever having journals let into grooves in the side walls of the bush. The invention also consists in providing a flange on the under side of the cover to confine the packing ring on the flange.

COTTON AND HAY PRESS.—Uriah Page, Ringgold, La.—This invention relates to improvements in presses for hay and cotton, and consists in the arrangement in a vertical frame with the packing case at the top of a vertically moving follower, having a strong stem projecting downward, and provided with gear teeth, connecting with a toothed pinion for operating it, which is placed on a horizontal shaft having a winding drum on one end and a cord for operating it, a horse-power or other suitable means to which it is to be attached. The invention also comprises an improved and simple arrangement of the packing case at the top in which the pressing is effected; and also an arrangement of the journal boxes for the support of the shaft, and a presser roller behind the toothed stem of the follower.

ANIMAL TETHER.—T. N. Wheeler, Blue Earth City, Minn.—This invention relates to improvement in apparatus for picketing animals, and consists in an improved arrangement of means for maintaining sufficient tension on the cord to prevent it from getting around the legs or necks of the animals and yet permit them the full range of it.

GRINDING MILLS.—S. T. Eck, Taneytown, Md.—This invention relates to improvements in apparatus for discharging the meal or other ground substance from the space between the curb and the rim of the stone more firmly than is done at present by the frictional action of the periphery of the stone on the ground substance. The invention consists in the application to the periphery of the running stone of scrapers attached to a flexible or other belt stretched around the stone, or it may be scrapers attached to a wheel placed in the space and worked by a pinion on a shaft rising up through the floor and gearing by suitable means with the stone operated or other suitable drawing gear.

SELF-FEEDING FOUNTAIN.—E. Amende, Paris, Ky.—This invention relates to improvements in fountains, such as are operated by compressed air, impelling water which is returned and used over, and it consists in a novel arrangement with an air vessel, two water vessels, and the basin, of a system of flexible air and water pipes and stop cocks for the application of the compressed air to force the water alternately from one of the water vessels while it flows back to the other, and *vice versa*.

PRINTERS INK.—Marshall Turly and B. F. Thomas, Carmel Bluffs, Iowa.—This invention relates to a new and useful improvement in ink for printers' use.

WATER ELEVATOR.—M. S. McSwain, Pole Grove, Wis.—This invention relates to a new apparatus for elevating buckets in wells, and for carrying them to the open sides of the curbs.

HAND CIRCULAR SAWS.—John A. Wood, Far Rockaway, N. Y.—The object of this invention is to furnish a simple and effective machine for sawing timber in wood shops, and for joiners' work generally.

GRINDING REST FOR TWIST DRILLS.—Stephen A. Morse, Newark, N. J.—This invention has for its object to provide an adjustable rest, by means of which twist drills may be properly held against grindstones or grinding wheels, of suitable kinds.

FRUIT-CORING KNIFE.—A. L. Harris, Kent, Ohio.—This invention relates to a new and useful improvement in a knife for coring apples, and similar fruit, for drying or cooking, whereby time and labor, as well as fruit, are saved.

HOT-AIR FURNACE.—Edward Webster, Hartford, Conn.—This invention relates to a new hot-air furnace, which is so constructed as to provide for a complete circulation of the products of combustion, and also for a sufficient accommodation and circulation of fresh air to be heated.

SUBMARINE PLOW.—Amos Morrison and R. E. Rose, New Orleans, La.—This invention relates to a new construction of ships for removing the earth from the bottoms of rivers, banks in harbors, etc., and gathering it in suitable receptacles, or scattering it, to be carried away by the currents.

PHOTOGRAPHIC REFLECTOR.—Wm. Kurtz, New York city.—This invention has for its object to construct an adjustable shield, by means of which the light thrown upon articles that are to be photographed, can be absolutely controlled at pleasure.

FILTER SUPPORTER.—Frank C. Hughes, Frankfort, Ky.—The object of this invention is to provide a funnel-shaped supporter for filters, whereby the entire surface of the filter will be utilized, and the process of filtering consequently hastened.

RING FOR SECURING HOSE TO COUPLINGS.—August Schrader, New York city.—This invention has for its object to provide a ring or clamp by means of which hose of suitable kind can be secured to the metallic coupling, and the invention consists in the construction of a clamping ring, with grooved surface and projecting teeth or ears, whereby it will become entirely self-fastening, the ears being bent into the grooves for holding the ends together.

FOLDING CHAIR.—Martin Lechler, New York city.—This invention relates to a new folding easy chair, which is made entirely without complicated machinery, but so that it may readily be converted into a bed or lounge. The invention consists chiefly in such a construction of the frame, which connects the rear and front parts of the chair, that the said frame serves as a support for the arm rest of the chair, and as the middle standard of the extension bed.

OMNIBUS FARE BOX.—John B. Slawson, New York city.—It is the object of this invention to provide a box for the reception of passengers' fare on omnibuses, which shall enable the proprietors of those vehicles to dispense with the services of conductors, and thereby materially lessen the expense of running them, and it consists in certain sliding plates, stationary shelves, and transparent plates, in a suitable box, so arranged as to receive and protect the fares, and detain them for the inspection of both passengers and driver.

GYMNASTIC APPARATUS.—C. H. Mann, Orange, N. J.—This invention relates to a new apparatus to be used for health exercise, and has particular relation to the construction and arrangement of a platform, so connected by means of a lever, or levers, to a cross bar or handles above the same, that a person standing upon the platform may, by pulling on said cross bar or handles, attain such an advantage over his own weight, the weight of the platform, and the additional pressure of his feet upon the platform, caused by his effort at lifting, as to lift himself and platform.

WARPING MACHINE.—Levi Abbott, Lewiston, Me.—The object of this invention is to construct a measuring and stop-motion attachment for a warping machine, whereby the operation will be arrested immediately after the requisite amount of thread has been wound upon the measuring roller, or by the breaking of a thread. This invention consists chiefly in the use of a peculiar cam, which is provided with a groove for adjusting a lever, by means of which the rock shaft that locks the shipper, and that is also under the influence of the drop wires, is moved to carry the belt upon the loose pulley.

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104,920.—WARPING MACHINE.—Levi Abbott (assignor to Lewiston Machine Company), Lewiston, Me.
104,921.—SELF-FEEDING FOUNTAIN.—Edward Amende, Paris, Ky.
104,922.—HAY AND COTTON PRESS.—C. J. Beasley, Petersburg, Va.
104,923.—INSTEP STRETCHER FOR BOOTS AND SHOES.—Moses Belding, Hartford, Conn.
104,924.—MILK-CAN BOTTOMS, ETC.—Thomas M. Bell, New York city.
104,925.—HEATING STOVE.—G. A. Blake and W. B. Taylor, Calais, Me.
104,926.—SEED SOWER AND CULTIVATOR.—George Bradley, Rockford Ill.
104,927.—HARVESTER RAKE.—Collins B. Brown, Springfield, Mo.
104,928.—CIRCUIT CHANGER.—Watkins L. Burton, Richmond, Va.
104,929.—METHOD OF GRAINING.—John J. Callow, Cleveland, Ohio.
104,930.—MINNOW PROPELLER.—W. D. Chapman, Theresa, N. Y. Antedated May 4, 1870.
104,931.—MACHINE FOR FORGING THE HEADS OF WRENCHES.—A. G. Coes, Worcester, Mass.
104,932.—FIFTH WHEEL FOR CARRIAGES.—W. A. Collins, Bloomfield, N. J.
104,933.—COVER FOR PAILS, FIRKINS, ETC.—T. F. Conklin, Fond Du Lac, Wis.
104,934.—AUTOMATIC WATER-ELEVATING APPARATUS.—H. H. Craigie New York city. Antedated June 29, 1870.
104,935.—BUNG.—D. M. Cumings, Newburyport, Mass.
104,936.—COTTON AND HAY PRESS.—J. G. Cummings, Columbus, Miss.
104,937.—COMPOSITION FOR PHOTOGRAPHIC PURPOSES.—Thomas Cummings, Lancaster, Pa.
104,938.—SPRING BED BOTTOM.—Lewis Cutler, Springfield, Mass.
104,939.—MANUFACTURE OF IRON BY THE ELLERSHAUSEN PROCESS.—Henry Davies, Newport, Ky.
104,940.—MEAT CHOPPER.—James H. De Poe, Boonton, N. J.
104,941.—PAVEMENT.—Andrew Dilger, St. Louis, Mo.
104,942.—STREET PAVEMENT.—Andrew Dilger, St. Louis, Mo.
104,943.—TABLE FOR DOVETAILING MACHINE.—Joseph Dill, Grand Rapids, Mich.
104,944.—SALT FOR BEDSTEADS.—A. S. Drisko and O. H. Drisko, Boston, Mass.
104,945.—JAR FOR WELL DRILLS.—W. W. Eastman and F. B. Marden, Meadville, Pa.
104,946.—GRINDING MILL.—S. T. Eck, Taneytown, Md.
104,937.—HAY UNLOADER.—Henry H. Ensminger, Buffalo, N. Y.
104,948.—STEAM HAMMER.—O. C. Ferris and F. B. Miles, Philadelphia Pa.
104,949.—LET-OFF MECHANISM FOR LOOMS.—L. N. Fletcher and Ira M. Page, Lowell, Mass.
104,950.—WATER METER.—Willard M. Fuller, New York city.
104,951.—MACHINE FOR PRINTING LABELS ON SPOOLS.—Gardiner Hall, Jr., South Willington, Conn.
104,952.—TRUSS.—E. B. Harding, Northampton, Mass.
104,953.—HARVESTER DROPPER.—David S. Harner (assignor to himself and W. T. Carey), Xenia, Ohio.
104,954.—FRUIT-CORING KNIFE.—Alford L. Harris, Kent, Ohio.
104,955.—STEERING APPARATUS.—C. M. Hayden, South Thomaston, Me.
104,956.—HEDGE TRIMMER.—William E. Horne, Decatur, Ill.
104,957.—METHOD OF ROLLING METAL BARS.—James Horner, New York city, assignor to himself and John Cox, Pompton, N. J.
104,958.—BORING TOOL.—Albert G. Hotchkiss, Wolcottville, Conn.
104,959.—FILTER SUPPORTER.—Frank C. Hughes, Frankfort, Ky.
104,960.—PAD FOR HORSES' FEET.—Jonathan Johnson, Lowell, Mass.
104,961.—PERMUTATION LOCK.—William Kock, Cincinnati, Ohio.
104,962.—HOT-AIR FURNACE.—Benjamine S. Koll, Pittsburg, Pa.
104,963.—PHOTOGRAPHIC REFLECTOR.—William Kurtz, New York city.
104,964.—PLOW.—John Lane (assignor to himself, C. P. Hapgood, W. B. Young, and G. H. Laughton), Chicago, Ill.
104,965.—FOLDING CHAIR.—Martin Lechler, New York city.
104,966.—SPIKE EXTRACTOR.—Louis Lehman, Buffalo, assignor to D. W. Fish, Brooklyn, N. Y.
104,967.—HAND STAMP.—Louis Lehman, Buffalo, assignor to Daniel W. Fish, Brooklyn, N. Y.
104,968.—CHURNING APPARATUS.—James Letort, Wytheville, Va.
104,969.—TUBULAR ARCHED BRIDGE.—W. S. Levake, Cleveland, Ohio. Antedated June 2, 1870.
104,970.—CLAMP FOR MAKING WHIPS.—J. P. Luther and S. K. Bucs, Berlin, Wis.
104,971.—LAMP BURNER.—George R. Lyon, Waterbury, Conn.
104,972.—CHURN.—C. A. Maltby, Roland, Ill.
104,973.—LIFTING MACHINE.—Chas. Holbrook Mann, Orange, N. J.
104,974.—SASH HOLDER.—Alfred C. Manning, Norwich, Conn.
104,975.—MITER BOX AND MITER SAW.—Daniel McAllaster, Malden, Mass.
104,976.—WATER ELEVATOR.—M. S. McSwain, Pole Grove, Wis.
104,977.—MECHANICAL MOVEMENT.—Elijah Melton, Flemingsburg Ky.
104,978.—HARVESTER.—Henry Mews (assignor to J. W. Cutler), Binghamton, N. Y.
104,979.—STEAM GENERATOR.—Joseph A. Miller, New York city.
104,980.—DREDGING MACHINE.—Gove Mitchell, Philadelphia, Pa.
104,981.—SUBMARINE PLOW.—Amos Morrison and Rufus E. Rose, New Orleans, La.
104,982.—GRINDING REST FOR TWIST DRILLS.—S. A. Morse, Newark, N. J.
104,983.—COMBINED CART, WHEELBARROW, AND TURNIP-DRILL.—Albert M. Newland, Olivet, Mich.
104,984.—TAP FOR AND MODE OF CUTTING DIES.—William Newsham (assignor to Morris, Tasker & Co.), Philadelphia Pa.
104,985.—MACHINE FOR CUTTING DIES.—William Newsham (assignor to, Morris, Tasker & Co.), Philadelphia, Pa.
104,986.—EJECTOR.—Joseph Nixon, Pittsburg, Pa.
104,987.—FILTER.—Joseph Nixon, Pittsburg, Pa.
104,988.—ARBOR FOR TURNING CLOTHES PINS.—B. B. Ockington and A. J. Ockington, Stratford, N. H.
104,989.—METHOD OF HANGING WINDOW SHADES.—H. W Olney, Pittsburg, Pa.
104,990.—FOLDING STEREOSCOPE.—Edwin K. Page, Havana, N. Y.
104,991—PRESS FOR PRESSING COTTON OR HAY.—Uriah Page, Ringgold, La.
104,992.—SEED SOWER.—William Painter, Baltimore, Md Antedated June 23, 1870.
104,993.—HAY AND MANURE FORK.—R. A. Peet, Caledonia township, Mich.
104,994.—ARTIFICIAL LEG.—Luther F. Pingree, Portland, Me.
104,995.—LATHE CENTER.—Henry K. Porter, Boston, Mass.
104,996.—LIBRARY SHEARS.—Louis Prang, Boston, Mass.
104,997.—METALLIC LATH, AND BILLETS FROM WHICH THE SAME MAY BE PRODUCED.—Jacob Reese, Pittsburg, Pa.
104,998.—SAWING MACHINE.—Frederick Rhoad, Liberty Center, Ohio.
104,999.—PEGGING JACK.—Hubert Ricard (assignor to himself and G. F. Eaton), Haverhill, Mass.
105,000.—COTTON-SEED PLANTER.—Jordan Riggsbee, Chapel Hill, N. C.
105,001.—PENMAN'S HAND SUPPORT.—Daniel A. Sanborn, Brooklyn, N. Y. Antedated June 30, 1870.
105,002.—SUPPLEMENTARY PEDAL ATTACHMENT FOR PIANO-FORTES.—Gustav A. Scott and William B. Frisbee, San Francisco Cal.
105,003.—RING FOR SECURING HOSE TO COUPLINGS.—August Schrader, New York city.
105,004.—CHAIN LINK.—W. C. Short, Providence, R. I.
105,005.—FARE BOX FOR VEHICLES.—John B. Slawson, New York city.
105,006.—COTTON-SEED PLANTER.—Bartemus Smith, Hood Swamp, N. C.

105,007.—MACHINE FOR TURNING CRANK PINS.—H. S. Smith and W. D. Whitmore, Bloomington, Ill.
105,008.—CONSTRUCTION OF DENTAL IMPRESSION MOLDS.—W. C. Smith, Warrensburg, Mo.
105,009.—WELL FILTER.—James P. Spaulding, Williamsport, Pa.
105,010.—APPARATUS FOR SAVING MERCURY FROM THE WASHINGS OF GOLD AND SILVER ORES.—Wells Spicer, Summit Co., Colorado Territory.
105,011.—MEDICAL COMPOUND FOR THE CURE OF FEVER AND AGUE.—O. M. Spiller, M.D., Akron, Ohio.
105,012.—APPARATUS FOR GENERATING AND BURNING GAS.—Wm. Stewart, Steubenville, Ohio.
105,013.—CORPSE PRESERVER.—James C. Naylor, Trenton, N. J.
105,014.—PRINTERS' INK.—Marshall Turly and B. F. Thomas, Council Bluffs, Iowa.
105,015.—PIPE-CLEANSING APPARATUS.—J. Van Slooten, C. S. Ruat, and Wm. McCulloch, New Orleans, La.
105,016.—SPIKE EXTRACTOR.—Walter Ward, Mount Holly, N. J.
105,017.—HOT-AIR FURNACE.—Edward Webster, Hartford, Conn.
105,018.—ANIMAL TETHER.—T. N. Wheeler, Blue Earth City, Minn.
105,019.—DISTILLING PINE WOOD.—T. W. Wheeler (assignor to himself and E. W. Carpenter), New Berne, N. C.
105,020.—CANDLE LAMP.—T. S. Williams and F. A. Taber, Boston, Mass.
105,021.—WELL AUGER.—John Wilson and G. H. Baisly, Hamilton, Mo.
105,022.—STOP-MOTION SPRING FOR BRAIDING MACHINES.—G. K. Winchester, Providence, R. I.
105,023.—SAWING MACHINE.—John A. Wood, Far Rockaway, N. Y.
105,024.—STONE TRUCK.—Jackson Wright and Green Wright, Morrisania, N. Y. Antedated June 30, 1870.
105,025.—DOOR SPRING.—Warren Allen, Oswego, N. Y.
105,026.—REVERSIBLE LATCH.—W. H. Andrews (assignor to Burton Mallory), New Haven, Conn.
105,027.—VALVE.—Henry Belfield, Philadelphia, Pa.
105,028.—BED BOTTOM.—Van Bell, Seville, Ohio.
105,029.—TUNING SCALE.—Morris L. Bennett, Waverly, N. Y.
105,030.—HEEL PRESS.—Horace H. Bigelow, Worcester, Mass.
105,031.—RIVET.—Alexander Boyd, Boston, Mass.
105,032.—SAW FRAME.—Eben Moody Boynton, West Newbury, Mass.
105,033.—MACHINE FOR MAKING NUTS.—B. H. Bradley, New York city.
105,034.—FLOUR BOLT KNOCKER.—J. Washington Bradly, Rocheport, Mo.
105,035.—DOUBLE-ACTING PUMP.—Martin Braun, Cape Vincent, N. Y.
105,036.—STEAM PACKING.—Wm. Brown, Hoboken, N. J.
105,037.—BEEHIVE.—David S. Burget, Martinsburgh Borough, Pa.
105,038.—APPARATUS FOR TREATING OILS.—T. H. Burridge, St. Louis, Mo.
105,039.—EARTH CLOSET.—R. A. Cannell (assignor to W. R. C. Clark), New Orleans, La.
105,040.—SIGNAL APPARATUS FOR CARS.—Charles Carr, Boston, Mass.
105,041.—DEVICE FOR CURLING AND DRESSING HAIR.—Paul Ceredo, Dusseldorf, Prussia, assignor to himself and T. F. Miller, Montreal, Canada.
105,042.—ELECTRIC BATTERY.—Theophile Chutaux, Paris, France.
105,043.—ELECTRIC BATTERY.—Theophile Chutaux, Paris, France.
105,044.—FILE.—J. H. Clark, Washington, D. C.
105,045.—EARTH CLOSET.—Wm. R. C. Clark, New Orleans, La.
105,046.—RAILROAD CAR VENTILATOR.—Wm. Conard, Burlington, N. J.
105,047.—FENDER FOR PLOWS AND CULTIVATORS.—J. C. Curryer and W. F. Curryer, Thorntown, Ind. Antedated June 30, 1870.
105,048.—MOUSE TRAP.—A. G. Davis and H. S. Frost (assignors to Davis & Woolson), Watertown, Conn.
105,049.—FORMER FOR BENDING AND GLUING THE CASES OF GRAND PIANOS.—David Decker, New York city.
105,050.—HAY KNIFE.—Casper Dittman (assignor to himself and G. B. Swope), Upper Leacock township, Pa.
105,051.—COFFEEPOT.—Johnson Dodge, New Orleans, La.
105,052.—STAMP CANCELER.—H. W. Dopp (assignor to himself and J. E. Thomson), Buffalo, N. Y.
105,053.—EARTH CLOSET.—J. A. Drake (assignor to W. R. C. Clark), New Orleans, La.
105,054.—MACHINE FOR ATTACHING ORNAMENTS TO CHAIN LINKS.—Virgil Draper (assignor to Oscar M. Draper, Attleborough, Mass.
105,055.—TREAD POWER.—J. H. Dull (assignor to Blymyer, Day & Co.), Mansfield, Ohio.
105,056.—PUMP.—J. B. Eads, St. Louis, Mo.
105,057.—EGG BEATER.—Timothy Earle, Smithfield, R. I.
105,058.—BREECH-LOADING FIRE-ARM.—A. B. Ely, Newton, and E. C. Clay, Malden, Mass.
105,059.—CORNET AND OTHER WIND INSTRUMENTS.—W. C. Fietz, Boston, Mass.
105,060.—TELEGRAPHIC PRINTING APPARATUS.—T. M. Foote and C. A. Randall, Brooklyn, E. D., N. Y.
105,061.—MODE OF SECURING GLASS VESSELS TO METAL BASES.—Alonzo French, Philadelphia, Pa.
105,062.—HAY PRESS.—Franklin Frey, Liberty, Ill., assignor for three fourths to A. H. Butts, Jr., Wm. H. Meacham, and Charles J. Karney.
105,063.—LAMP.—G. P. Fuller, Humphrey, N. Y.
105,064.—STAVE JOINTER.—R. W. George, Boston, Mass.
105,065.—WHIFFLETREE.—Arthur Green, East Kendall, N.Y.
105,066.—GRAIN AND SEED SIEVE.—N. S. Greenwood, Dorset, Ill.
105,067.—GATE.—I. H. Gustin, Middletown, Ind.
105,068.—COMBINED BOOT AND SHOE FOR HORSES.—H. G. Haedrich and E. M. Haedrich, Philadelphia, Pa.
105,069.—FOLDING BEDSTEAD.—J. C. Hall and A. C. Richards, Cincinnati, Ohio.
105,070.—COTTON GIN.—Samuel Z. Hall, Ossining, assignor to to himself, S. W. Lewis, Sing Sing, N. Y., and E. B. Brown, Stonington, Conn.
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105,156.—APPARATUS FOR CUTTING THE CASINGS OR TUBES OF OIL WELLS.—P. H. Lawrence, Petroleum Center, Pa.

REISSUES.

4,057.—MACHINE FOR DRESSING MARBLE.—R. P. Bailey, Niagara, N.Y., for himself and P. D. Babbitt, assignee of R. P. Bailey.—Patent No. 65,990, dated June 25, 1867.
4,058.—LAMP BURNER.—Abraham Burtis and Mary A. Van Alen, Brooklyn, and W. D. Ludlow, New York city, assignees of A. W. Browne.—Patent No. 74,793, dated February 25, 1868.
4,059.—COMPOSITION PAVEMENT.—H. L. Cranford, Brooklyn, N. Y.—Patent No. 90,280, dated Aug. 3, 1869.
4,060.—TRAVELING BAG.—Fredrick Fischbeck, Chicago, Ill.—Patent No. 86,742, dated Feb. 9, 1869.
4,061.—COOKING STOVE.—S. S. Jewett, Buffalo, N.Y. (assignee of Francis Ritchie), assignor to Jewett and Root.—Patent No. 91,968, dated June 29, 1869, antedated June 15, 1869.
4,062.—FARMERS' BOILER.—A. N. Merrill, Batavia, Ill.—Patent No. 98,988, dated Jan. 18, 1870.
4,063.—COOKING STOVE.—G. H. Phillips, Troy, N.Y.—Patent No. 83,799, dated Nov. 3, 1868.
4,064.—WINDMILL.—The United States Wind Engine and Pump Co., Batavia, Ill., assignee of Daniel Halladay.—Patent No. 11,629, dated August 29, 1854; extended seven years.

DESIGNS.

4,198.—BOOT AND SHOE PATTERN.—J. M. Dutton, Rochester, N. Y.
4,199.—PICTURE FRAME.—E. W. Haven, Brandon, Vt.
4,200.—TRUNK CORNER CLAMP.—Wm. S. Jessup, Newark, N. J.
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4,202.—TRACE-SUPPORTING STUD.—J. Letchworth, Buffalo, N. Y.
4,203.—TYPE.—Andrew Little, New York city.
4,204.—BOTTLE.—James Mackintire, New York city.
4,205.—BOTTLE AND CUP.—James Mackintire, New York city.
4,206.—BRACE FOR SCHOOL DESK.—J. K. McCullough and F. W. Smith, Burlington, Iowa.
4,207 to 4,209.—FLOOR CLOTH PATTERN.—Charles T. Meyer, Newark, N. J., assignor to E. C. Sampson, New York city. Three Patents.
4,210.—FLOOR CLOTH PATTERN.—Victor Meyer, Lansingburgh, N. Y., assignor to E. C. Sampson, New York city.
4,211.—TEA SERVICE.—William Parkin, (assignor to H. G. Reed, George Brabrook, and H. H. Fish), Taunton, Mass.
4,212.—DRAWER PULL.—Albert P. Seymour, Hecla Works, N. Y.
4,213.—TYPE.—Richard Smith (assignor to Mackellar, Smiths & Jordan), Philadelphia, Pa.

EXTENSION.

REGISTERS.—Edward A. Tuttle, of Brooklyn, N. Y.—Letters Patent No. 15,093, dated June 10, 1856; reissue 130, dated November 12, 1861.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

HYDRAULIC BRICK PRESS.—Ethan Rogers, Cleveland, Ohio, has petitioned for an extension of the above patent. Day of hearing Sept 7, 1870.

LUBRICATORS.—Norman W. Pomeroy, Meriden, Conn., has applied for an extension of the above patent. Day of hearing Sept. 7, 1870.

HARVESTERS.—William Gage, Buffalo, N. Y., has petitioned for the extension of the above patent. Day of hearing Sept. 7, 1870.

CIDER MILLS.—Tobias J. Kindleberger, Eaton, Ohio, has applied for an extension of the above patent. Day of hearing Sept. 14, 1870.

ORE WASHER.—Samuel Thomas, Hokendauqua, Pa., has petitioned for an extension of the above patent. Day of hearing Sept. 14, 1870.

COILED SPRINGS FOR RAILROAD CARS.—Carlos French, Seymour, Conn., has applied for an extension of the above patent. Day of hearing Sept. 21, 1870.

MACHINE FOR FOLDING PAPER.—Cyrus Chambers, Jr., Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing Sept. 21, 1870.

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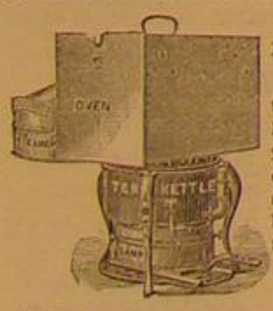
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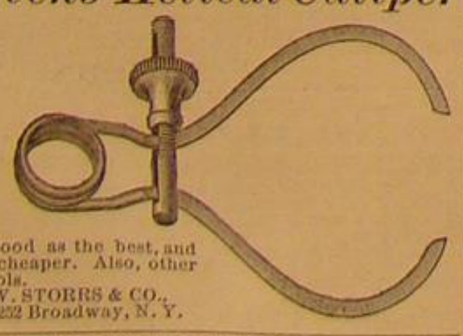


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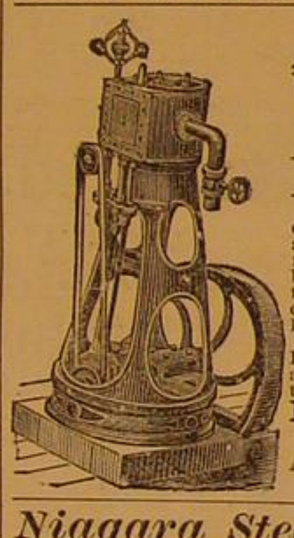
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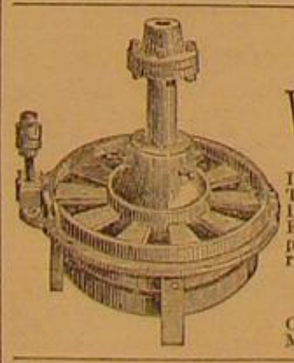
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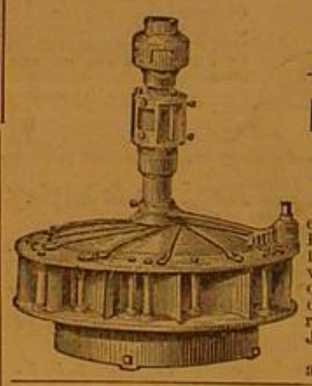
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KING'S PATENT WROUGHT-IRON, SOLID [AND TUBULAR CHANNEL ARCH BRIDGES.—*(For description see next page).*

IRON BRIDGE AT TOPEKA, KANSAS.

The immense and increasing use of iron in various forms in all departments of construction, is so marked a feature of the present age, that no surprise is excited when a new application, or an improvement in any old application of this material, is announced. In the department of architecture and civil engineering the advances in the employment of iron during the last quarter of a century have been immense and rapid. In naval construction, too, its effects have been such as to almost revolutionize ocean commerce, and to transfer the large shipbuilding trade, which formerly existed in this country, almost wholly to foreign lands.

In almost every department of the arts, iron and steel are gradually superseding wood for constructive purposes and almost daily one hears of some new application of this wonderful material.

But in no department of mechanical construction, has there been such a universal tendency to extend the employment of iron as in bridge construction. The nature of the material peculiarly fits it for use in structures of this kind, and multitudes of iron bridges now span the rivers of Europe and America. The forms of these bridges are also extremely diverse, and engineers have vied with each other to devise a construction wherein maximum strength with minimum weight, should unite with least cost. Patents have multiplied, and experiment has followed experiment, only to demonstrate more fully the great value of this application of a material that is inexhaustible in quantity, and unrivaled in strength, except by steel, itself a derivative of iron.

As weight depends upon quantity, the great problem in bridge construction is to so dispose the material, that the cohesive force of every particle shall act to the greatest advantage. In order to do this it is imperative that a weight placed upon any one part shall not concentrate its force upon that part alone, but that the strain it creates shall be distributed to other parts, and, so far as possible, to all parts of a span; so that mutual support is obtained in the highest degree.

To this end innumerable forms of trusses, trestlework, etc., have been devised, and the science of mathematics has been invoked to aid experiment in determining the laws by which strains are distributed through compound structures, and the strength of individual parts to resist deflection.

It is not strange that in so complex a general problem as this, and one which has given rise to such a vast number of special problems, some differences of opinion should arise, and that still there should be some points upon which doubt exists. The fundamental principles, however, are fully demonstrated, if perhaps we except the law of deflection of beams which has lately been questioned by Professor Norton, of New Haven. [See page 256, last Vol., SCIENTIFIC AMERICAN].

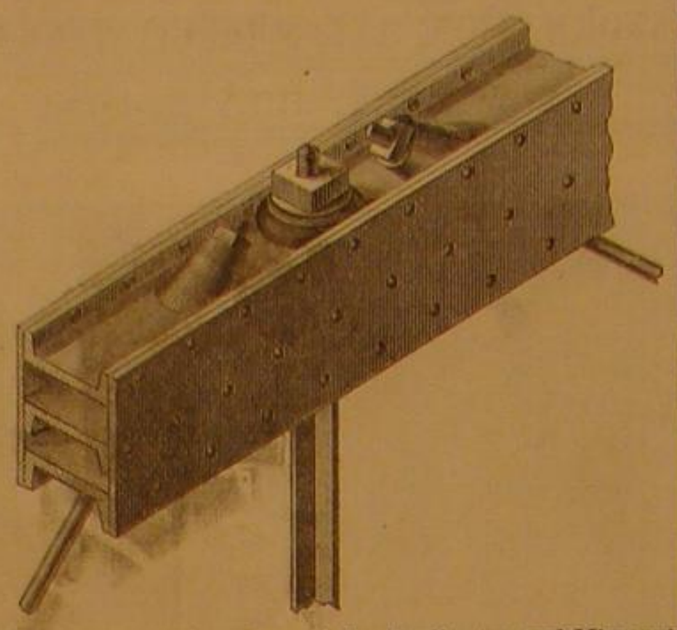
The inventor of the bridge we are about to describe, and —if we may judge from the testimony of numerous engineers and civilians—many others believe that superior results in the attainment of strength combined with lightness and cheapness, have been secured by the principle of construction adopted therein, and the great number of these bridges which are in use (we are told 700 have been built since 1860) shows that they are of a character to secure the confidence of the engineering public.

Our engraving is that of a bridge of this kind built over the Kansas River, at Topeka, Kansas. It is composed of six spans of one hundred and fifty feet in length, making a total length of nine hundred feet. It is eighteen feet wide in the clear with a sidewalk on each side. The hight of the arches is sixteen feet measured to the crown. Each arch has two chords with a section of six inches by three fourths of an inch. The arches are of boiler plate and channel iron. A section of this arch is shown at A, Fig. 2, which explains the manner of its construction sufficiently without minute description.

The arch is nine inches by thirteen at the foot, and nine by ten inches at the center. By reference to Fig. 2 the style of bracing will be also more apparent than the scale of the larger engraving renders possible. The spaces between the chords and arches are filled with struts and braces so disposed as to distribute the strain uniformly to all parts of the structure.

The Western bridges in this country designed for general traffic are often subjected to severe strain from droves of cattle, which, in passing, produce a cumulative oscillation peculiarly trying to them. In fact it is probable that one hundred cattle driven upon a bridge of such spans as the one shown in our engraving, and moving together, would test its strength more severely than a train of passenger cars at moderate speed. It is on this account that the ability to pass cattle without extraordinary deflection has come to be a sort of standard for the strength of bridges. A large number of these bridges have been thus tested and found to resist the strain in the most satisfactory manner.

A bridge of this kind over Blue River, at Edinburgh, Indiana, composed of two spans, each one hundred and sixty feet in length, was tested by driving upon it one hundred and twenty head of cattle, first on to one span and then on to the other, without any visible deflection. The cattle were then crowded hurriedly into the center of a single span, and yet no visible deflection occurred.



H. Theilson, chief engineer of the Burlington and Missouri Railroad, states that he has examined the iron bridge built over Spring Creek, near Chandler's, Des Moines county, Iowa, being one of King's patent channel bridges, sixty feet span, and found it to be a substantial and strong structure, well adapted for the purpose designed.

These are but samples of a large number of similar testimonials which have been shown us, and those familiar with the subject will at once comprehend that bridges which can withstand these tests must be of great strength.

We give in Fig. 3 an elevation, partial plan, and enlarged detail of a channel or solid arch bridge, of one hundred feet span, showing the manner of bracing between the chord and the arch, and also the horizontal cross bracing.

The manufacturers of these bridges have secured such an extended demand for them that they find it necessary to keep on hand a large stock of bridges of all lengths, to fill their orders. This is a new and peculiar feature in bridge building, and sufficiently indicates the esteem in which their work is held by the public. Wrought iron is the only material employed in their construction unless we except the floor planking.

The manufacturers also make a wrought-iron swing or drawbridge, which they claim is one of the stiffest and strongest now constructed. The tubes of these swing bridges are also made of channel iron and sheets riveted together. The floor beams pass through and are firmly riveted to each side of the tubes, connecting the tubes together; and the whole is thoroughly braced underneath the floor.

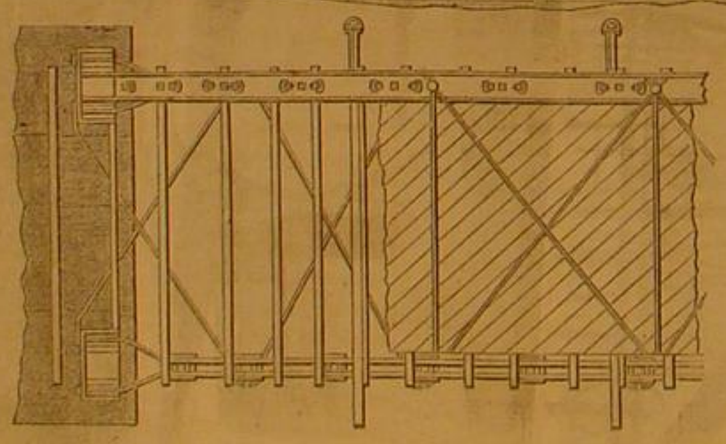
They also construct the Ives' patent cast-iron columns or supports for bridges designed to be used instead of stone piers. It is claimed that they only cost half as much as stone in prairie country, where stone is scarce, and that they answer the purpose admirably.

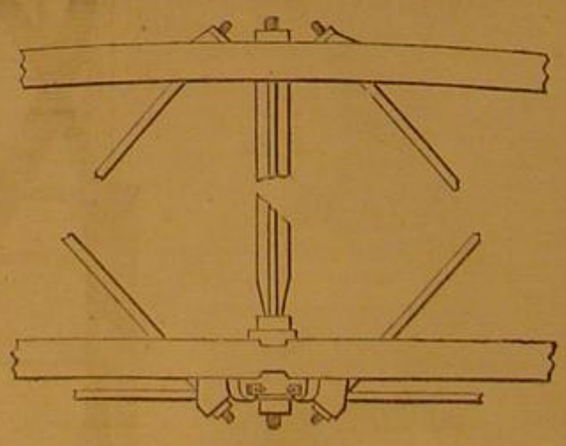
This bridge and its adjuncts are covered by a number of patents dating from 1861 to 1870. For further information address Z. King & Son, Cleveland, Ohio. Office and works corner of St. Clair and Wason streets.



100 Feet.

CHANNEL OR SOLID ARCH BRIDGE.





POSITIVE and negative electricity is always developed in equal proportions from a battery.

How People Live in Paris.

An article in the *Penn Monthly*, entitled "Paris with American eyes," contains the following: "The necessity of artificial wants, of luxuries, of pleasurable idleness to prevent over-production, is fully recognized in France. All the officers of government—executive, legislative, judicial, administrative; the Emperor and his family, ministers, senators, judges, officers of the law; all the soldiery, from generals to privates; all the learned men, from professors to students, doctors to victims, clergymen and penitents; and the host of others—actors, editors, writers, thieves, traders; many, if not most, of those who are engaged in handicraft of all kinds; all women, sick persons, and young children—must look for their support to artificial, not natural, productiveness. The proposition reduces itself to this: Given a nation with land enough to raise food, fuel, textile material, mineral products, and building material for a certain number of inhabitants; then it is a mal-administration of government when it is not provided to apportion the natural productions among them. And this should be done, without borrowing money or products from other nations, to be repaid for by future generations; famine or war alone justifying a departure from this rule. The application of this proposition to American affairs, at this moment, might be made, as well as to the condition of labor in France. It, perhaps, may seem an imprudent statement, but we think that about one person only in sixty is really occupied in producing the living necessities of civilized human existence. Be the theory propounded as it may, this one thing is certain: that, for fifteen years, the poor laboring man has not, while the granaries of France were full, suffered for want of bread in Paris, because his labor could not be exchanged therefor. In London, overflowing with wealth, many hundreds starved to death the past winter; and in the United States, with the absorption of our lands, the evil day is upon us. Even now, in New York, or any of our large cities, there is far more destitution than in Paris."

White Slaves.

There seems to be an impression among a great many people that somebody is doing them a grievous wrong, unless they are able to make a liberal livelihood, and only work one third of the time. There was an old edict once passed by an authority that is much contemned now, which declared to mankind that "by the sweat of thy brow shalt thou eat bread," but our age has outgrown such restrictions, and all classes of people have concluded to earn their bread on easier terms, or at least abuse somebody roundly, whether such person be the right one or not, provided they find the bread is not abundant or is hard to come at.

We are always glad to find toil well recompensed, and wish to encourage every increase of the wages of labor, and would be pleased if eight hours' work could be made to produce as much pay as ten. But we utterly despise the man who wants to get off with eight hours' work when he can do ten, and who laments if he cannot indulge his penchant for laziness. No man would think of working only eight or ten hours if he were laboring for himself, and the great error of our entire system is that it is the custom to pay mechanical labor by the day instead of paying it by the hour. The world is entitled to all and the best efforts of which every man is capable, and is cheated if it does not receive them: whereas he can justly claim the reward of everything that he does.

To restrict labor of any kind to a fixed limit is an outrage and oppression where it is not a folly or a crime. One man is capable of working twelve hours at severe manual toil. Why should he not be permitted to do so and to draw a proportionately larger return than the feeble individual who is exhausted in half the time? Were a lawyer, an editor, a doctor, or a farmer to make a rule that he would not begin work till ten o'clock and would leave off at six, no matter whether the columns were empty, or the patients were dying, or the clients were in prison, or the crops were rotting, how long would it be before such a lunatic were in the poor-house? And yet, were a builder, sore-pressed to complete his contracts, to ask mechanics to commence work at five o'clock and not leave off till seven, provided he paid them extra, he would probably be refused. We have no patience with laziness, and yet our nation seems to be deifying laziness into a god.—*N. Y. Citizen.*

ROMER, a Danish astronomer, who flourished in 1676 was the first person who discovered the velocity of light, which he calculated to be at the rate of 167,600 geographical miles a second.

STRANGE DRINKS.

[From Chambers' Journal.]

"Man, being reasonable, must get drunk!" Many people accept that as an axiom who never heard the name of the poet who wrote it. On that head the most forlorn and stupid of savages are at one with civilized folks; and some extremely curious, let alone nasty concoctions, does human ingenuity hit upon in its desperate desire to produce a beverage that will cheer and inebriate. The cocoa-nut tree is a great boon to thirsty man, giving the weary traveler a draft of pure water, rewarding the early riser with a cup of sparkling toddy, and delighting lovers of strong potations with its potent arrack. The first beverage is contained in the fruit; the less innocent ones are made from the sap of the tree. The operations of the Cingalese toddy-drawer are simple enough. He binds all the shoots bearing embryo nuts firmly together, cuts off the ends, and attaches beneath them an earthenware vessel holding about a gallon, and so leaves matters for four-and-twenty hours—from sunrise to sunrise. When the time is up, the chatty is lowered, emptied of its contents, and replaced; and so the process goes on, until the flow of sap is exhausted. The liquor thus obtained looks like milk and water, and tastes like soda-water and milk slightly flavored with cocoa-nut. In a few hours, rapid acetous fermentation takes place, and by mid-day the sap becomes toddy, resembling a poor acid cider, and from this arrack is made by distillation. The same source supplies the subjects of the Rajah of Sarawak with their national beverage, which is kept in huge jars, and hospitably handed to all comers in cans, bottles, or cocoa-nut shells, whichever happen to be handiest. Mr. Boyle says it looks like thin milk, and smells like five hundred negroes drunk in a slave pen, while its flavor seems to be as unique as its smell.

"When first taken into the mouth, it suggests an idea of cocoa-nut milk gone very sour, and holding in solution a very considerable quantity of brown sugar and old cheese; when it reaches the throat, the agonized novice becomes aware of a hot peppery flavor, causing him to believe that starch mingled with the finest cayenne must have a great share in the composition; and, finally, should it safely reach its destination, and the sufferer be compelled to put his head precipitately through the railings behind, he conceives with astonishing suddenness that he is waiting for the crisis in a rolling vessel at the change of the monsoons."

When the Marquesans are in the humor for a drinking bout, a number of boys are set to work preparing aroo, by squatting around a large bowl, and masticating cocoa-nuts, which they spit into the bowl when sufficiently chewed. Enough being prepared, the vessel is filled up with fresh water, and stirred, and the pleasant mess left to settle, when the flowing bowl is passed about for the merrymakers to drain to the lees.

Another drink, in high esteem among the South Sea Islanders, is made in a similar manner from the ava root, and ava drinking forms an essential feature of all Feejean ceremonies. In Rewa, when the ava has been duly chewed, as the water is poured in, the expectant spectators, ranged in a semicircle round the chief operator, set up a howl, finishing off with a cry of "*Ai seou.*" Then the operator strains the liquid into an immense wooden bowl, singing all the while; his song being taken up by the company, who, at the same time, imitate his motions to the best of their ability, varying the performances at every important stage of the proceedings by clapping their hands. The brewage concluded, the drinking cups are filled from one having a hole in it; over the hole the ava maker placing a finger when dipping, withdrawing it to let the liquor ran out on a stream. The drinking of the king's draft is followed by an extra loud clapping; that of an inferior chief by the exclamation: "*Sa madaa!*" (It is empty): After ava, his Rewain majesty rinses his mouth, lights his cigar, and takes his ease on his mat. The royal barber, not being permitted to touch anything with his hands, has to find a friend to hold the cup to his lips while he drinks his allowance. The royal ava drinking at Somu-somu is equally ceremonious. Early in the morning the king's herald or orator cries out in front of his house: "*Yango-na li ava.*" To this the people reply with loud shouts, meaning "prepare ava." The chiefs and principal men assemble immediately with their bowls and ava roots, which are handed over to the younger folks, while they have a palaver about things in general. The ava preparers must have clean and undiseased teeth, and are liable to punishment if they are detected swallowing any of the precious juice. The chewing over, and the water poured on the ava, the herald drawls out in the vernacular: "Make the offering." The ava is then strained through cocoa-nut husks—a tedious operation. Then the herald repeats his cry, and the chiefs join in the chorus. Somebody is dispatched with the royal ava, and the company go on singing. The orator invokes their god, Tava Sava, and his companions implore their dead friends by name to watch over them. Then prayers are raised for the king's life, for rain, the arrival of ships, for riches, and life to enjoy them. The chorus, "*Mana endina sendina le,*" a sort of "Amen, so be it," is repeated again and again, each time in a higher pitch, until the force of human lungs can no higher go, when the performance ends in a general screech of "*O-ya-ye!*" which is taken up by the outer mob; and then the king drinks his ava, the chiefs clapping hands while he does so, and when he has finished, setting to work upon their own account, and afterwards to business with what soberness they may. No one dreams of doing anything until the king has emptied his bowl; and if a visitor wishes to keep on good terms with his hosts, he must be careful not to do any work, or make any noise, until the ceremony has come to an end. The pievorree of Guiana and the chica of Chili and Brazil, like ava and aroo, are produced by the masticatory process; the first named being a concoction of cassava bread, saliva, and water; while the principal ingredient of the Brazilian chica consists of maize dough, thoroughly chewed by a parcel of old women.

Among the many strange acquaintances made by M. du Chaillu was a drunken old chief named Olenga-Yombi, whose head wife favored the gorilla hunter with the following account of her worthy husband's bringing up: "When he was quite a child, Olenga Yombi's father used to put him in a big bag, and carry him to the top of a high tree, where he plied him with the intoxicating palm wine. Every day he repeated the dose, till the child came to like palm wine better than his mother's milk, whereat the father was greatly delighted, because he wished him to be renowned when he was grown up for the quantity of palm wine he could drink. 'So you see, Chaillu, you must not be angry with him, for it is not his own fault.'" This frightful example was always going to the drink, on the drink, or sleeping off the drink, and must have furnished a nice text for the total abstainers of those parts, supposing they preferred their principles to their heads.

Genuine palm wine is obtained from the palmyra palm, and is far superior to that of the cocoa-nut tree. As the trunk of the tree is too rough for hands and knees to be used in climbing, the wine drawer adopts another mode of ascent. He passes round his body and the stem of the tree a hoop of bamboo, which serves to support his back. Pressing his feet firmly against the trunk, and grasping the hoop as firmly with his hands, he draws slightly forward, keeping his foot steady, and slipping the hoop up a little higher, advances a step or two with his feet; and so he goes up some fifty or sixty feet, till he reaches the leafy crown of the palm. He then bores a hole in the trunk, about half an inch deep, and inserts a leaf rolled up funnel-wise into it, the other end being inserted into the mouth of a calabash, which he sends down as soon as it is full. A tree will yield a quart of wine twice a day for a month; and if the hole is afterwards carefully stopped with clay, wine may be drawn from the same tree for many successive years. Captain Burton says the oil palm yields the finest wine of all, a drink surpassing the best of cider. His Majesty of Dahomey, however, with an eye to the oil trade, prohibits his subjects from drawing their liquor from this source, because, like the Kroomen, they fell the trees first; so that the thirsty souls of Whydah have to content themselves with bamboo wine, tasting like soapsuds laced with vinegar.

Dr. Livingstone found the Magenja of the Zambesi the possessors of a grateful beverage, which satisfied the cravings of fever at one draft, and almost justified the advice of a friendly chief: "Drink plenty of it, and as it gets in it will drive the fever out." This beer is made from vegetated grain dried in the sun, pounded into meal, and gently boiled. When a day or two old it is fit to drink, and is then a pinkish, sweet, acidified liquor of the consistence of gruel. It only intoxicates when deep and long-continued potations are indulged in, and then even no permanently evil result follows, for the Magenta are, for Africans, a very long-lived race, although, in contempt of European sanitary notions, they never wash themselves unless by accident. Drinking is the one enjoyment of their existence, and the completion of a family brewing an occasion of merry-making. Sometimes a selfish couple will pretend to be ill; and shut themselves up in their hut until they have put away all their brewage; but they generally invite their friends, who in return praise the beer as so good that the taste reaches to the back of the neck, or declare that it will make their stomachs cry "Tobu, tobu, tobu!" at every step on the road home.

Abyssinian beer, known as sona, tallah, or donqua, according to its quality and strength, is made by mixing Dagbusha flour into a dough, and leaving it two or three weeks to ferment, when the dough is made up into cakes and baked on hot iron. These are put into a large jar of water, with a mixture of barley meal and water, and a small quantity of a bitter herb called "geso," growing abundantly upon the plains. After remaining quiet for a few hours, the beer is considered fit for consumption. Moack, made from this beer by boiling it with eggs, honey, butter, and spice, is declared by a traveler to be a drink fit for the entertainment of the gods, when in the good old Abyssinian times they used to pay that land an annual visit. But the favorite beverage among our whilom foes is tedge or honey wine, which was praised years ago by the Jesuit father, Foncet, as a delicious liquor, pure, clarified, and the color of Spanish white wine. The process of manufacture is a simple one. To one part of wild honey is added five or six parts of cold water; this is well stirred and put into a narrow-mouthed jar, with a little sprouted barley, some biccalo or taddoo bark, and a few geso leaves. After three or four days, exposure in the sun, this ferments, and is generally drunk as soon as it has nearly lost its original sweetness, being even then a muddy sort of liquor. Mr. Parkyns speaks disparagingly of it, and quotes Bruce against it; but the natives appreciate it highly, and drink inordinately of it when they have the chance. In Shoa, the manufacture of tedge used to be a royal monopoly, and it was not allowed to be sold in public. Of course it was to be procured by bribery, but even then, Mr. Johnson says, the purchaser probably got the rations of some economically disposed guest of the king, who had poured his daily allowance into a large jar instead of drinking it. A superior sort, made for his Shoan Majesty's own use, was prepared by adding kuloh berries (resembling our elder berries) to the other ingredients, and allowing the liquor to be undrawn for some months. This was called "barilla," from its being handed to guests in small Venetian bottles of green glass, the accidental breakage of which was a serious offense in the monarch's eyes. Mr. Henty, the war correspondent of the *Standard* newspaper, describes the taste of tedge as resembling a mixture of small-beer and lemonade made from moldy lemons. With three comrades, he went into a native public house at Abtegrat fair, and called for tedge. It was brought in a flask resembling a Lucca oil-flask, but rather flatter, and with a larger neck. As it did not hold more than half a pint, the hot and thirsty customers soon called for more, but were made to understand they must wait for it to be strained, an operation they witnessed with dismay. A large jar was brought in; the wife of the proprietor put a part of her very dirty garment over the mouth, and poured the liquor through it into the flask. Luckily, Mr. Henty and his friends had learned not to be over-squeamish, and were able, spite of some qualms, to satisfy their thirst; he does not say whether the straining process improved the flavor of his honey wine, or otherwise.

Besdon, a drink in high esteem in some parts of Africa, is made like tedge with honey, but in this case the only addition is some millet, the beverage being brought to perfection by being exposed for ten days to the action of the sun. The Soosoos extract a tolerably palatable liquor from "yin-ying" root, by burning it and infusing the ashes in water. The people of Unyon think it wasteful to eat the plantain. They bury the green fruit in a deep hole, and keep it covered with earth and straw until it ripens. It is then peeled and pulped into a large wooden trough well mashed, and thoroughly stirred: in a couple of days it is fit for use. The Bullooms go a different way to work; they let the fruit ripen naturally, remove the skin, and bruise the rest in hot water. In twelve hours or so, this mixture is strained and bottled, being corked closely for a week, by which time it has become a beverage of moderate intoxicating power. The folks of Taboga find their wine all but ready-made. When the flower stalks of the American agave begin to sprout, the heart of the plant is cut out, and the juice collects in an artificial well formed by the operation. One plant will yield as much as three pints a day for a month; and when the juice has fermented, it will cause intoxication, and the end of the collector is attained.

Dampier relates how his friend Laut, Rajah of Mindinao, with all his courtiers, got as drunk as swine upon rice drink, which must have been a similar beverage to saki, beloved of the Japanese, who make it of all degrees of strength, from that of weak wine to potent spirit; and much the same sort of thing as the Chinese samshu, and, in the opinion of Sir R. Alcock, quite as good or bad. Marco Polo, perhaps because he had not tasted it, is much more complimentary. He says: "The greater part of the people of Cathay drink a wine made of rice and many good spices, and prepare it in such a way that it is more agreeable to drink than any other liquor. It is clear and beautiful, and makes a man drunk sooner than any other wine." This is praise indeed. But of all curious drinks, commend us to Ladakh beer, which possesses the great merit of portability. It is made of parched barley, ground, mixed with rice and the root of an aromatic plant, pressed into a hard solid cake. When wanted, a piece is broken off, and thrown into a vessel of water to ferment. This resembles gruel in appearance, and has a sour spirituous smell. What a boon it would be to our soldiers and sailors if the beverages of Bass and Whitbread could be thus solidified? Where is the inventive genius, not above taking a hint from the savage, who will make it possible to carry a pint or two of Burton ale or London porter in one's waistcoat pocket?

The SCIENTIFIC AMERICAN, with the first of July, begins the second volume of the year. It is superfluous to describe and almost superfluous to praise this, which is undoubtedly the most successful technical journal of America. On the whole it has well deserved its success—not but that there might be a better technical journal, simply as a technical journal; but that it has given scientific and technical information carefully, skillfully, and correctly to the largest possible audience. It is one of the many good points of the SCIENTIFIC AMERICAN that it is not above being understood. There is scarcely any subject connected with the mechanic arts which it does not treat intelligently, and it has become indispensable to every one—mechanic, farmer, business or professional man—who would keep himself informed of the progress of the nation in the mechanic arts and sciences. During the year it has widened its field and increased its interest by greater attention paid to the natural sciences, treated in a popular manner. We hope that it may go further in this direction, and that, when it has occupied the whole field, and does in reality represent thoroughly the "scientific" American, no intelligent American family will be without it. Of course there are always many—especially women and children—who care little for mechanics. But there are—or should be—very few who are not, or cannot be made to be, interested in some branch of natural science, so when this field is adequately occupied, we may expect to find the SCIENTIFIC AMERICAN to find a place in "my lady's chamber" by the side of the *Bazar*, *Every Saturday*, and the magazines. But it is hardly fair to ask this journal to be "all things to all men"—and, moreover, when it is already so much to so large a class.—*Railroad Gazette.*

Arkansas State Fair.

The Third Annual Fair of the Arkansas State Agricultural Association will be held at the grounds of the Association at Little Rock, commencing Tuesday, October 11, 1870, and continuing four days. Schedules of premiums and regulations may be obtained by addressing the Secretary, Mr. Edward C. Morton, Little Rock, Arkansas.

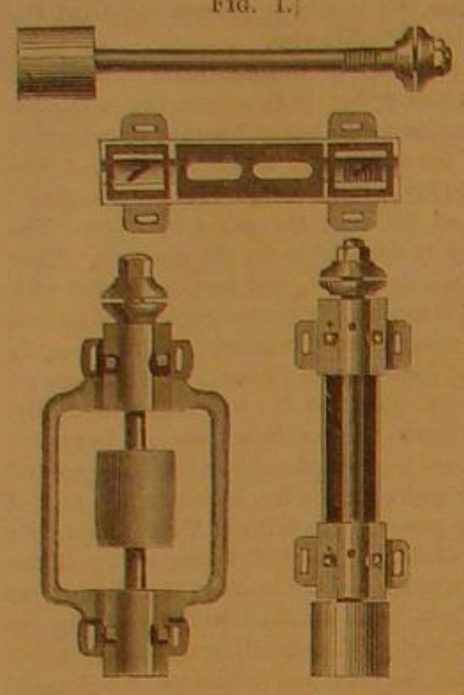
TO CANADIAN INVENTORS.—Under the Amended Patent Law, Canadian inventors are allowed to apply for patents on the same terms as foreigners of other countries. In fact there is now no discrimination in this respect, all inventors—citizen and alien—being placed upon the same footing. This is an example worthy to be followed by the Government of the Dominion.

S. A. WOODS' SELF-OILING CIRCULAR-SAW ARBORS AND ADJUSTABLE CONE BUSHING.

Our engravings illustrate improvements in saw arbors, which seem to possess many advantages over other arbors now in use. They are provided with self-oiling boxes shown in Fig. 1, and with an adjustable cone bushing, shown in Fig. 2.

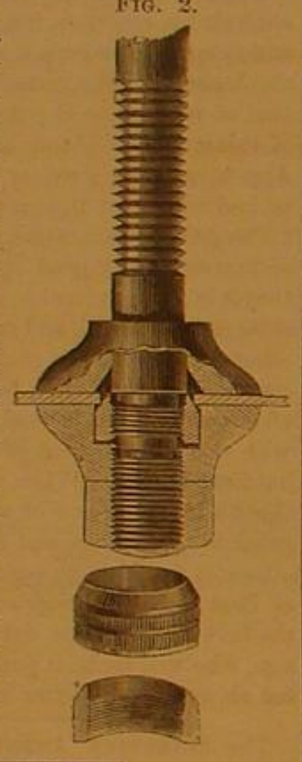
The self-oiling box possesses superior advantages. It consists of a chamber under the journal for the oil, which is fed to the bearing in sufficient quantity to always keep it lubricated; the oil being carried up by capillary attraction through a small cotton-waste packing placed in the cavity diagonally across the box, the end extending down into the air chamber below, as shown in the section of the box in Fig. 1.

FIG. 1.



The bed and boxes are cast together, and are consequently always in line. On one of the journals are a number of V-shaped grooves, with corresponding grooves in the Babbitt lining of the box, which prevent all end motion, and keep the arbor always in its proper place.

FIG. 2.



The adjustable cone bushing, shown in Fig. 2, will commend itself, we think, to all practical mechanics as a perfect means of centering the saw on the arbor. With this bushing saws can be used with holes varying three eighths of an inch in the same arbor, without the inconvenience of bushing each saw, as will be seen by reference to the engraving; and the arbor can be used either with or without the bushings. If saws come with holes to fit the arbors, the bushings can be left off.

Those who have used these arbors, and with whom we have conversed, are unanimous in conceding their superiority.

Patented, September 7, 1868. For further particulars or for price lists, address S. A. Woods, 91 Liberty street, New York city, or 67 Sudbury street, Boston, Mass.

Department of Docks of the City of New York.

The Commissioners of Docks held a public meeting, July 8th, for the further consideration of plans, specifications, and suggestions in relation to the docks and piers of the city. John T. Agnew presided, and the following members were present: Messrs. Wood, Henry, Hunt, and Smith.

Mr. S. F. Chellbourne presented the following in relation to sewerage: He would construct two main sewers inside of the new bulkhead on each side of the city from the Battery to Westchester. At these points there should be a tidal basin of twenty to fifty acres to receive the flood tide, and discharge it on the ebb through these main sewers. These main sewers would receive the contents of all cross-town sewers, and joining at the Battery would be continued in one large subaqueous sewer to a point in the bay near Ellis Island, where should be constructed a reservoir. A dredger is to be provided in the reservoir capable of supplying 800,000 tuns per annum of the solid matter of the sewerage to scow tanks, and then sold to farmers and gardners. These main sewers will clean themselves, being flushed by tide water.

Mr. C. H. Lillenthel proposed to build a system of piers extending around the city, on which buildings are to be placed for the storage of combustible materials, for keeping or slaughtering purposes, or for others that are objectionable to have in the city.

A railroad track on the wharf extending to each pier, the advantages being that it would require but little power, being on a dead level, the cars could be twice the size of ordinary cars, and be driven by a small engine. The rental of the buildings would pay a large dividend on the outlay.

Mr. J. C. Luce submitted the following: Piers of granite in solid masonry parallel with the river line, twelve feet long and 100 feet wide, should be built, and intersected at right angles midway by one of the same width running from the bulkhead, through which should run a sewer to the river. Large and small iron posts should be set in the piers for use in making ships fast and unloading them. On the pier fireproof warehouses should be built for storage and other purposes. Bulkheads should be extended thirty to fifty feet in solid masonry, covered with a continuous iron shed from the Battery to Harlem River. On the roof of these structures rail tracks may be laid for conveying passengers or freight from the Harlem River to the Battery.

Theron Skeel presented a plan for driving iron screw piles, which are to be chemically protected by gutta-percha from corrosion, and then mechanically protected by a covering of wood. Mr. James Burson exhibited a model of a construction for laying masonry under water.

Mr. Charles Pontez submitted a plan, with drawings, for the foundation of structures with great solidity, in deep water, without the use of the coffer-dam. His plan was to use an immersed coffer or caisson, as now used in the foundation of the abutments of the Brooklyn bridge. He then gave a detailed description of the construction.

The meeting then adjourned.

This was the last public meeting, although the stated meetings will be as usual, when plans, specifications, etc., may be sent in. Already there have been forty-five plans, specifications, drawings, etc., presented, which the Commissioners will carefully examine.

Gen. McClellan has been appointed Engineer-in-chief of the Department of Docks.

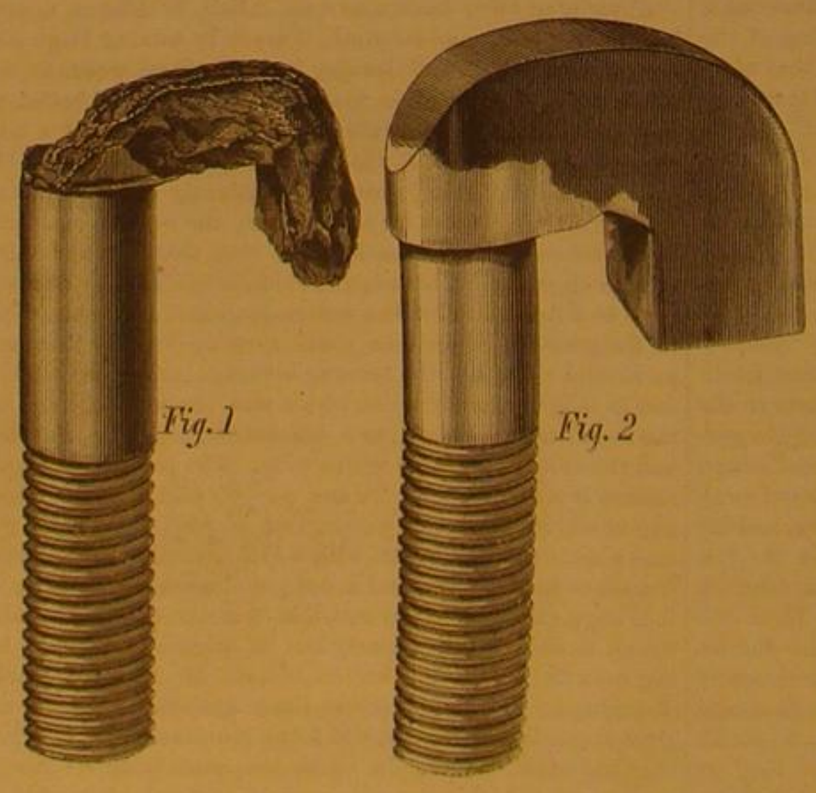
The Originator of the Telegraph System.

The name of Mr. Francis Ronalds was lately recorded as having received the honor of knighthood. Who is Mr. Francis Ronalds? was a question more likely to be asked than answered. Mr. Ronalds is neither more nor less than the originator of our telegraph system. He was the very first, either here or abroad, to invent an electric telegraph so constructed as to be capable of extensive practical application, and so far back as 1823 he fully developed its principle and mode of action. Still earlier, viz., in 1816, he had constructed a working electric telegraph, and on offering it to the then Government, received an answer which can never be too often cited as an illustration of official complacency: "Telegraphs of any kind are now wholly unnecessary, and no other than the one now in use will be adopted." Nothing daunted by this apathy Mr. Ronalds matured his invention, and in 1823 published a "Description of an Electric Telegraph, and of some other Electrical Apparatus." Mr. Ronalds was too far ahead of his time, and too purely a man of science, to secure a hearing for his discovery in those early days, and it was left to others to mature his idea, and to establish the system which his prophetic eye had foreseen would one day transform the world. It was not till 1837, fourteen years after Mr. Ronalds' pamphlet, that Messrs. Cooke & Wheatstone took out their first patent. The science and practical skill of these and other eminent electricians have brought electric communication to its present state; but the great fact remains that Mr. Ronalds was the first to demonstrate practically the principle which they have developed. At last, thanks to Mr. Gladstone's sympathy with genius, the special merits of Mr. Ronalds as a pioneer in this great field of action have received a public recognition. Mr. Ronalds, although still an active devotee of science, is now in very advanced age. A little longer and his honors might have come too late.—*Pall Mall Gazette.*

NICKEL-PLATING---INTERESTING TO MARINE ENGINEERS.

Our readers are aware that the process of nickel plating is daily extending. Among some of the new applications is that of covering the exposed parts of steam engines with nickel, whereby a surface easily kept bright is obtained, and a highly ornamental appearance is secured.

Mr. L. A. Scofield, chief engineer of the *Lodona*, a steamer of C. H. Mallory's line, plying between this port and New Orleans, called upon us recently, bringing with him specimens of bolts used to secure the valve seat in the air pump of the engine of that vessel, which we have had engraved.



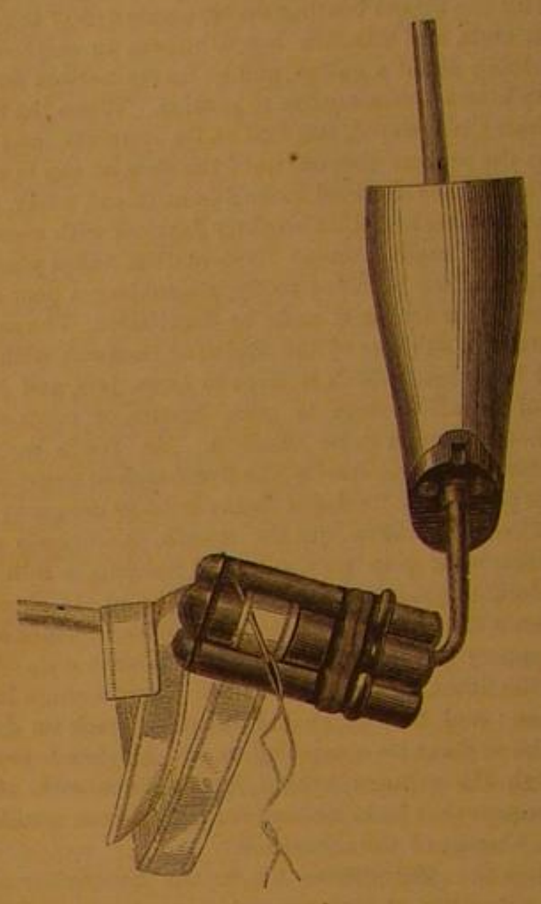
Mr. Scofield stated that the action of the steam and injection water—aided by galvanic action—upon those bolts was formerly such as to corrode them greatly; reducing them in an average of three round trips to the condition shown in Fig. 1.

To obtain a more durable kind of bolts, Mr. Scofield made them of composition, but this metal did not prove sufficiently strong. His next resort was to nickel-plating, and the result is shown in Fig. 2 Both the bolts shown have been equally exposed for three months, and occupied positions only about eight inches apart.

The bolt in Fig. 2 is discolored somewhat, as shown, but this discoloration is extremely thin, not in any place penetrating through the nickel coating. There is no doubt that the application of nickel to this purpose will be found a perfect protection.

MECHANICAL FINGERS.

We give an engraving of what we consider a useful and ingenious contrivance by which a lady who has had the misfortune to lose a hand may perform sewing. The inventor of this contrivance writes to the *English Mechanic*, from which we copy the engraving, as follows:



"Three weeks ago, I had a machinist apply for an arm amputated a few inches from the shoulder, and she wanted among a number of appliances, an instrument that would hold the work like the natural fingers, to enable her to hem, stitch, and tack her work for the machine. After many trials I succeeded, and so successful is the appliance, and so simple, that in a short time she was enabled to stitch and hold the finest or coarsest fabric, with almost as much ease as with the natural fingers.

"The instrument is fixed in the wrist, and is removed, as you see, instantly on touching the spring. There are three rods corresponding to the thumb and the first and second fingers; the two under rods are fixed; the top one, over which the work is drawn, is movable in any direction, and bound to the other two by a vulcanized rubber band; this band according to its tension keeps the work. On each rod is a piece of brass tube, which revolves when the work is drawn. Over the two under tubes is slid a piece of vulcanized rubber pipe. The work is placed in the instrument precisely as it is in over the index finger, the vulcanized rubber holds the work just like the soft cushions of the fingers; as the person stitches she can draw the work, the rollers revolve, and thus they can hem, and stitch at any length. Ladies who have lost an arm at the shoulder, above or below elbow, may now by the use of this instrument follow their favorite employment, which through their loss they may have long been deprived of."

J. GILLINGHAM.

Water-Proof Packing Paper.

Water-proof packing paper is thus made by some manufacturers: The paper is covered with a resinous liquid, then painted over with a solution of glue and soot, as without this the paper will later show blotches. After this is dried, the actual water-proof coat is applied. This is prepared with two and a half ounces of powdered shellac, dissolved into two pints of water, which is gradually brought to boil, and stirred until the substance is perfectly dissolved and softened, when gradually one third ounce of powdered borax is added, until an intimate union of the substances takes place. The liquid is then left to cool, and while still hot any mineral color may be added, such as lampblack, yellow ocher, red ocher, iron blue, or burnt umber, whereupon it is left to get entirely cold. It is then ready for use. It is said the operation can be so quickly performed with a brush that two women can prepare three thousand feet in ten hours.

THOUGH apparently in a state of rest, the atoms or molecules of all gases are always vibrating. Like the motion of gnats in a sunbeam, the molecules of oxygen gas are moving at the rate of 1,500 feet a second; those of hydrogen gas at 6,000 feet a second.

THE line of perpetual snow varies in different parts of the earth, depending upon latitude. Thus, at the equator it is 15,000 feet; in latitude 62° it is only 4,000 feet; and in latitude 71° it is as low as 1,000 feet above the level of the sea.—*S. Piesse.*

[For the Scientific American].

THE HESPERIANS.

[By Edward C.H. Day, of the School of Mines, Columbia College].

The Hesperians are one of those interesting families that intervene between well-marked groups, partaking of characters belonging to each, and thus confounding the systematist, who, forgetful that a system of classification, aiming to represent the system of nature, must be free from all "hard" boundary lines, attempts rigidly to define either. A butterfly, a sphinx or hawk-moth, and a miller or night-moth recall to the mind three very distinct objects. The night-moth is unmistakably indicated by its thick body; its very downy plumage; its wings displaying, when at rest, the upper surface, and generally that of the front pair alone; its hind wings folded, and the two wings on each side held together by a slender bristle on the one passing through a loop in the other (an arrangement technically termed "the bridle;" by its plume-like antennæ), and, above all, by its nocturnal habits. The butterfly, on the other hand, is equally well distinguished by its wings so large in their expanse when compared with the slender body—held in repose upright, so as to display the under sides—wanting all trace of the bridle, and with the hind pair never folded; by its antennæ threadlike, but terminating in a club-shaped expansion; and by its time of flight, in the full glare of day. Again, the narrow, lengthened, powerful wings—bearing much the same relation to those of the miller, as the wing of the falcon among birds does to that of the fowl—with its correspondingly strong and bird-like flight in the twilight hour, sufficiently distinguish the sphinx from the night-moths; while its thick, spindle-shaped body, its bridled wings, and its antennæ bent at the end into the semblance of a little hook, prevent its being confounded with the butterflies. But these associations of characters occur only in the type forms of each group; exceptions to almost every term of the above definitions may be found among some one or other of the less typical members. Thus there are "night-moths" and butterflies as crepuscular as the sphinx, and sphinges as nocturnal as the former; moths with their wings devoid of a bridle or a fold, and carrying them out of all accordance with the general rule; and so, too—and this is what interests us most at present—there are butterflies that have the club of the antennæ bent into a terminal hook, whose bodies are thickened so as to appear more or less moth-like, and whose hinder wings extend horizontally in repose, while even the front pair stand up by no means erect. Among these many, moreover, seem to assimilate somewhat in habits to the night-moths by preferring the deep gloom of the forest to the sunlit meadows or the open flower beds.

Such butterflies as these form the connecting link between the butterflies and the moths, standing lowest among the former; not that we mean that there is a direct passage from the highest moths through these to the higher butterflies, but rather that at some stage in the history of Lepidopters, these lowest forms branched away from a more "comprehensive" type, one that embraced characters now distributed among the three great groups, and that these have undergone less change than have the more highly specialized butterflies or the typical moths.

The Hesperians are popularly known as "skippers," from their peculiar jerking flight as they flit from spot to spot. The species figured is the *Pamphila aracynthus*, a small European form. The upper side of its wings is of a dark brown color, spotted with a few yellowish markings. The under surface of the hind wings is beautifully adorned with whitish spots encircled by brown, and from a fancied resemblance of these markings to tiny looking-glasses, this pretty little species is known in France as the "Mirror" butterfly. Its caterpillar feeds on grasses, and, according to Blanchard, in some points recalls to mind the caterpillars of the Pyralids among the night-moths. Wanting, however, as the perfect insect does, the hooked termination to the antennæ, and having but, comparatively speaking, a slender body it has not two of the most characteristic features of the skipper. Any person sojourning at this time of the year in the country may find a better example of the group in one of our native butterflies.

The *Eudamus Tityrus*, with wings expanding upwards of two inches, is a large and beautiful representative of an American genus of this family. Its upper surface is a rich glossed brown with greenish, marked with a band and spots of a dull yellow; beneath, on the hind wings, is a large pure white patch which renders this insect a conspicuous and pleasing object in our flower gardens, to which it frequently resorts. Its markings, when viewed close at hand, rather resemble blotches of paint laid on than the delicate shading of the dainty butterfly's plumage. Thick-bodied as it is, it is a strong, vigorous flier, so much so that, as Harris remarks, it is difficult to take it in the net without its doing itself injury. Its caterpillars, according to the same authority, feed upon the leaves of the common and viscid locusts, and "when quite small, conceal themselves under a fold of the edge of a leaf, which is bent over their body and secured by means of silken threads. When they become larger they attach two or more leaves together so as to form a kind of cocoon or leafy case to shelter them from the weather and to screen them from the prying eyes of birds.

"Although there may be, and often are many of these caterpillars on the same tree and branch, yet they all live separately within their own cases. One end of the leafy case is left open, and from this the insect comes forth to feed. They eat only, or mostly, in the night, and keep themselves closely concealed by day. These caterpillars are very cleanly in their habits, and make no dirt in their habitations but throw it out with a sudden jerk so that it shall fall at a considerable distance. They frequently transform to chrysalids within the same leaves which have served them for a habitation, but more often quit the trees and construct in some secure place a cocoon of leaves or fragments of stubble, the interior of which is lined with a loose web of silk."

Very similar are the habits of many other Hesperians. The cocoon of the "Mirror" is seen on the left of the engraving, formed of the blade of the grass folded over, inclosing the chrysalis, the whole being bound together by a loose network of silk.



METAMORPHOSES OF THE MIRROR BUTTERFLY.

Correspondence.

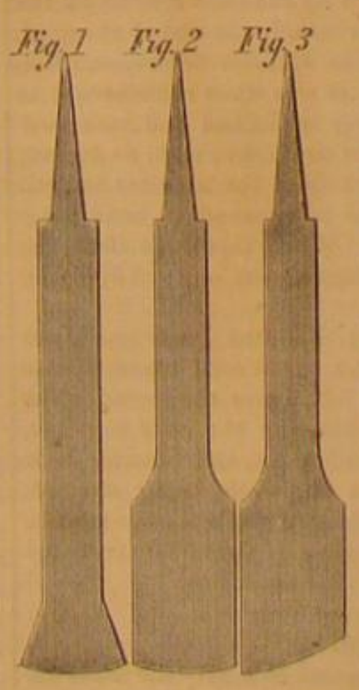
The Editors are not responsible for the Opinions expressed by their Correspondents.

Scraped Surfaces.

MESSRS. EDITORS:—I quite agree with Mr. Barber in most of his remarks about the use of the scraper. Trying to fit two surfaces together with a fine file and oil, is an exceedingly crude mode of doing such work. I think I may safely say it is utterly impossible to make a really good job with the file, because the file cannot discriminate between a small point, probably not half the size of a pea; and a good deal of the surrounding surface. But with a scraper the smallest point can be cut down and no other part touched.

A common mistake with an ignorant workman is to put too much marking on the surface which he is scraping. To make good work, the surface plate, or the part to which another piece is being scraped should at most be merely damped with oil; but generally a first-class workman uses absolutely no marking whatever to finish with. The two dry surfaces are simply rubbed together, when all the high points on the piece of metal being scraped, will be clearly shown by being polished in the rubbing, the low parts remaining dim.

Any kind of metal or composition, unless hardened, can be scraped, so there is no excuse whatever for new work not fitting perfectly. All working surfaces intended to be a good job, should be scraped, they will then remain good much longer than if merely filed, no matter how well that operation may be performed.



I never found any difficulty in using the three-cornered scraper. For instance I always scraped locomotive valve tables with it, as the flat scraper could not be used in many cases, and it worked quite well. I don't advocate the three-cornered one for flat surfaces where the flat one can be used.

The best form of a flat scraper is to have the point *thicker* than the body because a better cutting edge can be kept up than if the sides are parallel. To run the scraper down to a point is quite contrary to all I have ever used or seen. The point can either be square or angled—the angle being theoretically the better one.

WM. P. COWAN.

Brooklyn, N. Y.

Our Dwelling Houses.

MESSRS. EDITORS:—The admirer of good substantial workmanship can certainly find but little satisfaction in the method, or rather lack of method, in which two thirds of our common dwellings are now put up. Having interested myself in this matter recently, with a view to having a house built, the subject has presented itself quite practically.

There are always more or less of these dwellings in process of construction in this growing locality, so that "he who runs may read" in more ways than one, perhaps, in a high wind.

The greatest deficiency is in the foundation supports. Much experience and good judgment are necessary in making a good cellar wall; any novice can fill in chinks with small stone so as to give a wall a fair surface and appearance, but it is quite another thing to arrange a mass of unshapely stone into a wall so that it shall rest firmly and not settle.

I happened into one of these structures recently, which is an average instance of about two thirds of the common houses built here. This one is some 36 by 40 feet, three stories, including the modern double pitch or "French roof;" it was nearly inclosed and the roof about all on, and some of the partitions are being fixed for lathing. I noticed that the cellar wall was made of small flat stones which were so unskillfully laid that many of them were falling out, occasioned doubtless from the jar incident to putting up the building above. Under this whole area of 36 by 40 feet there are but five intermediate supports; these consist of two 2 by 3-inch partition studs, and three chestnut posts 4 to 6 inches diameter; one of these is crooked some four inches out of line, and rests upon a sort of cobble-stone sunk partially in the gravel, presenting a surface, I venture to say, of not more than seven inches square to the gravel, and of less than two inches to the post; under another post the only visible rest was a fag end of a 2 by 6 joist resting upon the ground; one of the posts had a fair rectangular piece of granite for its rest, but it was much too small for a ground rest, it should have beneath it another granite block, from 12 to 18 inches square. The accumulating weight above has already bent one of the 2 by 3 posts to the form of a bow.

Now I venture to say that the ten tuns or more of mortar will go on to the walls and ceiling above upon this inadequate and ill-arranged support. The consequence will of course be the settling of the whole central portion, at least, of the floors some two or three inches, more or less, or until somebody is frightened into sticking under some more props.

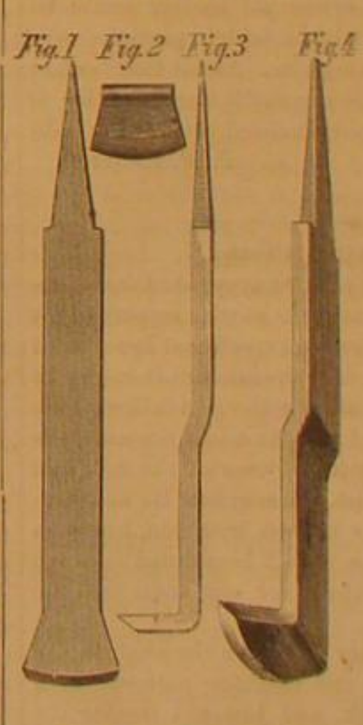
A large house just finished with all of the latest conveniences and in the best style, on Washington street, was the subject of precisely the ordeal indicated above. And from my late observation I am inclined to say two thirds of our houses are thus inadequately supported. F. G. W.

Worcester, Mass.

Scraped Surfaces.

MESSRS. EDITORS:—I am much interested in the discussion on the subject of valve scraping, I have been scraping valves for fifteen years from three inches square to three feet square. But none of the scrapers as shown answer the purpose as well as the ones I use. But doctors differ.

I use an old file; I find mill saw files, about twelve inches long, the best. I grind out the chisel cuts on the end, then heat a cherry-red, and draw out thin, not hammering it on the edge, as that is apt to open the grain. It naturally widens at the point (Fig. 1); I then bend a hook about five eighths of an inch long, and make a slight bend in the center of the file, as in Fig. 3. I then harden in salt and water as hard as it will make it, plunging it in the entire length when it is hot. If held only in the water a short distance they often crack at the surface of the water. I then grind straight on the inside and beveled at the outside side, as shown in Fig. 3. Oilstone across the grain of grinding, and you have a good scraper for any sort of work. The scraper cuts by drawing towards you. I never could scrape shoving the tool from me. I suppose Mr. J. E. Barber uses one of his sideways, and one push from him. I use the right hand on the handle, the left on the back of the scraper to put on the pressure.



JOHN J. BINGLEY.

Hanover, Pa.

Speed of Circular Saws and Saw Mills.

MESSRS. EDITORS:—It is laid down in mechanics that the speed of a circular saw should be about two miles per minute, that is, the periphery of the saw should run nine thousand; or a little over that number of feet per minute.

Having had much experience in the building and the running of saw mills, I have found that a greater speed could be used with safety, of which I will give an example, a mill that I finished and put in operation about eight months ago for Messrs. Milner & Caldwell, of Greenville, Butler Co., Ala., they having employed me to build them a first-class saw mill. I was in nowise to be trammeled, and

everything was left to my direction, which gave me an opportunity of testing a very high speed, together with a heavy feed on a large saw, which has proved a success.

The size of the building was 34 × 100 feet, and two stories high. Size of engine, 15 × 30 × 82, with 83 revolutions per minute. Three cylinder boilers, 36 in. diameter by × 30 feet long. Fly-wheel, 20-in. face × 12 feet diameter; weight, 8,000 pounds.

From the fly-wheel, with a 20-in. belt is driven a 4-in. counter shaft, with a 4-ft. pulley. A 6½-ft. pulley on countershaft, with a 16-in. belt to a 2-ft. pulley on saw mandrel, drives the saw, which is 66-in. diameter, running 800 revolutions per minute—14,000 ft. per minute—which is about 5,000 ft. per minute over the standard. With this very high speed the saw cuts 3 in. to the revolution, making a 3-in. feed.

On the 22d of April we tested the capacity of the mill, which cut the following amount of lumber:

1,501	plank, 1 × 12 × 20½ ft. long	30,770 ft.
80	" 2 × 12 × 20½ "	3,280 "
	Total	34,050

In sawing the above, 97 logs were cut up, the most of which were very large. The mill was run just 12 hours; during the first 6 hours some time was lost in having to take up the saw belt, and we cut but about 15,000 ft. of the entire amount; the last 6 hours run we cut over 19,000 ft. Has it ever been equaled? C. H. CRANE.

Greenville, Ala.

Mississippi State Fair.

MESSRS. EDITORS:—In a late issue of your paper you were kind enough to invite information concerning fairs yet to be held. The Mississippi State Fair will be held at Jackson, commencing Monday, October 10th, and will continue six days.

For a beginning, our fair last year was quite a success, and encouraged thereby, our arrangements for the next are being made on a more extensive scale. The premium list is now being published, and will be sent to any address on application. We invite manufacturers and inventors to come and see us, and show themselves, and whatever they may have new or old that will economize labor. So anxious are the directors of the fair to have a full exhibition, it has been determined to make no charge for the entry of any article. The only fees will be for individual admission. Arrangements will be made, as far as possible, for reduced transportation for visitors and machinery for the fair.

I will add that the Hon. Horace Greeley has been invited by the directors to deliver the annual address, and we are hopeful of his acceptance. J. L. POWER.

Jackson, Miss.

The Permutation Theory.

MESSRS. EDITORS:—The chief difficulty which appears to operate in the minds of many, preventing a recognition of the logic of the so-called permutation theory, referred to in the SCIENTIFIC AMERICAN a few weeks since, is, that all particles are said to be capable of infinite subdivision, and that consequently there could be no beginning (I use the word for want of a better) to the initiation of the grand plan of permutation. Allow me to say that this argument will fall to the ground before the self-evident fact that there must be a limit to these subdivisions, otherwise all matter would be homogeneous. There is a limit within which particles will combine—this is the lowest working size. Admit that God, or some great acting principle, made the earth, the particles of which it is composed were all individualized previous to said creation. Who can deny this? N. F. ENGLISH.

Hartland, Vt.

Cleaning Bolting Cloth.

MESSRS. EDITORS:—Reading in your "Answers to Correspondents" the difficulty that a millwright is in with respect to his bolting machine, I would like to give an experiment I saw tried with one that would not perform near the amount it ought to do, although experimented on by some of the best millwrights to be found outside the city I lived in. As a last resource, the millwright with whom I worked (the owner of the mill had a prejudice against him before this) was sent for. He had boxwood balls of 2½ inches diameter turned, with ⅝-in. holes in them. He took pieces of ⅝-in. iron with T heads, and fastened them to the shaft of the bolter; the other end went into the outer ribs a short distance.

The tapping of the balls as they fell from the shaft to the ribs and back to the shaft, made the machine perform, with ease, double the quantity of work, and brought double the quantity of work to the millwright's shop from the same mill.

New Orleans, La. FRANCIS CARROLL.

To Prevent Bolting Cloths from Clogging.

MESSRS. EDITORS:—Your correspondent C. A. L., of Tenn., in SCIENTIFIC AMERICAN of June 18th, page 402, wants a remedy for clogging in his bolting cloths. The remedy I would give would be to tear them off and get new ones, and when he starts his new cloths, not to bolt fresh meal from the stone, but run through some ship stuff, with grindings over middlings, say twenty bushels. This scours off the sizing or glutinous matter. I have never had any trouble with cloths clogging when I have taken this precaution.

N. S. HARRINGTON,
Foreman of Cleveland and National Mills.

Cleveland, Ohio.

How to Clean Bolting Cloths.

MESSRS. EDITORS:—Let C. A. L., of Tenn., select a dry day; clean his bolting cloths thoroughly inside and out, also his bolting chest, and then pass the flame of burning alcohol rapidly under the whole cloth.

Extreme care must be observed to avoid damping the cloths. AN OLD MILLER.

Macon, Ga.

Why Should Brass Lamps have Iron or Tin Bottoms?

MESSRS. EDITORS:—Is it generally known that petroleum acts upon tin or iron vessels corrosively? My lamp had a tin bottom, and when it commenced leaking the bottom was thin enough to thrust the fingers through as if it were paper. The tinman says that the coal oil contains some of the refining ingredients, and that these cause the corrosion. Why should brass lamps have iron or tin bottoms? J. A. S.

Philadelphia, Pa.

Wanted—A Dye to Color Pine and Light-colored Woods in Imitation of Black Walnut.

MESSRS. EDITORS:—Can you or some of your readers give some method of dyeing (not daubing as what is called "graining" is usually) some of the lighter-colored and cheaper woods—as pine, chestnut, ash, butternut, whitewood, etc.—to the natural color of walnut? The preparation should act as a dye, and not lie in a coat on the surface, thus showing the fine lines, of the natural grain of the wood used, which I have never yet seen truly imitated. I have the impression that many of the woods above named could, if treated in the manner suggested, be made to look equally well with walnut. BUILDER.

Brooklyn, N. Y.

How to Put Up a Wire Trellis or Fence.

In this season, when most of our rural subscribers, and some, at least, of those who reside in cities, are paying attention to the decoration of their grounds, it may be interesting to know how a cheap wire trellis may be put up. Mr. S. Mitchell gives the following practical advice upon this subject in the columns of the *Country Gentleman:*

"In putting up a grape trellis or a wire fence, the end posts should be strong, well set, and braced by a brace of seven or eight feet long, the upper end resting in a notch cut near the top of the post, and its foot against a stout stake driven down nearly even with the ground; three-quarter-inch holes should be bored through them the distance apart the wires are desired to be. For a grape trellis, No. 12 annealed wire is large enough, and No. 9 for fence. When first put up, they will be covered by a thin coat of rust, but seem soon to glaze over, and remain perfect for a great number of years. The posts should be set from twenty to twenty-four feet apart for a grape trellis, and can be driven with a heavy iron maul, in holes made by a heavy iron bar. I have one I use, made of square bar iron, the handle rounded and the end drawn down to a perfect point and hardened. It weighs about forty pounds, and will go down through coarse gravel, or even quite large stones, with the greatest ease.

"I see, in the agricultural papers, many elaborate descriptions of instruments for stretching the wire. I use a round, hard-wood stick, twelve or thirteen inches long, and two inches in diameter, with a small hole through the middle, just large enough to pass the wire through, and another near one end large enough to put in a peg for a handle. When ready to stretch the wire, lay down two coils side by side at one end; then let one person take the free end from each coil in his hands, and travel the length of the fence or trellis, while another person stands by the coils, letting the wires pass through his hands, to prevent fouling as it uncoils. When the end is reached the wires should be passed through the auger holes in the end post, and a hard-wood pin driven in firmly on the outside, and the wire coiled several times around the protruding pin to prevent its being drawn out while being strained. The wire should be fastened to each of the middle posts, by driving a small staple over it, but not quite home (the staples can be purchased by the pound in the market the same as nails); then draw up the slack and break the wires sufficiently long to pass through the end of the post, and through the small hole in the windlass before described, and bend down, so that it will not slip when commencing to turn. Then take hold of the peg in the end and turn, coiling the wire around it until it is strained as tight as desired; then drive in a peg and unwind from the windlass and coil around the peg as before. Some recommend to drive home the staples in the middle posts. When this is not done, the wires can be tightened by driving out the peg and applying the windlass as before.

"I use three wires for grape trellis—the lower one about eighteen inches from the ground, the second twenty inches above, and the third about two feet above the second. The wire can be readily spliced by twisting the ends together, making about two and a half inches lap, and bending back the ends, so that they will not slip while being strained. From twelve to fifteen rods is long enough for one stretch, unless the staples holding the wires to the middle posts are driven home, when the distance does not matter."

Salad.

In every country salad is composed of nearly the same ingredients. Many vegetables contain potass, and when they can be eaten raw they are excellent antiscorbutic food. Boiling them would remove the potass; thus their principal virtue would be lost. The Romans ate salad freely, mixed with olive oil. The general ingredients of a salad are well known. In spring and summer, cos lettuce, mustard and cress, water cress, and radishes form the staple; in the autumn, endive and cabbage lettuce predominate. Nothing spoils a salad so much, both in appearance and flavor as cutting it up too fine. Every atom should maintain its individuality. Radishes cannot be cut too fine, but the slices should be in rings, and not dice shape. Onions must remain a matter of taste; but not so as regards mint. Every salad should contain from three to six leaves of young mint, as it greatly assists its digestion. No salad can be properly made without one or two hard boiled eggs, because the yolks are necessary to blend the oil. The mixture should be made thus: Boil two eggs quite hard; when done take them out of the saucepan and put them into cold water. This causes the eggs to shrink, and the shells can easily be removed without disfiguring the white. Cut each egg into three parts, and remove the yolk into the salad bowl; cut the white into fine rings, some of the best of which should be preserved to place on the top of the salad when served. With a wood or silver spoon break up the yolk in the salad bowl, and add one tablespoonful of oil; these ingredients rub together, and they will blend; then add at least three tablespoonfuls more of oil, and again rub all together; now add a teaspoonful of moist sugar, again rub, and all will blend. Now add gradually, a little at a time, the vinegar, in quantity about twice as much as the oil used; lastly, put in pepper, salt, and ready-mixed mustard, the latter but little; but on no account use mustard that has not been previously mixed with water. A little taragon vinegar, used scantily, improves every salad. It is very essential to mix the ingredients in the order laid down as above. When this is carefully done an excellent salad will be the result—soft, yet aromatic; creamy, but not greasy.

There are true chemical reasons for mixing yolk of egg with oil, as there are for mixing flour-of-mustard with water, and not vinegar; but this is not the place for examining them—the facts stated must be accepted. It is the general want of the knowledge of how to blend the oil that causes the common remark, "I am very fond of salad, but I'll not take any oil, thank you." Of course, served up as it frequently is, all floating and greasy, few things can be more objectionable, unless it be that rancid potion sold in ring bottles in shops under the name of "Salad Cream." Avoid this. Beetroot, as a staple to a salad, is not used sufficiently in England. At least half a good-sized beet should be cut up with every salad. It is digestible, nutricious, and in general favor.—*Septimus Piesse.*

Bank Alarm Telegraph.

For some time past the bank officials of this city have been engaged in looking after some system of protection or alarm, to work in connection with each of their institutions to the headquarters of the fire alarm telegraph, where some person is always on duty. Mentioning their desires to Superintendent A. L. Whipple, of the fire alarm telegraph, that gentleman's efficient aid was enlisted, and to-day the public will have an opportunity of witnessing the operation of the new and beautiful machine which will in future perform an important part in guarding the millions of treasure locked in the bank vaults of this city.

The electro-magnetic watch clock is a beautiful piece of mechanism, inclosed in a black walnut case, about six feet high and two feet wide. It consists of a magnet, with a recording dial, clock works, and a signal bell. From this clock run eleven wires, one to each of the banks, Commerce Insurance Company, and the Gas Company's offices. Two watchmen will be employed, whose duty it will be to visit each bank at stated times during the night and give signals, which are recorded on the dial of the clock in the fire alarm office, showing the time that the signal was given from any particular bank or office.

The order in which the banks must be visited will be changed each night, as also the time that the signals shall be made from each; the watchman must make the visits according to the programme handed him every night by Superintendent Whipple. In this way no collusion can be formed between the watchman and evil disposed persons, who may want to operate on any safe or vault.

If this signal is not given within five minutes after the appointed time, the man on duty at the fire alarm office communicates with the office of the Superintendent of Police, and an officer is immediately dispatched to the point where the trouble exists, and from whence no signal has been sent. In this way freedom from burglary is insured, and bank officials may rest peacefully at night, without any fears of the depredations of the bold rascals who have heretofore made raids on these moneyed institutions. The work has been well done, so far as we have examined, and we are proud that Mr. Whipple has shown such a thorough knowledge of his profession as an electrician as is evinced in the work just completed.—*Albany Argus.*

ORANGE MARMALADE.—Cut the orange in quarters, turn out the pulp, and put the peel in water for twenty-four hours. Change the water several times; turn the pulp from the skin, and pick out all the pips; squeeze all the juice you can; boil the peel until tender; turn it out and let it drain, then cut it crossways, very thin; and to every pound of fruit put two pounds of sugar, and to every pound of sugar put a quarter of a pint of water. Let the sirup boil, and skim it; then put the fruit in, and boil very slowly for one hour and a half. —*S. Piesse.*

As tallow-melters, oil-boilers, varnish-makers, and others, are very liable to accidents from fire, Dr. Piesse suggests to them the application of Sir H. Davy's discovery of wire gauze, as in the miner's lamp, for the prevention of accidents, by covering the boilers and vats during operation with a drum-head or dome of wire gauze.

THE SCIENTIFIC EDUCATION OF WOMEN.

[From Nature.]

The feature which will probably most clearly mark the year 1869 in the view of the future historian of education, will be the definite recognition of the rights of woman to all the advantages of education accorded to men. The advance of public opinion within the last few years on all subjects relating to the legal, social, and educational position of woman, has indeed been so rapid, that the man whose words were only quite recently listened to by his friends with a condescending smile of pity, is now scarcely in advance of his times. As it is generally believed that the movement has yet far from reached its full development, and the course in which it has been so far directed having been in the main sound and excellent, we would still wish to suggest to its promoters whether the curriculum of subjects taught under the auspices of the various associations may not be somewhat widened by a more liberal infusion of the scientific element. The ability of women to appreciate instruction by the highest teachers of natural science has as yet hardly been tested. The high position occupied by a few women like Miss Martineau and Mrs. Somerville as writers on political and natural science cannot be taken to prove the capacity of the whole sex; but we think that so far as opportunity has yet been offered, the evidence is entirely favorable.

The programmes of the lectures to women on physiography, physics, and botany, recently delivered at the South Kensington Museum, by Professors Huxley, Guthrie, and Oliver, show at least no want of confidence in the capacity of their pupils. The first of these courses has already been given substantially to a mixed class of boys and girls at the London Institution, and in the results of the examination of that class, the girls had decidedly the advantage over the boys. In most of the large towns of Great Britain courses of lectures to ladies have now been delivered during the last two or three years by eminent professors of the various branches of literature; in many of these rigorous examinations have been held at the close of the courses; and where this has been done, there is but one expression of opinion as to the quality of the work executed. At London, Edinburgh, Manchester, Liverpool; in English literature, mathematics, experimental physics, mental philosophy, the testimony is uniform, that not only can women compete with men in the qualities essential for severe and successful study, but that in many respects their average attainments are higher than among the working members of a university. A careful examination of the reports of the various educational associations convinces us that the statement is decidedly within the mark.

Among so many testimonies to the same effect, it seems almost invidious to pick out one; but we cannot forbear quoting from Professor Fraser's report of his class of logic and mental philosophy at Edinburgh: "Sixty-five students enrolled. Forty-eight of these shared more or less in the examinations and essays of the class. I found, as the session advanced, that I had at the outset underrated the mental power and persistency of as able and zealous a set of students as I have ever had the good fortune to conduct. . . . . In the examination the average of marks gained, was about 55 per cent; one twelfth of the class gained more than 80 per cent of the marks, and only one had less than 25 per cent."

The Edinburgh Association stands out from most of its kindred societies in being formed on a decidedly more academical basis. The courses are longer, averaging about forty lectures each, and, consequently, deeper and more thorough: the teachers are all university professors, and the aim of the Association is, as it were, to form a distinct faculty of the University. So far as we can judge, the success of the Association has justified the views of its founders. Many advantages no doubt result from immediate connection with a great center of learning like the University of Edinburgh, a connection which has hitherto been denied to female education. We are inclined to think that the "College for Women" may have made a mistake in establishing itself in a locality "midway between London and Cambridge." The College will not share in the life of the University; the Cambridge professors will not feel the Hitchin College a portion of their own system, unless the College is locally associated with the University.

We have already alluded to the comparative absence of natural science from the programmes of the ladies' educational associations; this is not so strikingly the case as it was last year. The London Association is making arrangements for some scientific classes next session; at Edinburgh Professor Balfour is trying the experiment of a class of botany; classes for zoology and geology are included in the Manchester curriculum for 1870–71; as well as one on logic by Professor Jevons; natural science has a place both in the entrance examination for the Hitchin College and in the College course, though it has not yet been taught; while chemical classes have already been conducted in several localities by Professors Williamson, Roscoe, and others, with marked success. We notice with great pleasure the movement at Cambridge for the instruction of women to which we have referred elsewhere. Here a wide field is opening for the future, and one which it will surprise us if women do not make especially their own.

In the training of boys we have recently awoke to the discovery that a complete education implies something more than an intimate acquaintance with two dead languages. There is no danger that we shall ever underrate the value of a critical acquaintance with Latin and Greek, as requiring a mental training which no other studies can give; but while a classical education imparts the highest culture possible to the intuitive faculties, it scarcely brings into play the powers of observation. Now, it is in these very powers of perception, as distinct from conception, which the natural sciences cultivate, that woman has naturally the advantage over man; and we may therefore *a priori* conclude that their study will be specially within the range of her powers. Another consideration is also worthy of notice by those who are looking for "new careers for women." At a time when we are beginning to recognize the importance of a scientific training as an essential portion of a liberal education, we find that our teaching powers fail us. The number of really competent teachers of science has by no means kept pace with the extension of a desire for instruction; the leading men in every branch are overwhelmed with work; and the younger men to whom they can with confidence intrust a portion of their labors are by no means sufficiently numerous. It is thus not women only, but men, the whole human race, that is stunted in its intellectual development at a time when its growth should be the most rapid, by the practical restriction to one half of the race only, of the means of acquiring the ability to help in this development.

We next touch upon a subject of great delicacy; we refer to the instruction of women in medicine and surgery. There is an important distinction between this and all other departments of science. While it is competent to any one to teach chemistry, geology, or botany, and his success as a teacher will depend on his competency, the teachers and practicers of medicine and surgery form a guild, a professional trades' union protected and licensed by the Government. It is in the nature of guilds and monopolies to be exclusive; and when we find that the medical profession is united almost as one man (with a few honorable exceptions) to resist the admission of women into its ranks, it is only what might with confidence have been predicted. The instinct of self-defense is a strong one; and if any evidence is required of the extent to which self-interest has entered into the causes of the opposition by the profession to the medical training of women, we need only to refer to the "seven reasons against the admission of ladies to the profession," given in the *British Medical Journal* for May 7th. Into the abstract question of the utility of monopolies we need not enter: those who are excluded from their benefits are perfectly justified in using every legitimate effort to overthrow them, and in claiming the assistance of those who believe in the universal adaptation of the principles of free trade. Seldom have greater persistence and self-denial been shown than by those few women who have labored long and hard in this country, America, and France, in attempting to open to their sisters the doors of the medical profession. Careless of cruel misrepresentation, of public slander, of private persecution, they have held nobly on their course, and their services to mankind will one day be recognized.

Few have yet realized the enormous gain that will accrue to society from the scientific education of our women. If, as we are constantly being told, the "sphere of woman" is at home, what duty can be more clearly incumbent upon us than that of giving her the opportunity of acquiring a knowledge of the laws which ought to guide her in the rule of her house? Every woman on whom the management of a household devolves may profit by such knowledge. If the laws of health were better known, how much illness and sorrow might be averted! What insight would a knowledge of chemistry afford into the wholesomeness or unwholesomeness of different articles of food! What added zest would be given to a country walk with the children, or a month by the seaside, if the mother were able to teach the little ones intelligently to observe and revere the laws of nature! Above all, what untold sufferings, what wasted lives, are the penalty we have paid for the prudish ignorance of the physiology of their bodily frame in which we have kept our daughters! These considerations have had far too little place with us at present.

We trust that a new era is dawning upon us; may the higher education of women be pursued in the admirable spirit of the last report of the Edinburgh Ladies' Educational Association: "So far as we can see, cultivation does for women what it does for men—intensifies every moral attribute in proportion to the mental growth. Those who must go into the world go out with a truer courage, founded upon a nobler estimate of work; those whose duties lie within the circle of home find them invested with a new and vivid significance from the higher elevation, and consequently larger views, of their own minds; and, finally, as 'woman is not undeveloped man,' we believe that womanhood can only be made more truly womanly, as manhood is made more truly manly, by the utmost use of the possibilities of high cultivation."

The Apparent Size of the Moon.

This question which has probably interested every school boy in the world, has latterly been discussed at length in the columns of *Nature*, and various opinions have been given upon the subject. The last one given, and in our opinion the best explanation, is that of the celebrated Professor Helmholtz, which we extract:

"The moon appears larger when she is near the horizon than when she is high in the heavens, although in point of fact owing to atmospheric refraction her vertical diameter ought in the former case to seem less than in the latter. Even Ptolemy and the Arabian astronomers were perfectly aware that the true reason why the moon appears larger when seen in the horizon, is that she then appears further off. The real question therefore is, why the sky should appear further from us at the horizon than it does at the zenith. Various causes have been assigned for this fact, and I am myself disposed to admit that there are several causes which combine to produce this effect, so that it may be difficult to say which of these causes predominates in any one case.

"First of all we must remember that there is no decisive reason why the starry firmament should appear to us to be a spherical surface. It certainly reveals to us objects (the stars) which are at an infinite distance; but hence we can only infer that it may assume the appearace of any such indeterminate surface as any motive whatever may lead us to ascribe to it. If we were floating in empty space, and could survey it in its whole extent at the same moment and in all directions, or if its movements were so rapid as to make a distinct impression on the senses, there might be more reason for assigning to it a spherical rather than any other kind of surface. In point of fact, however, its apparent form and apparent direction are constantly changing, according as the portion we happen to see is more or less inclosed by various terrestrial objects, and according as we fix our attention on a higher or a lower spot. We shall see further on that we are naturally disposed to regard it as a plane surface, at right angles to the line of sight, whenever both eyes are steadily fixed on one point.

"But with the canopy of cloud the case is entirely different. The clouds in general are so far from us that the criteria for judging of distance which binocular vision or the movement of our own bodies can supply are utterly useless. But the clouds are often disposed in parallel lines, they generally drift with a constant velocity and in the same direction; when near the horizon they appear like bars across the sky seen edgewise, and so lighted that it is easy to perceive they are bodies whose horizontal extension is foreshortened by perspective. All these indications serve to give us the impression that the true form of the canopy of cloud, at least in the zenith, is that of a very flat dome. On the horizon indeed these indications cease to serve us; there the clouds, like the mountains, appear to be evenly painted on a vertical or nearly vertical background, which gradually passes into the surface of the earth below, and into the firmament above. Now, since the senses supply no criteria by which we distinguish between the distance of the clouds and that of the sky, it seems only natural that we should ascribe to the one the ascertained form of the other, so far, at least, as we can separate them. This, I believe, is the way in which our conception of the sky, as a flat domelike vault, must originate, vague, variable, indefinite as that conception undoubtedly is.

"Moreover, the apparent increase in the size of the sun or the moon is never very striking or decided, except at those times when the air near the horizon is heavily charged with vapor, and when, as a necessary consequence, the heavenly bodies in question only shine with a very feeble light; we have then the very same effect with which we are perfectly familiar in the case of distant mountains. They appear more distant than they do when the air is clear, and therefore larger. Moreover, when suitable terrestrial objects happen to be placed near the horizon, they add very much to the effect. When, for instance, the moon sets near a tree some twenty feet in diameter, and about 1,000 yards off, as she subtends the same visual angle, and is known to be far more distant, she appears to be very much larger; whereas, when the moon sets behind a flat horizon, there is no object of comparison to enable us to perceive that her small *apparent* may represent a very great *absolute* magnitude.

"When I look at the moon reflected from a piece of parallel glass, so that her image appears to be very near the horizon, I do not find that the image looks decidedly larger than the moon herself seen directly high in the sky, although in this way it is easy to compare the apparent magnitude of the reflected image with that of the terrestrial objects seen together with it. In this case it is evident the reflected image has not the effect of being seen through the vaporous portion of the atmosphere.

"To my eye, the apparent increase in magnitude near the horizon is much more apparent in the case of the moon than in that of the sun. When the form of the sun can be distinguished at all, his light is generally so dazzling that we cannot look at him steadily, and consequently cannot compare him directly with any terrestrial objects that happen to be on the horizon. Even in the case of the moon when the sky is clear, the delusion is not so apparent. In all cases the delusion depends in a very great degree on the state of the atmosphere."

Polishing Wood Carving.

Take a piece of wadding, soft and pliable, and drop a few drops of white or transparent polish or French polish, according to the color of the wood. Now wrap the wetted wadding up in a piece of old linen, forming it into a pad; hold the pad by the surplus linen; touch the pad with one or two drops of linseed oil. Now pass the pad gently over the parts to be polished, working it round in small circles, occasionally re-wetting the wadding in polish, and the pad with a drop or so of oil. The object of the oil is merely to cause the pad to run over the wood easily without sticking, therefore as little as possible should be used, as it tends to deaden the polish to a certain extent. Where a carving is to be polished after having been varnished, the same process is necessary, but it can only be applied to the plainer portions of the work. Plane surfaces must be made perfectly smooth with glass paper before polishing, as every scratch or mark will show twice as badly after the operation. When the polish is first rubbed on the wood, it is called the "bodying-in;" it will sink into the wood and not give much glaze. It must, when dry, have another body rubbed on, and a third generally finishes it; but if not, the operation must be repeated. Just before the task is completed, greasy smears will show themselves; these will disappear by continuing the gentle rubbing without oiling the pad. You should now be able to see your face in the wood, at least, so says the *Cabinet Maker*, from which we take the above directions.

Improved Ballard Pavement.

Wood pavements seem to be gaining in public confidence, especially for light driving. At least this would seem to be a legitimate inference from the fact that their use is constantly extending. In this city and in Brooklyn the area of wood road surface has greatly enlarged during the past two years, and our observations in other cities which we have visited show that these roadways are gaining in popularity elsewhere.

The defects which existed in the earlier wood pavements have been some of them removed; and those at present laid are much better than the first ones.

We herewith give illustrations of a new claimant to public favor in this field, being an improvement on the Ballard pavement illustrated and described in our issue of April 23d of the present year, and which it is thought is adapted to heavy trucking as well as for lighter vehicles.

The accompanying engravings show the shape of blocks and manner of laying the improved Ballard pavement, which

Fig. 1

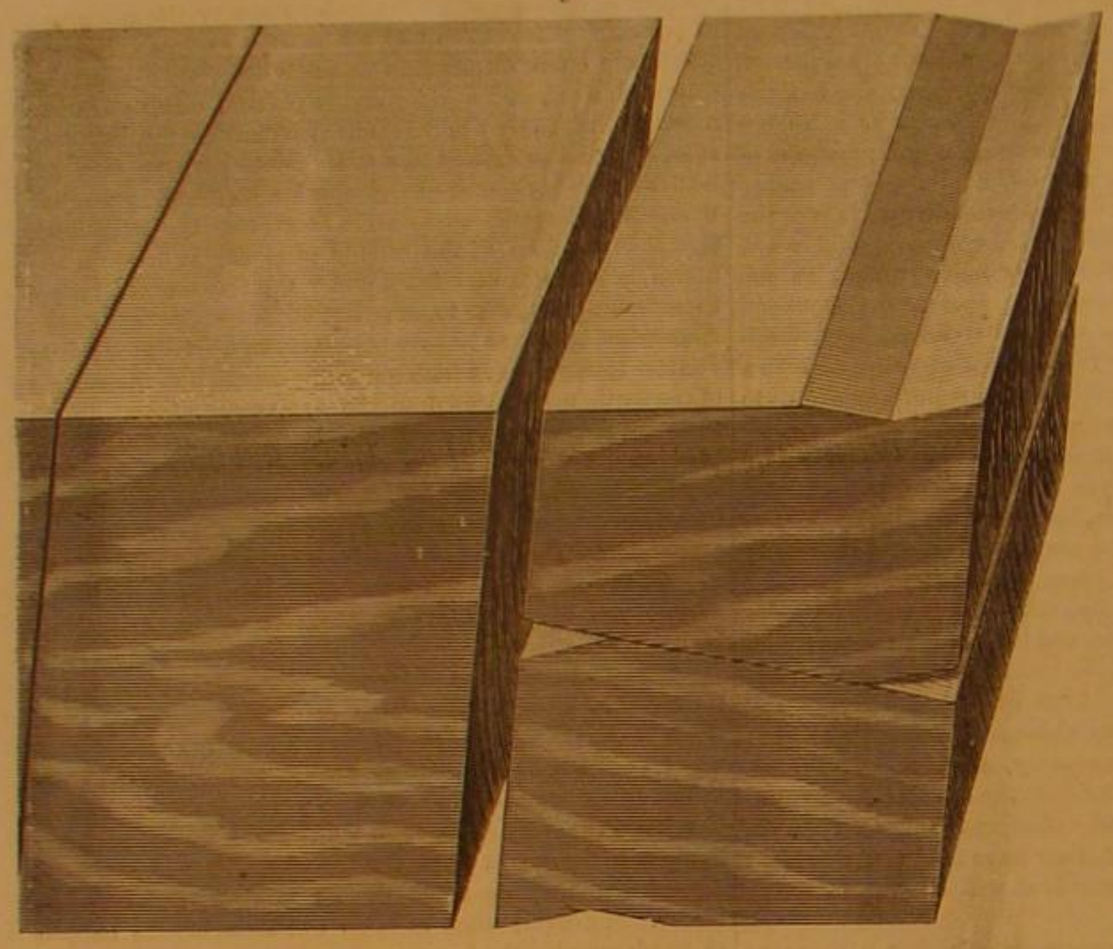
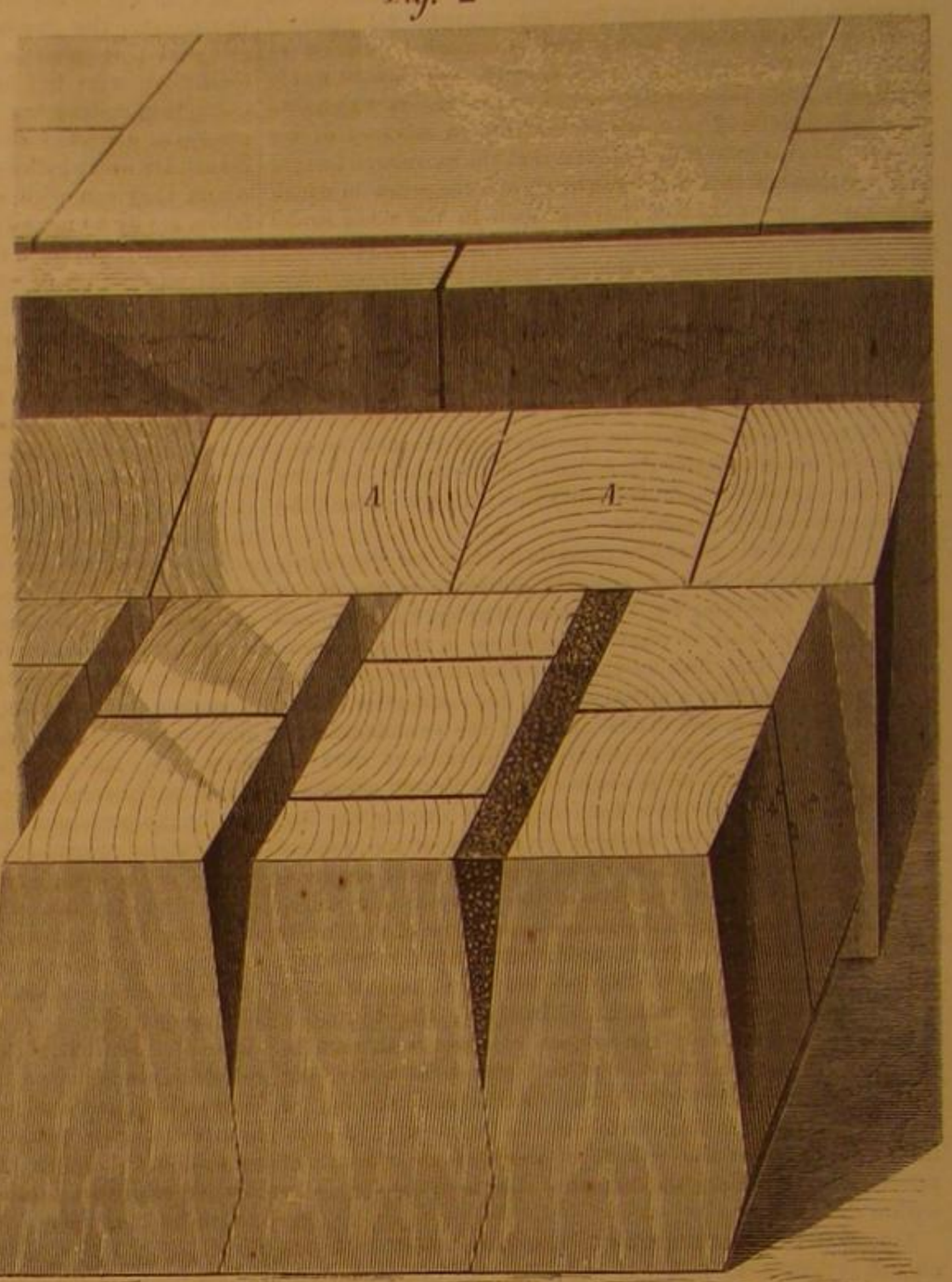


Fig. 2



IMPROVED BALLARD PAVEMENT.

the inventor is confident reaches the highest point of excellence at a much lower price than any other pavement now in use can be constructed. It seems simple, stable, and durable, and with a given class of material, its first cost is less than any other wood pavement. The lumber for the blocks may be sawed any convenient length and of any size, from three inches to the full size of the log or timber one way, and should be seven inches the other way. In sawing the blocks there is no waste of lumber or labor, each cut of the saw producing a block, which is so divided by the splitting saw as to form two broad-based, wedge-shaped blocks (Fig. 1), which are then run between two revolving cutters, making them exactly the same thickness at the bottom, and the proper shape for locking into each other, as shown in Fig. 2. This is done as rapidly as the blocks can be handled, and with the slightest waste of lumber.

This form of the blocks does away with the necessity for the objectionable wood flooring, and thus saves, after fitting the blocks, over eight feet of lumber to the square yard of pavement. The blocks when set, as shown in Fig. 2, leave a wedge-shaped opening at the top, to be filled with concrete thoroughly rammed.

The blocks rest upon a foundation of simple earth and sand properly rolled; and this is all that goes to make up this most simple and yet it is claimed, solid and complete pavement It is laid without nails, without strips, without pickets, and without a wood flooring. The blocks being of the same thickness at the bottom and fitting into each other, they can be laid with perfect regularity and great rapidity. One or more blocks can be taken up with great ease by removing key blocks, A, which are placed next to the curb; and it thus combines the advantages of a single block pavement, and is at the same time a solid and continuous structure.

For the manner of cutting the wedge-shaped blocks, we refer to the SCIENTIFIC AMERICAN of April 23, 1870.

These peculiar blocks of wedge shape, interlocking as they do at the bottom, and covering the entire surface of the carriage-way, when framed and keyed, constitute an unbroken arch, and, it would seem, render it impossible for one block to settle below another, without moving the whole pavement on the street laterally.

The combination of the three principles, of the broad-based, wedge-shaped blocks, covering the whole surface, the wedge-shaped key or filling, and the interlocking of the blocks, makes, we are assured, a pavement of such firmness and sustaining power that it is suitable for streets over which the heaviest loads are driven. It would be interesting, and we hope to see an experiment with this pavement on our thoroughfares which are subject to the heaviest use and wear.

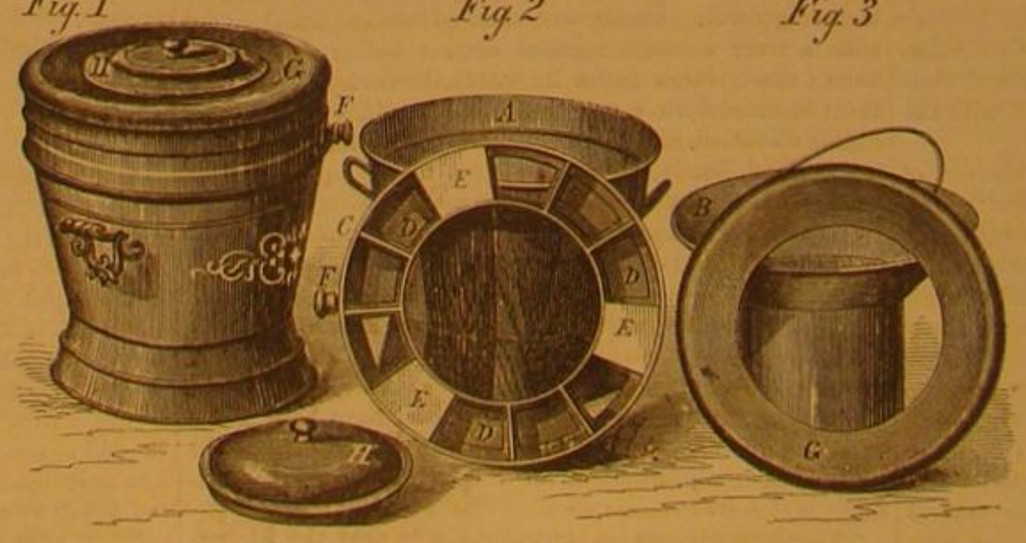
This improvement was patented July 12, 1870, and is owned by the Ballard Pavement Company in connection with their patents for wedge-shaped blocks, wedge-shaped interstices, wedge-shaped or key filling, etc. Patents have been applied for through the Scientific American Patent Agency, in England and other foreign countries. The office of the Ballard Pavement Company is No. 117 Broadway, New York.

Bliss' Portable Earth Chamber.

Having already indorsed the earth-closet system in unmistakable terms, and assigned what we deem ample reasons for favoring its general adoption, we may, without preliminary remark, proceed to the description of a new, cheap, convenient, and portable earth closet or chamber, of which our engraving gives a complete view, and also details of construction.

Fig. 1 is a view of the apparatus as it appears when closed. It is composed of the five parts, shown in Figs. 2 and 3. A being the outside shell case or bucket, and B an inner bucket or pail flaring at the top so that its upper and outer edge meets the inner side of A. The flaring portion makes a sort of funnel, by means of which the earth discharged from the chambers in the piece, C, hereafter to be described, is conducted toward the center of the internal chamber, B. This chamber or bucket is provided with a bail, by which it can be lifted out to be emptied and cleansed.

Fig. 1 *Fig. 2* *Fig. 3*



BLISS' PORTABLE EARTH CLOSET.

In putting the apparatus together, B is first placed in A, as above described, and the part, C, is placed over A and B. In C are formed chambers, D, each capable of holding one half a pint of dry earth. An annular bottom forms a common floor to all the chambers, D. In this bottom are formed three apertures corresponding to the parts marked E. The annular floor being turned by means of a latch knob, F, till its apertures are brought under the parts, E, the chambers, D, are filled with earth, the annular seat, G, is placed over the part, C, the cover, H, is placed upon the seat which completely closes communication with the interior, and the apparatus is then ready for use.

The fecal matters are covered with earth by turning the annular floor under the chambers, D, a distance equal to the width of one of the chambers, D; stops being provided to regulate the distance, and the floor being turned by means of the latch knob, F, as above described. This brings the three apertures in the annular floor underneath three of the chambers, D, equidistant from each other, and the earth from these chambers falls toward the center, covering and deodorizing the dejections. There being nine chambers, the apparatus may be used three times before emptying.

The object of this invention is to supply a small portable earth chamber, which, by its low price and convenience, will secure to families of moderate means the domestic comfort of the earth system, and which will meet all the requirements of the sick chamber. The following advantages are claimed:

It is a comfortable chamber, easily supplied with earth, and its deposits are removed without trouble. It is portable, requiring no more room than an ordinary toilet pail. Instantaneous and perfect deodorization of its contents is secured, so that the atmosphere of the sick chamber may be kept much sweeter and purer than is usually possible, thus adding greatly to the comfort both of patient and attendant.

Patented, through the Scientific American Patent Agency, May 3, 1870, by W. H. Bliss, whom address for rights or closets, at Newport, R. I.

TO REPRODUCE A BEAUTIFUL WHITE ON FLANNEL GOODS TURNED YELLOW BY AGE.—For the restoration of old flannels to their original color, Prof. Artus tried a method that had been proposed formerly: 2¼ lbs. white Marseilles soap is dissolved in 75 lbs. of soft water, and to the solution is added, under constant stirring, 1 oz. of liquor ammonia. The goods are soaked in the fluid, and afterwards well washed with water. The object may be accomplished, however, quicker by putting the goods for an hour in a dilute solution of bisulphite of soda, and adding, under constant stirring again, some dilute hydrochloric acid, when the vessel has to be covered and the goods left in it for 15 minutes longer. They are then washed in the same way.

SAMUEL A. DUNCAN has been appointed Assistant Commissioner of Patents, and John M. Thatcher, of Virginia, Examiner-in-Chief in the Patent Office in the place of Mr Fessenden, resigned.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

HOW THE HEIRS OF AN INVENTOR MAY BE REWARDED.

In the year 1819, Jethro Wood, then of Scipio, N. Y., took out a patent for a cast-iron plow, an implement now very generally used in this country.

Jethro Wood died in poverty after devoting his fortune and his life to the introduction of his improvement; and it may be said, with truth, that few men have conferred a greater benefit on mankind than he did by the invention and practical application of his improvement.

A bill has been recently reported in the House directing the Secretary of the Treasury to pay Phœbe and Sylvia Ann Wood, daughters of Jethro Wood, deceased, in trust for the heirs of said Jethro Wood, the sum of $25,000, out of any moneys in the Treasury not otherwise appropriated.

The report states that the Committee on Patents are satisfied, from the abundant testimony submitted to them, that Jethro Wood practically accomplished for the farmer what Fulton accomplished for the navigator; that like Fulton he died before it was possible for him, under the peculiar circumstances, to reap the reward to which he was entitled. He was the first man who invented and put into practical application and use the cast-iron plow. Singular as it may appear, before this invention the improvements in this much-needed implement were made at long intervals of time, and failed to result in any important benefit to mankind.

The report further states that until this invention was made the old-fashioned wooden plow was universally used in in this country, with its heavy wrought-iron share offering great resistance and requiring great power of draft. Jethro Wood improved the form of the mold board, constructed the several parts of cast iron, and in such manner that they could be speedily and strongly put together; made the plow far lighter of draft and easier to be guided, and not only reduced the original cost fifteen dollars a plow, but effected a great saving of time and expense which previously became necessary for constant repairs.

The report further states that additional particulars need not be cited, because every agriculturist is familiar with the details of this most useful invention; that it is sufficient to add that the Jethro Wood plow was finally adopted, and in its essential features is in universal use throughout our country. This result, however, was only effected after the struggle through which a meritorious inventor seems always fated to pass. When Jethro Wood made his first improvement, at which he labored many years of his life, until its perfection in 1819, he was known as a rich man, with a homestead of hundreds of acres and a comfortable income.

The great prejudice of the farmers against any innovation, the large expense of casting mold boards in many shapes until the desired one was obtained, the necessity of compensating incredulous manufacturers unwilling to assume what they call a great risk, soon deprived him not only of his fortune, but nearly all the profits of his new art which was then beginning to be appreciated.

Nor was this all. In order to convince it was necessary to a certain degree to give a public use to the article. It soon became pirated, and when suits were commenced the then defective state of our patent laws allowed the infringers to escape. In 1839 the law was at last altered so as to permit two years' use of an invention prior to the application for a patent without abandonment to the public; but even then Jethro Wood was met by decisions that this did not apply to patents issued before the passage of the act. It was not until 1845—several years after Jethro Wood had died in poverty, leaving a large family totally unprovided for—that on a full trial before Justice Nelson, of the Circuit Court at Albany, it was decided that the act of 1839 applied to patents granted before its passage; and all the questions of law and fact were determined in favor of the Jethro Wood invention.

Shortly after the patent expired, and on several occasions since, application was made to Congress for its extension in favor of the heirs, being two married and two single daughters of said Wood, and the child and grandchild of the two deceased sons.

In three Congresses as many reports were made upon these applications; and twice a bill passed the Senate granting the extension. But these bills failed in the House, because the farmers, while urging that a money relief should be given to the children of this public benefactor, were unwilling to pay it in the shape of a continued royalty.

The bill reported by the committee offers such relief to a very limited degree, taking into consideration the important progress in this art attained by Jethro Wood and the great benefits he conferred upon the public. But the sum of $25,000, which it gives, will alleviate at least the wants of his family, and show the gratitude of the nation to one whose useful invention has added comfort and wealth as well as honor to the people.

Previous to the passage of the bill, Mr. Randall, of Pennsylvania, raised a point of order for the purpose of inducing the Committee to reduce the amount. He regarded the claim as meritorious, but thought the sum named excessive. The judgment of the House, however, was expressed in favor of the recommendation of the Committee.

At the time the Goodyear heirs were applying for an act of Congress to enable them to secure another extension of the Vulcanized India-rubber Patent, we advised them to adopt the very course which has been so successful in behalf of the surviving children of Jethro Wood.

SYNOPSIS OF THE AMENDED PATENT LAW.

We have now before us a copy of the law to revise, consolidate, and amend the statutes relating to patents, recently enacted by Congress. It contains no radical changes, but simply codifies the old system, and reduces it into more compact shape. We do not consider it necessary to reprint the entire text of the bill, but will present a summary of its chief features.

The officers provided are a Commissioner, Assistant Commissioner, three Examiners-in-chief, Chief Clerk, Examiner-in-chief of interferences, twenty-two Principal Examiners, twenty-two Assistant Examiners, Librarian, Machinist, five clerks, class 4; six clerks, class 3; fifty clerks, class 2, forty-five clerks, class 1; and purchasing clerk.

Additional clerks, male and female, copyists, etc., *ad libitum*, or according to necessity

The claims and engravings to be no longer published in the report. The annual report to contain only a list of the patents.

The three Examiners-in-chief required to be persons of competent legal knowledge and scientific ability.

No other persons connected with the Patent Office required to have such qualifications.

Models to be furnished when required by the Commissioner.

The printing of the patents and drawings is authorized, and we trust that the Commissioner will make the work creditable to the advanced state of American art and invention

All persons may take patents provided the invention has not been in public use for more than two years.

No discrimination is made against Canadians. The law requiring foreigners to put their inventions on sale within eighteen months is abolished.

Assignments void, as against a subsequent purchaser, unless recorded within three months from date.

All cases can be appealed from the Commissioner to the District Court, except interference cases.

In cases where a patent is refused by the District Court, an appeal by bill in equity may be taken.

Disclaimers may be filed.

Designs may be taken by all persons—no discriminations. This will enable foreign manufacturers to protect themselves against having their designs copied, which has hitherto been quite extensively practiced in this country, especially in the production of textile goods.

Trade-marks may also be protected by firms or individuals, $25 for thirty years, with right of renewal.

The above are the more important changes made by the new law. They are simple, and on the whole commendable.

EXPERIMENTS WITH GUN COTTON.

In consequence of several serious accidents by the explosion of nitro-glycerin, many transportation companies have become very suspicious of all explosive agents, and frequently decline to take gun cotton as freight, although all precautions are observed that are usual with gunpowder. In order to quiet the fears of the freight agents, some experiments were undertaken by Messrs. Wilson & Prentice that are worthy of notice.

A small box, containing 125 charges of gun cotton, representing an explosive force equal to one quarter of a tun of gunpowder, was fired by a fuse in an open space. As soon as the fire reached the cotton, there was a great flame, similar to that produced by straw, but no explosion, and, after the lapse of a few moments, nothing further was burning excepting the brown paper in which the gun cotton had been packed. The box was an ordinary one, such as is commonly used for the transportation of gun cotton, was fastened by nails, but not by iron bands on the covers.

Several charges of gun cotton were placed on the track and were run over by heavy coal cars; some of them were ignited, others not. Another charge was cut into pieces by a chisel without producing any effect—there was neither explosion nor ignition. By percussion on an anvil, a roll of gun cotton was exploded, but it was observed—as is the case with nitro-glycerin, under similar circumstances—that only the portions struck gave an explosion; the other portions burned up quietly.

The heat of burning gun cotton does not appear to be very great, as a small tuft of it can be fired on a heap of gunpowder without igniting the powder.

In reference to the spontaneous decomposition of gun cotton, there is no well authenticated instance of such a change taking place without elimination of fire; but numerous examples of the entire disappearance of the contents of bottles and boxes are on record. Sometimes the cotton changes to a gum, and, at others, to oxalic acid; but the chemical decomposition takes place gradually and without danger.

From all of these observations it would appear that gun cotton can be transported as freely as gunpowder and with the same precautions. In Germany, in order to satisfy the minds of the freight agents, gun cotton for philosophic purposes, is sent in bottles, wet with alcohol, and, on arrival at its destination, only requires to be saturated with ether to be dissolved into collodion, ready for use. Gun cotton is also sometimes immersed in a bath of melted paraffine, to protect it from the effects of moisture.

THE MANUFACTURE OF BEET-ROOT SUGAR IN ENGLAND.

The manufacture of beet-root sugar in countries where beets can be grown, and which now depend for their supplies of sugar upon other countries, seems to be attracting general attention at the present time.

In America this manufacture has been already commenced, and is giving promise of future success. In England this industry has been considered as offering superior advantages as a means of relieving the condition of the working classes now suffering under the existing industrial depression in that country. The art of extracting sugar from the beet is, however, so imperfectly understood outside of the countries in which it is extensively practiced, that the quickest way to convince agriculturists and capitalists that large profits are possible from its introduction into countries where beet-root sugar is not at present made, is by publishing as widely as possible the details of processes, their scientific basis, and full statements of cost of plant, current expenses, and the returns which may be relied upon for a given expenditure.

All this information is comprised in the work under review*, together with much other matter of great value to all, whether English or American, who directly or indirectly feel an interest in the extension of beet-root sugar production.

The origin of the work is stated in the following extract from the author's preface:

The present volume is founded principally upon a series of articles published about twelve months ago in the columns of the SCIENTIFIC AMERICAN, a weekly newspaper, which, in its special department of applied science, stands almost without a rival on the American continent. The articles were written by M. Julien M. Deby, C. E., a scientific gentleman who has devoted considerable time to the practical study of this manufacture on the Continent of Europe; and arrangements were made with the proprietors of the SCIENTIFIC AMERICAN for their republication in England, with the original illustrations, it being intended to reproduce them, almost as they stood, in the pages of the *Chemical News*. The subject, however, appeared to be of such national importance, that it was soon decided to issue the articles in the form of a book, with such alterations and additions as were necessary to bring the information down to the latest date, and adapt it to the requirements of the United Kingdom. The following pages must therefore be regarded as an original work, Mr. Deby's articles having been closely followed only in Chapters III., V., VI., VII. (the latter part), and VIII.

A further extract will show the great benefits which would undoubtedly result to England from the introduction of the beet-root sugar industry into England:

The Chancellor of the Exchequer, in his recent speech on the Budget, when introducing the subject of the partial remission of the sugar duties, said: "We know that the beet root industry of the Continent seems to have got over its difficulties, and to be spreading very widely. There is also the prospect of the growth of beet root, with this object, in our own country; and if we could hope for anything so good as that it should be introduced with success into the south of Ireland, it would be one of the greatest blessings that could possibly befall that country."

The sugar beet has been grown experimentally in various parts of the county of Kilkenny by the Hon. L. Agar Ellis, M.P., and the important result has been established that the climate of the south-east of Ireland is suitable for the growth of such a crop, and that sugar beet can there be grown of a quality which will remunerate the manufacturer. It is calculated that a proportion of 8·5 of crystallizable sugar will pay, and in some instances comprised within the range of the experiments there was a yield of 10·91 and of 8·94. Mr. Ellis observes that, to make the crop worth growing, either the present sugar refiners of Ireland must put up machinery for "converting" it, or separate districts must erect the necessary works. That the magnitude of the industry is sufficient to warrant operations on the largest scale, is shown by the fact that last year France alone produced no less than

* ON THE MANUFACTURE OF BEET-ROOT SUGAR IN ENGLAND AND IRELAND. By William Crookes, F.R.S., etc., Editor of the *Chemical News*. Illustrated with Ten Engravings. London: Longmans, Green & Co.

300,000 tuns of beet sugar, which at £25 per tun would be worth £7,500,000, the molasses (100,000 tuns at £5) bringing up the value to £8,000,000. Beet root may yet redress the injury inflicted on Ireland by the potato.

Perhaps no English chemist possesses superior qualifications for the preparation of such a work than Dr. Crookes. His ability as a chemical writer and experience as an editor have placed his journal, the *Chemical News*, at the head of all similar publications printed in the English language, while it is equal in reliability, comprehensiveness, and in all other respects to any journal of its kind published in the world.

The book is not, however, valuable on account of the extent of original matter contributed to its pages by the author, but as a specimen of able and discriminating compilation; and in its freedom from superfluities or omissions, it is excelled by few technical treatises.

An introduction gives an account of the discovery of sugar in beet roots by Marggraf, in 1747, and a recital of the difficulties he met with in his attempts to establish its manufacture. This is followed by a brief history of the rise and progress of the industry, and a survey of its present extent. The introduction is followed by a chapter upon the beet, its nature, composition, average yield, and percentage of sugar it contains in various localities.

Chapter II. gives full direction for the cultivation of the beet in all its stages of growth, and also methods for harvesting and preservation of the crop. In this chapter will be found much additional matter to that originally furnished by Professor Deby for our columns; the views of Dr. Voelcker, an extensive contributor to the "Journal of the Royal Agricultural Society," on the "Chemistry of the Silesian Sugar Beet," and "Beet-Root Pulp," and also those of Mr. Arnold Baruchson, who has published a valuable work upon Beet-Root Sugar*, being given.

The chapters referred to in our extract from the author's preface, contain the principal part of the technical information contained in the work, so far as it pertains to the manufacture of sugar from beet roots, substantially the same as published originally in Vol. XX. of the Scientific American. But the ten other chapters contain very full information upon very important matters. The chemistry of beet-root sugar is much more fully treated in the fourth chapter than was done by Mr. Deby. From the ninth to the fifteenth chapter inclusive, the work treats of what is known as the new "concreting process;" the utilization of the spent-root beet pulp; the manufacture of spirit from beet juice; the new sucrate of lime process, which seems likely to prove of great importance; the manufacture of potash salts from the beet residues; excise regulations; percentage of sugar in different kinds of beets; yield per acre; and a full description of Dr. Schiebler's calcimeter, or apparatus for the quantitative estimation of the carbonate of lime in bone-black, by volumetrical assay.

An appendix contains useful tables of comparison of the degrees of Baume's areometer or hydrometer, with the specific gravities of liquids.

The work is a handsome octavo, printed on tinted paper, and tastefully bound. It should be in every technical library, and should meet with a large sale in this country, as much of the matter it contains has hitherto been inaccessible to the majority of American readers.

* Beet-Root Sugar: Remarks upon the Advantages derived from its Growth and Manufacture in the United Kingdom, together with a Description of its Rise, Progress, and Present position on the Continent of Europe, and some Practical Directions to Agriculturists and Manufacturers, with an Appendix on the "International Covention." By Arnold Baruchson. London: Effingham Wilson, Royal Exchange. 1868.

PAPER AND PAPER STOCK.

The Industrial Society of Mulhausen, France, recently offered a reward for the best treatise on the manufacture of paper and the choice of stock. The award was made to M. Oriolli, from whose admirable dissertation we propose to prepare a few abstracts.

The author first gives a scientific exposition of the properties of cellulose, then discusses the best methods for its treatment, and, finally, gives an account of all the raw material from which paper can be made.

It is gratifying to see that in the manufacture of paper, as well as in all other arts, there has been great progress during the last hundred years. Chemistry and mechanics have each contributed their part. The former has afforded us improved methods for washing, bleaching, bluing, and coloring the stock, which must yield a different product from what was made by the ancients. The mechanical improvements have been many, and tend to facilitate and cheapen the manufacture of paper. The use of ultramarine, which at one time was almost as valuable as gold dust, is a contribution from chemistry that the most sanguine believer in the progress of science could not have foretold. To see the beautiful blue color that Raphael so highly prized now made so cheaply as to be available in every laundry and in extensive manufactures, is one of the triumphs of modern science.

The same science that has given us our color has also taught us that the cellulose of all plants is the same as that contained in rags; and, in fact, the fiber of some plants will give us a paper that cannot be made from rags.

Not all plants, however, are adapted to the making of paper. Much depends upon the bark, membrane, and fiber, and there is a difference in the purity of the cellulose in various plants. The chemical tests also show a modification in the fiber of plants. The cellulose of cotton yields a blue color immediately with tincture of iodine; that of flax does not turn blue until an acid has been added, and hemp requires both acid and considerable time before the blue color makes its appearance. These reactions point to the presence and absence of starch and glucose in different species of plants. Chemically pure cellulose is perfectly white, more or less translucent, elastic, with a mean specific gravity of 1·5. It is insoluble in water, alcohol, ether, and volatile and fixed oils. It is unchangeable in dry air, but when moist, it becomes yellow in consequence of the formation of ulmic acid. In the sunlight moist cellulose suffers changes that have not been fully explained, and these alterations are modified and retarded by coloring or any organic matter. The action of acids upon cellulose is full of interest. Sulphuric acid changes it into a species of parchment, and if the action of the acid be permitted to go on for some time, the cellulose is transformed into starch, dextrine, and glucose. Very concentrated sulphuric acid chars paper and converts it into ulmic acid. Nitric acid has violent action upon cellulose and changes it into explosive compounds, and longer contact converts it into oxalic acid. Hydrochloric acid dissolves cellulose in small quantities.

A mixture composed of 80 per cent hydrochloric acid and 20 per cent nitric acid has been shown, after a great number of experiments, to be the best adapted for the disintegration of woody fiber. In 24 hours it converts the cellulose of wood into a spongy, soft mass, that can be easily separated by the fingers. The color is not changed, and all of the incrusting and foreign matter of the wood is destroyed.

In consequence of these experiments, Oriolli came to the conclusion that woody fiber treated as above, afterwards carefully washed, pressed in a mortar, again washed, neutralized with a 10 per cent soda lye, bleached with a 10 per cent chloride of lime bath, would yield long, soft, strong, silky fiber for the manufacture of paper. But notwithstanding the success of the experiment in a small way, all attempts to apply it on a large scale have proved unsuccessful. The wood was mixed with the *aqua regia* in large stone reservoirs, and it was found to be impossible to prevent leakage; then arose the difficulty with the red fumes of nitrous acid that produced a most deleterious effect upon the workmen. After the wood is disintegrated it must be hastily washed or the acid would wholly destroy it, and there was difficulty in performing this operation, as the acid would attack iron rapidly, and thus introduce chloride of iron into the stock, which would certainly ruin it for the manufacture of paper. There was also a great loss of soda growing out of the neutralization of the pulp after it had been disintegrated.

The inventors found so many difficulties that they were obliged to abandon the process, but it nevertheless possesses many points of interest, and may suggest a way of treatment for other fibers that have thus far not been found available for the manufacture of paper.

It is somewhat remarkable that Oriolli insists upon the necessity of some kind of treatment, by acids or alkalies, of the woody fiber before it can be adapted to the manufacture of paper, and yet in the face of his theory we have in the United States vast quantities of wood paper made without bleaching and by simply washing the pulp which is rasped from the sticks by rapidly revolving wheels.

In this country the whole process is a purely mechanical one, excepting in the establishment near Philadelphia, where chemical agents are employed.

Oriolli prefers boilers with double bottoms to any other invention for preparing the stock, and he lays much stress upon the gradual increase and decrease of the temperature. He also gives an account of the successful employment of ammonia water in the treatment of certain kinds of fiber. In reference to the various ways of bleaching the pulp preference is given to the employment of chlorine gas and of hypochlorites. If the hypochlorite of alumina were a salt that could be made in sufficient quantity and at a reasonable cost, it would be better than any other as a bleaching agent, but under the circumstances its use must now be confined to a superior quality of paper where the cost is of less importance. Bleaching by chloride of lime appears to have been universally adopted, although of late years much has been said about the use of permanganic acid as in every way preferable.

As for the vegetable fiber best adapted to the manufacture of paper, nearly everything has been tried—roots, leaves, stems, bark, cabbage, potatoes, beets, vines—but in practice none of them has been found of any value. On the other hand straw, wood, corn stalks, rice straw, esparto grass have been successfully used in various countries.

Interesting and valuable articles could be written upon each of the last enumerated raw material now used in the manufacture of paper. In Austria the husks of corn are not only made into paper but into clothing, and a good article of food is also produced from them. Paper clothing is also made in China and Japan, where a good coat can be had for ten cents, and a suit of clothing for a quarter of a dollar. In Germany paper napkins are now introduced, the cost of them is a trifle, and they can, after having been once used, be thrown into the common stock to be worked over again.

The fact that cotton and linen are really the same thing, chemically speaking, as paper, may take away from the prejudice that some persons entertain in reference to the use of paper collars, cuffs, and clothing. The cheap production of paper suggests its application for many ornamental and useful purposes. For doors, windows, cornices, papier-mache statues, moldings, bookbinding, pails, tubs, boats, and houses, there is a great future open to paper, and hence the importance of increasing our stock of raw material and our knowledge of the best methods for its manufacture.

ARTIFICIAL ULTRAMARINE.

Ultramarine, as known to the ancients, was called *lapis lazuli*, and was a precious stone. Very fine specimens of the mineral were ground up and used by the old masters, Raphael, Guido, and Domenichino, for the choice paintings, but the color was as dear as it was highly prized.

A few years ago a German chemist, while experimenting with anhydrous sulphuric acid and sulphur, made the accidental discovery that an exquisite blue color was produced. He came to the conclusion that the blue color of the ultramarine was probably due to sulphur and sulphuric acid, and at once instituted some experiments with alumina, soda, sulphur, and sulphuric acid, and succeeded, after repeated failures, in actually imitating the precious stone. It is not necessary to follow out the history, but is more agreeable to refer to the great success attending this industry at the present time.

Ultramarine is now so cheaply made that it enters into more industries than the public are aware of. We find it in the laundry as a bluing to correct the yellow color of linen. In the manufacture of white paper the consumption is becoming enormous. It finds ready application for fancy paper, paper hangings, and window shades, and is largely used in painting, not only decorations, but the common wood work of our houses. In the refinery of sugar it is also employed to give a fine white color to the loaf.

Its cheapness and the abundance of the supply have suggested its application in all cases where a clarifying substance is desired, and its manufacture has now reached proportions of many tuns per annum. We can buy a box of bluing for twenty-five cents that would have cost Raphael some thousands of dollars. Such is the success of the application of chemistry to the arts; and it is a color of so much importance in many manufactures that its cheap preparation has become a matter of prime necessity, and numerous establishments now vie with each other in producing a choice and cheap article. The principal seat of the industry is in the neighborhood of Nuremberg, where the original discovery of its artificial production was made.

PROJECTED SHIP CANALS.

The great Suez Canal, and the proposed Darien Canal, have so occupied the attention of the public that few have had their attention called to the numerous projects of a similar character now on foot in various parts of the world. It would seem that nations are everywhere looking for new and shorter routes of commerce, and that an era of ship canals has commenced.

In a recent issue we announced that the Suez Canal had been deepened so as now to admit the passage of vessels of the largest class. This was doubted by a cotemporary journal which is supposed to know more about spiritual than engineering matters. The fact remains, however, and sufficiently substantiates our statement, that large cotton steamers, one of them carrying over eleven thousand bales, have recently made the passage, one of them passing through the canal in only fourteen hours, and this passage has justly been accepted as establishing the practicability of the canal for larger vessels.

The prospects of the Darien Canal are not definitely settled, but it is hoped a practicable route will be established ere long.

The canal that was proposed to be established between the Baltic Sea and the German Ocean is now much favored by various commercial associations, and is so strongly urged that probably a survey to establish the most practicable route will soon be made.

It is thought that a canal will also soon be cut through the Isthmus of Corinth in Greece, thus connecting the Gulf of Ægina and Lepanto. This canal cannot, however, compare in extent or in commercial importance with the one intended to connect the Baltic with the German Ocean. It is, however, favored by the Greek Government, and will probably be cut through sooner or later.

A much more important project, and one which in magnitude eclipses all the others is a canal connecting the Bay of Biscay with the Gulf of Lyons, a distance of two hundred and twenty-five miles. An estimate of the cost of the work has been placed at $125,000,000. The termini of this work as now projected are Bordeaux on the Bay of Biscay, and Cette on the Gulf of Lyons. The section of the cutting is proposed to be of the same dimensions as the Suez Canal.

Other minor works of the kind are under consideration, and it is quite evident that the isthmuses of the world are destined to become the scenes of remarkable engineering works in the time to come.

The commercial changes the works already projected will effect, if they should ever be completed, are altogether beyond present comprehension. A work like that proposed between the Bay of Biscay and the Gulf of Lyons, could scarcely have been looked upon, in any other age, except with doubt and derision. If any now deride, it is because they see reason to doubt financial, rather than engineering success.

FRICTION MATCHES.

Matches without phosphorus or other poisonous ingredient are made by J. J. Karlen & Sons, of Erlenbach, Switzerland, in the following manner:

To a solution of bichromate of potash dissolved in cold water is added hyposulphite of lead, then chlorate of potash, then sulphur, then peroxide of manganese, and finally peroxide of lead, in the order stated.

These six materials are well mixed and kneaded together with water to form a thick paste, which is then rubbed upon a slab or passed through a mill, such as is used for grinding paints, so that all the ingredients are intimately and thoroughly blended. The paste is then warmed in a bath of lukewarm water, but not hot water.

Gelatin or glue having been dissolved in somewhat warmer water, this solution and powdered glass are added to the former mixture, and the whole mingled together in the form of a paste, which is then well stirred for a quarter of an hour, when the composition is ready for dipping the match sticks.

It is important that the chlorate of potassa be ground to

an impalpable powder. The glass should not be so finely pounded.

These matches ignite readily by friction on a common match-box or any suitable rubbing surface, as stone, glass, porcelain, wood, etc.

The above invention was patented in the United States April 5th, 1870. For further information, address John Hitz, Esq., Consul-General of Switzerland, Washington, D. C.

REPORT OF THE DEPARTMENT OF AGRICULTURE FOR MAY AND JUNE.

The season has sufficiently advanced to render practicable the formation of an approximate opinion as to the prospects of the coming harvest.

Those engaged in strictly mechanical pursuits are apt to overlook the intimate relation existing between general agricultural prosperity and that of the manufacturing interests. The cotton or woolen manufacturer directs his attention principally to the production of the staple which he consumes in his business, and is apt to feel too little interest in the production of food crops, notwithstanding the fact that scarcity or fulness in any particular production unavoidably influences prices, and even the future production of other staples. A scarcity and consequent sustained high prices of beef may induce the wool grower to abandon his present business and seek for a larger profit in the growth of neat stock. Or the profit which is found in the growing of cotton may so induce an increase of cultivation as to greatly affect its price.

As we have said, the season is sufficiently advanced to enable some judgment to be formed upon matters of this kind, and the Commissioner of Agriculture has given in his last report statistics and facts, which are of interest and value in making up an opinion as to the probable future of the manufacturing and commercial interests as affected by the next general harvest.

The average heat of the present season has been greater by a difference of from six to seven degrees than for the corresponding months of 1869, and very large sections of country have felt a serious deficiency in the amount of rainfall. The parts of the country which have suffered most in this respect are the New England States, portions of New York, an extensive section between the Ohio River and the northern lakes running as far west as Lake Michigan; another section west of the Mississippi, and south of Iowa, and the cotton States from South Carolina to Louisiana.

While a decrease of five per cent in the acreage of wheat sown is reported, compared with last year, the Eastern and Southern wheat-growing States report the crop as above an average. Per contra, the leading Western wheat-growing States report unfavorably, so that, on the whole, there will probably be a smaller crop of this cereal than was produced last year. In Utah the grasshoppers have made great havoc in the wheat fields, and in California the squirrels are said to have been destroying the crop "by the acre daily." The ravage caused by these animals has been so great that public meetings have been called to organize some method of protection from their depredations. The other cereals will probably be a fair average production.

In regard to cotton, the report says:

The cotton growers seem determined this year to reduce the price to fifteen cents, with every prospect of doing it. The acreage is materially increased in every State, while that of wheat (and probably of corn, though the county estimates of the entire country do not come in till July 1) has decreased. If neglect of all other interests can only be cured by cheap cotton, the sooner the reduction comes the better. The condition of the growing crop in North Carolina is good; in South Carolina it is looking well, except that some complaint of bad stands is made; in Georgia it is late, and smaller than usual from effects of a drought of five weeks, which terminated May 25, but is growing vigorously now; the dry term was shorter in Florida and Alabama, and cotton is generally in good condition. Reports from Mississippi are still more favorable; in Tensas Parish, La., where the greatest cotton yield of 1869 was made, the condition of the crop is 20 per cent better than last year, and the acerage is increased one fifth; from Texas comes reports of a backward spring, with cotton late but thrifty and promising; and no State makes more favorable returns than Arkansas.

The average condition of cotton is better than last year at this time—a fact desirable and gratifying in itself, but of no controlling force in determining the ultimate result. Last season was unpropitious to August, and afterward favorable to an almost unexampled degree, a tenth of the crop being due to the extreme length and propitious character of the autumnal season. The acreage of Sea-island cotton in Texas has been increased.

The autumnal fruit crops give great promise of abundance.

The beet sugar works at Alvarado, Cal., are nearly completed. When in full operation they will be able to crush fifty tuns of beets per day. The beets grown in that State are rich in sugar, an analysis showing a yield of ten per cent, or two per cent better than the average yield in Germany and Belgium.

The Commissioner alludes to the competitive trials of harvesting machinery to be held in Missouri and Ohio during the coming harvest. In Missouri the trial will be made of harvesting machinery in general; reapers, mowers, horse hay forks, hay stackers, hay rakes, and all kinds of machinery germane to harvesting, to be held near St. Louis during the harvest of 1870. The trial will be conducted under the immediate supervision of the State Board of Agriculture, some of the members of which will serve on each of the awarding committees. The trial will be conducted, in the main, under the rules of the reaper trial, held at Dixon, Ill., which were also adopted at the last World's Fair, held in France; namely—1. Quality of work, representing perfection, 40. 2. Simplicity of construction, representing perfection, 10. 3. Durability of construction, representing perfection, 15. 4. Ease of draft, representing perfection, 20. 5. Market price, 5. 6. Facility of management, 10. A perfect machine (reaper or mower), 100. Entry fees of $5 to $10 will be charged for machines.

The award will be the certificate of the Missouri State Board of Agriculture, and that to be the first and only reward.

The Ohio trial will be held at Mansfield, in that State, and will be conducted by the Ohio State Board of Agriculture. It will be confined to mowers and reapers, and will commence at such time as wheat may be in proper condition to test the machines, and continue from day to day until all machines are satisfactorily tried. The scale of merits, as agreed upon by the committee is the same as that adopted for the Missouri trial. The first prize will be a gold medal for the best reaping machine; the second, a gold medal for the best mowing machine; the third, a gold medal for the best reaping and mowing machine.

SCIENTIFIC INTELLIGENCE.

COBALT BRONZE.

A fine violet bronze, which can be rubbed up like talc, and resembles chloride of chromium, can be prepared from cobalt. It is free from arsenic, which is of material importance, and is chiefly composed of phosphoric acid, oxide of cobalt, ammonia, and water. A green cobalt color is made of oxide of cobalt and oxide of zinc. If these colors could be made in sufficient quantity, and cheaply, they could in many instances replace the poisonous arsenic colors now extensively employed for wall paper.

TUNGSTEN COMPOUNDS.

Notwithstanding all the efforts that have been made to introduce them, tungsten colors do not appear to find much favor—nor does the use of tungsten in the manufacture of steel accomplish all that was predicted for it. The goodness of the steel was generally found to be due to the manganese that happened to be present in the tungsten ore. Tungstate of zinc has been proposed as a substitute for white lead; and tungstate of soda is sold as a phœnix powder because it renders fabrics incombustible. This latter use of tungsten compounds to prevent the combustion of theatrical scenery and of dresses is one of the most important of any.

CURE FOR WARTS.

The best cautery for warts, corns, etc, is said to be dichloracetic acid. It must be applied on the sharp point of a glass stopper made for the purpose, and great caution ought to be observed not to use too much of it, as it will eat a deep hole into the flesh. One application is frequently sufficient to drive away a wart. The acid smells like vinegar, but is a much more powerful caustic. It can be had of our best druggists, and sometimes comes put up in bottles with directions for use.

THE RIGHT OF APPEAL MAINTAINED.

The original bill before Congress to amend our patent system, withheld the right of appeal from the decision of the Commissiener of Patents. This proposition was discussed and opposed in the SCIENTIFIC AMERICAN of Feb. 19, the article concluding as follows: "Hence we contend that the right of appeal from the Commissioner's decision should be sacredly preserved, and with such additional safeguards thrown around it as will reassure inventors that they have an impartial, inexpensive tribunal outside the Patent Office, to which they can apply for redress." Applicants for patents will be gratified to learn that the right of appeal (except in interfering cases) to the Supreme Court of the District of Columbia is retained—a feature in the law that we consider of great value.

AMERICAN INSTITUTE EXPOSITION.

During the months of September and October next, our readers will find at the great structure on Third avenue, near Sixty-third street, the grand annual display of the products of American skilled labor. Arrangements have been completed by which the Directors will have this year, what on previous years they have so much needed, room enough. This industrial display will be a leading feature in the attractions of the metropolis even to the common visitor, and may well draw artisans and all of a scientific taste from distant localities. It is time for those intending to enter machines and goods to apply for space. See Secretary's card in another column.

Fair of the Cotton States Mechanics and Agricultural Fair Association.

The First Annual Fair of the above Association will be held at Augusta, Ga., commencing on Tuesday, Oct. 25th, and continuing five days. The managers feel confident that exhibitors of all branches of industry from the North as well as from the South, will find no better opportunity for bringing their productions prominently before the public, than will be afforded at this exhibition. They assure exhibitors of articles which, under the rules of the Association, may be debarred from competing for premiums, that every facility shall be afforded them for displaying their productions to the best possible advantage, and that committees will make ample arrangements for the accommodation of visitors and exhibitors during their stay in the city. Mr. E. H. Gray, of Augusta, Ga., is the Secretary of the Association.

AT a distance of 1800 feet above the surface of the earth the air is expanded to double its original volume, and, as a consequence, the pressure is diminished to half its original amount.

The Good and the Evil of Much Knowledge.

A writer in *Fraser's Magazine*, taking for his text the words of Solomon: "He that increaseth knowledge increaseth sorrow," shows clearly enough that knowledge is not an exception to the rule, that no sublunary attainment, no matter how free it may be from sin, either in its procurement or enjoyment, is altogether an unmixed good, and that knowledge, in all departments, has increased sorrow; but he does not leave the subject without presenting the reverse of the picture, and this reverse we lay before our readers. As a specimen of powerful rhetoric we have seldom met its superior. He asks:

Is, then, the pursuit of knowledge, after all, truly a delusion, the worst and weariest of human mistakes, a thing to which we are driven by our necessities on one hand, and lured to by our thirst for it on the other, but which, nevertheless, like the martyr's cup of salt water, only burns our hearts with its bitter brine?

No! no! a thousand times, no! The mistake has not been in the pursuit of knowledge, but in the reasons we have alleged for that pursuit. We have wooed our beautiful bride for her dower, and not for her own sake, and it is but justice if we discover that that dower, amid its treasures, contains many a snake.

Man *was* created "to know and to contemplate. The *differentia* between him and the lower animals has been stated in many ways; but the most real of all differences is, that he bequeaths from generation to generation (mainly, of course, through written language) his experience and his faith; so that the "heir of all the ages" is the recipient of the whole treasure of time. Each dog is an upstart, a self-made creature. Each man has royal pedigree, and all the sages of the world are his preceptors. His thoughts grow on the grafts of culture. His religious trust is no solitary spring of enthusiasm, starting up alone in the desert; but the flowing stream into whose higher waters all the prophets and apostles have emptied their urns.

This is the true distinction of humanity. All others are matters of degree; degree of cranial development, degree of higher osteological type, degree of faculties of all kinds. One philosopher will say, "man alone is a laughing animal." But the bark of a dog, in its delight of freedom, is the joy-laughter of a child.

Another remarks that man alone is a "cooking animal." But, having no hands, the beasts can light no fires, and all which is physically possible they actually effect by burying their food till the four-footed epicure can eat it "high."

Again, a third says that "man alone can speak." But some animals have almost as many sounds as they have wants and ideas, and unlettered savages have little more. It is not till language comes to be written that the analogy stops.

A fourth observes, that man alone has the sentiment of pity. But cannibals kill and eat their dying relatives, just as the *carnivora* do; and an affectionate dog has an amount of sympathetic compassion for his master's tears which it is much to be wished his fellow-man should invariably feel.

The fifth claims the sense of right and wrong as the sole prerogative of humanity. But, at least, so far as extends the system which rests morality on rewards and punishments, even the heavy-witted cow has a clear idea that she is doing unlawfully in getting through the hedge into the corn.

Even the sixth grand distinction between man and beast—the religious sentiment—is rather in the object of the feeling than in the nature of it. The Creator has, as it has been often said, made man a god to the beasts. The devotion, humility, fidelity, gratitude, allegiance of a noble dog to a kind master, if not religion itself, is a perfect parable of religion. Fain would we hope that feelings so beautiful—we had well-nigh said, so sacred—must possess immortality, even in the poor fond brute. Is heaven to be a world without any life in it except our own? As well might we suppose it without flowers!

Knowledge, like virtue, is not good because it is useful, but useful because it is good. It is useful contingently, and good essentially. The joy of it is simple; and not only needs not to be supplemented by accessory advantages, but is well worth the forfeit of many advantages to obtain. The most miserable wretch we can imagine is the ignorant convict locked up in a solitary cell, with nothing to employ his thoughts but unattainable vice and frustrated crime, whereon his stupid judges leave him to ruminate, as if such poison were moral medicine, likely to cure the diseases of his soul. And, on the other hand, one of the happiest beings we can imagine, is the man at the opposite end of the intellectual scale, who lives in the free acquirement of noble knowledge. What is any "increase of sorrow" incurred thereby, compared to the joy of it? To look on the fields of earth and air—not as the dull boor regards them, as mere patches of brown, and green, and blue, with promises of food or shelter, sunshine or shower—but as the geologist, the botanist, the astronomer, regards them, each as an infinite world of interest, wherein order, and law, and Beauty are tracked by his rapid thought, even as the swallow traces the insect on the wing! To be able to take surveys such as these, is to be admitted to a spectacle for which angels might envy the sons of men. But to do yet more, to make memory like a gallery hung round with all the loveliest scenes of nature, and all the masterpieces of art; to make the divine chorus of the poets sing for us their choicest strains, whenever we beckon them from the cells where they lie hidden deep in our souls; to talk familiarly, as if they were our living friends, with the best and wisest men who have ever lived on earth, and link our arms in theirs in the never-withering groves of an eternal Academe,—this is to be happy, indeed. This is to burst the bonds of space and bring the ages together and lift ourselves out of the sordid dust to sit at the banquet of heroes and of gods.

Is "the increase of knowledge the increase of sorrow?"

Ay, so let it be, wise son of David! But, not its own sorrow, nor all the other sorrows of earth, can dim its triumphant and inalienable joy.

Experiments in Wood Pavements.

The Boston *Herald* says: "The laying down of wood pavements in Columbus avenue, in that city, by way of experiment, and for which the City Council appropriated $100,000, to test the various kinds, side by side, is now in progress. The proposed experiment was to give about half a mile in space, or 2,700 feet, assigning to each of nine varieties 300 feet. But seven of the owners of wood pavement patents have availed themselves of the opportunities for making the test, and the space assigned will extend from Clarendon street south, to a point between West Newton and Rutland streets. The occupied space is nearly 13,000 yards, the price ranging from $3·25 to $5 per yard, and the contracts amounting to about $50,000. The pavements represented, and their order, from Clarendon street, are: the Paul, Warner, Lancaster, Hodgman & Perkins, Stafford, Nicolson and Betterley. The Miller and Stowe, the most southerly, do not make their appearance. The Paul pavement is nearly completed. This is the same now on trial in Tremont street, from Pleasant street to the railroad bridge, the price being $4 per yard. The Warner has been commenced, adjoining the Paul, and is composed of square blocks of burnetized spruce, the price being $3·50 per yard. The third section, the Lancaster, is a partially hollow block, a smaller block fitting into this, with a filling of concrete, the price being also $3·50 per yard. The Hodgman & Perkins blocks fit together at the bottom, smaller at the top, with wedge-shaped interstices, to be filled with a concrete substance. This also is to be furnished at 3·50 per yard. The Stafford pavement is the same now in use around the Court House, the price being $5 per yard. The Nicolson was several years tried in Exchange and Mason streets, and is put down at $4. The Betteley is composed of round blocks of chestnut, and is to cost $3·25 per yard."

Blood.

By the aid of a microscope it is seen that blood consists of minute round bodies floating in an opaline liquid; these are termed corpuscules. They are so very small that one cubic inch of blood contains no less than eight hundred million corpuscules. Blood is rather heavier than water, as is seen when a drop is let fall into the transparent liquid; it falls through it. In about fifteen minutes after blood is drawn from the body it ceases to be fluid, and becomes a gelatinous mass. After standing for about twenty-four hours it separates into two distinct parts—one a watery fluid, which is called serum; the other, a solidified mass, coagulum. The red color of blood is due to a substance called hematine, which exists in the corpuscules. The coagulum consists in the main of a body called fibrin—flesh producer—masked by the color of the hematine. This fibrin differs but little from the nature of the white of egg. The blood fulfils every office in the body by restoring and building it up. Certain matters are eliminated from the blood to produce hair, nails, skin, fat, muscle, bone, brain, etc. It is therefore obvious that the blood must be of a complex nature. As a single fluid it contains more known elements than any other known natural body; among others may be mentioned phosphorus, lime, magnesia, iron, sulphur, soda, chlorine, potass, etc. In its natural condition it contains fat and sugar. The average composition of blood indicates that in every thousand parts from a male, it contains 780 of water; from a female, 790 of water.—*Septimus Piesse.*

DEATH OF ADMIRAL DAHLGREN.—We regret to be called upon to chronicle the death of Admiral Dahlgren, an officer of high distinction, and the inventor of the celebrated gun which bears his name. He was a man of liberal attainments in his profession, and an accomplished military engineer. An able officer, he merited by courage and genius all the honors which he won.

S. MEUNIER states that it appears more and more certain that the cutting down of forests in France is rapidly decreasing the annual rainfall.

Facts for the Ladies.

I have had a Wheeler & Wilson Sewing Machine over twelve years; have never spent a shilling for repairs; have done the sewing for a family of four all that time, and for the last two years done all my sewing with the same needle; and do not know any reason why it should not last for several years to come. MRS. ANNETTE GERYER.
Rock Island, Ill.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

APPARATUS FOR GENERATING CARBONIC ACID.—J. F. Boynton, Syracuse, N.Y., has petitioned for the extension of the above patent. Day of hearing Sept. 21, 1870.

PLATE-HOLDER FOR PHOTOGRAPHIC CAMERAS.—William Lewis, of Brooklyn, N. Y., and William H. Lewis, New York city, have petitioned for an extension of the above patent. Day of hearing Sept. 21, 1870.

VISE.—Caleb C. Walworth, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing Sept. 21, 1870.

MACHINE FOR MAKING NUTS.—William E. Ward, Portchester, N. Y., has applied for an extension of the above patent. Day of hearing Sept. 21, 1870.

METHOD OF BENDING WOOD.—Edwin Kilburn, St. Louis, Mo., Artemas Kilburn, and Cheney Kilburn, Philadelphia, Pa., have petitioned for an extension of the above patent. Day of hearing Sept. 21, 1870.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO., 37 Park Row, New York

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12 Address MUNN & CO., 37 Park Row, New York.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

Catlin's Patent Self-closing Barrel Filler for filling packages with liquids of any kind. See other advertisement, and address, for circular, S. C. Catlin, Cleveland, Ohio.

Rawhide Sash Cord has no equal for heavy windows or dumb-waiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct.

Scroll Saw.—First Prize Fair American Institute, N. Y., and Richmond, Va., State Fair. For price, etc., address T. L. Cornell, Derby, Conn.

Wanted.—Information of S. O. Scott, mechanic, formerly of N. Y. city. Something to his advantage. Address R. H. Wanener, Attorney, 26 N. 7th st., Philadelphia, Pa.

Wanted.—A 2d-hand engine and boiler, about 3-H. P. Address, stating price. W. L. Swift, Hart's Village, N. Y.

Balloon.—Any one able to make a regular balloon will address Box 444, Charleston Postoffice, S. C.

Wanted—A Partner with a Capital of $5,000 in a Water-power Manufacturing Business, established. Address Andrews & Son, Rock Falls, Ill.

Pictures for the World.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," for sale everywhere.

Business Chance.—A good, energetic mechanic, either molder or machinist, with a moderate capital, can get a good chance in an established Foundery and Machine Business. Address lock box No. 14, Hastings, Minnesota.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 64 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

For the best Oil Cups, for shafting and machinery, address H. Moore, 41 Center st., New York.

"Your $50 Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

Wanted.—Situation as Superintendent or foreman in Machine Works. Fifteen years' experience. Address P.O. Box 1016, Worcester, Mass.

Foundery and Machine Shop for sale, with fine lot of patterns. Is doing a good business; excellent location for general jobbing, and for m'f'g agricultural implements. Address S. Moore & Bro., St. Peter, Minn.

Patent Water-proof Building Paper for Carpet for halls and stairways, shoe stiffening, walls, ceilings, and roofs, manufactured by Mc Nell, Irving & Rich. Patentees, Elwood, Atlantic Co., N.J., or 59 Duane st., New York, 520 Commerce st., Philadelphia, Pa.

The best hand shears and punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

$15 for the best Saw Gummer out. Address The Tanite Co., Stroudsburg, Pa.

The entire Right of the best Wrench ever Patented, for sale. For Drawings, address J. F. Ronan, 36 Orchard st., Boston, Mass.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery rom two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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

All reference to back numbers should be by volume and page.

M. E., of Pa.—Railway cars, built wholly of iron, were first made by Mr. Brunel, in 1842, and were used on the Great Western Railway, England.

C. H. C., of Pa.—Consult some practical locomotive engineer in respect to your boiler and engine.

D. B. C., of Vt.—It is certain that piston pressure engines, driven by water, were used as early as 1739. See cut of Belidor's pressure engine, page 355, Ewbank's "Hydraulics and Mechanics."

R. C. P., of N. Y.—To kill *aphidæ*, or plant lice, which this season appear to greatly infest almost all plants of a succulent character, the surest way is to place over the plant a barrel or a dry-goods box previously made tight by caulking the cracks, and place under the box a small wire basket, or something similar, in which tobacco will burn freely. Ignite the tobacco, and as soon as it gets well to burning, shut down the box, pressing the edges into the earth; the air in the box will sustain the combustion for a little time, and become replaced with tobacco smoke. After four or five hours the box may be lifted, when the offending insects will all be found dead. By tapping the plant, so as to jar it slightly, the result will be apparent on the ground below. We have tried many plans, but find none so effective as this. Some plants, however, are so large that they cannot be treated in this way, unless they chance to be in the greenhouse. In this case the whole house may be filled with smoke, and no boxes are required. Honeysuckles are very apt to be infested by these insects, which accumulate upon the bunches of buds With these and other plants of a similar kind, we have tried with success the plan of dipping the bunches in a very strong decoction of tobacco This, while it does not directly kill the plant lice, unless the application is protracted beyond practicable limits, weakens them so that if done previous to a smart shower, or if followed by a copious and violent syringing, they will drop off, and may be beaten into the earth, where they perish.

G. P. R., of Ky.—We believe there is no fixed unit of the conductivity of metals. Despretz called the conducting power of gold 1000, and found by his experiments that the comparative conductivities of the other principal metals were as follows: Platinum, 981; silver, 973; copper, 897: iron, 374: zinc, 363; tin, 304; lead, 179. Other experimenters have attained different results. Wiedemann and Franz took silver as a standard of comparison, calling its conductivity 100. They found the comparative conductivity of copper to be 73·6; gold, 55·2; tin, 14·5; iron, 11·9; steel, 11·6; lead, 8·5: platinum, 8·4. Others have obtained still different results, which shows that the exact ratios of the conductivities of metals have not been satisfactorily determined.

M. M., of Conn.—Richard Trevithick was the inventor of the locomotive. The British Patent Office has the drawings of the first locomotive in its possession. Trevithick was the first to couple the driving wheels; he also applied the steam jet to the chimney, and ascertained that smooth wheels would adhere sufficiently on rails to give the required traction, without the use of teeth. The idea of planting evergreen trees, such as pine, cedar, hemlock, along the cuttings of railways is good and effective to prevent snow drifts on the track, but not new. We believe it is practiced in this country. In France the plan has long been successfully employed.

E. E., of Ky.—Hollow iron piles have been sunk by introducing through them a current of water, which lifts the sand under the point of the pile, and the latter then settles. This method of sinking piles has been very successfully practiced in England. The iron columns are generally 9 inches in diameter; and they are sunk at the rate of between one and two feet per minute. In one case the iron pile was sunk 26 feet in 20 minutes. A force pump is employed to drive the water down through the column against the sand, which is lifted and carried along the sides of the column.

E. C. O., of Ohio.—To construct a mercury pressure gage, to indicate a very high pressure, make a tube bent backward and forward like a nest of steam pipes used for heating; the bent pipe to be placed so that the bends shall be alternately at the top and bottom. Make holes in the top bends, through which mercury may be put, and fill each bend half full with mercury. Fill the remainder with some light fluid, as alcohol, glycerin, oil, etc., and then seal the apertures. The pressure you can measure with such a gage will depend upon the length and number of the bends.

J. D., of N. Y.—We should not think of making a round chimney with an internal diameter of less than four feet, for the furnaces of boilers designed to furnish two hundred horse-power, if the hight of the chimney were limited to eighty feet, as you state. This diameter would give more draft than needful in many cases when the length of flue circuit is comparatively small, but it is best in building a chimney to provide for ample draft, even if when completed it is found there is a margin of surplus.

L. D. T., of N. J.—You labor under a mistake arising from your failure to understand that all measurement of the angles of heavenly bodies made from the earth's surface, only show *apparent* position. The true position can only be determined by making corrections for refraction, parallax, and aberration. Of course we cannot enter upon the discussion of these things here, but it seems strange that you should attempt to reason upon a subject without first endeavoring to master its first principles.

H. F. C., of Pa.—You may soften the water drawn from your well by the addition of a little milk of lime, or a little caustic soda. The amount necessary must be determined by experiment. See articles on pages 98 and 217, Vol. XXI., SCIENTIFIC AMERICAN.

D. C., of Ill.—We are informed that the cement used in the manufacture of scythe rifles to hold the emery, is simply common glue, or glue with a small quantity of gum tragacanth added. The latter is thought not to be essential.

J. G. F., of Wyoming Territory.—Your solution of the mechanical problem on page 192, last volume of the SCIENTIFIC AMERICAN, employs a toothed wheel, which is expressly forbidden in the enunciation.

Recent American and Foreign Patents.

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

CULTIVATOR.—J. W. Philp, Humboldt, Tenn.—This invention has for its object to furnish an improved cultivator, which shall be simple in construction, strong, durable, not liable to break or get out of order, and which may be easily adjusted for use in cultivating wide or narrow rows.

HORSE DETACHING APPARATUS.—John C. Hancock, Charlestown, and Edward P. Richardson, Somerville, Mass.—This invention has for its object to furnish an improved apparatus for detaching the horse or horses from the vehicle instantly, when from fright or other cause he or they may have become unmanageable, and which shall at the same time be simple in construction and easily operated.

COMBINED HINGE AND RING FOR LOCKETS.—George Hartje, New York city.—This invention has for its object to furnish an improved combined hinge and ring for lockets, which shall be simple in construction, neat in appearance, strong, and durable, and which will allow raised work to be attached to the locket without interfering with the proper operation of the hinge.

PEN HOLDING ATTACHMENT FOR INKSTAND.—Matthew O'Reardon, New York city.—This invention has for its object to furnish an improved pen and pencil holding attachment for inkstands, which shall be simple in construction, convenient in use, and easily attached to the inkstand.

BRIDGE.—Thomas B. Gregory, Champaign, Ill.—The object of this invention is to so construct a bridge that the same may be adjusted vertically to correspond with all similar adjustments of the roads to which such bridge may pertain. The invention consists in the construction of extension posts, of which the upper parts are secured to the cap, and the lower to the supporting frame or sill of the bridge.

AWL.—Samuel Babbitt, Brazil, Ind.—This invention relates to a new awl, which is so constructed that it may be used to draw a double or single thread outwards from the inside of a boot or shoe, and also to carry it inward from the outside, as may be desired.

SHOW CARD SUSPENDER AND CLASP.—William Stokes, New York city.—The object of this invention is to form a card suspender by stamping it out of sheet metal, so that when bent in its proper shape for use, a spring loop will be formed, which will serve to keep the card suspender locked, and also form a loop whereby the same may be suspended.

FEVER MEDICINE.—Samuel Laighton, Newark, N. J.—This invention relates to a new compound for curing fever and ague in all its various forms, especially that produced by miasmatic exhalations.

GRAIN CLEANER AND SEPARATOR.—Wm. Gardner, Catalpa, Ky.—This invention relates to a new grain separator, which is to be attached to thrashing machines, or used in barns for separating wheat and other grains from the chaff. The invention consists chiefly in the combination of a peculiar screen belt with a series of perforated plates.

WATER REGULATOR AND ALARM FOR STEAM BOILERS.—William Wyatt, Nashville, Tenn.—The object of this invention is to construct an attachment to steam boilers whereby the operation of the feed pumps will be so regulated as to keep the water in the boiler at the required hight; also, to connect with a regulator of this nature an alarm which will only be worked when the water is below the safety level.

WEATHER STRIPS.—W. Miller, Chicopee, Mass.—This invention relates to improvements in weather strips, such as patented to him the 4thday of May, 1869, No. 89,785, and consists in an improved construction and manner of attaching the spring, by which the lower vibrating strip is confined to the upper strip or bracket, which is attached to the door.

SCRUBBING BRUSH.—Jacob Odell, Petroleum Center, Pa.—This invention relates to improvements in scrubbing brushes, and consists in the application to the block, to which the bristles are attached, near each end, leaving an open space between, of a stiff india-rubber scraper to scrape the hard substances adhering to the floor, which the bristles will not remove.

SPAWNING SCREEN.—A. S. Collins, Caledonia, N.Y.—This invention relates to a new and useful improvement in screens or beds for receiving and securing the spawn of fish, in the art of pisciculture, whereby the process is greatly simplified and the labor diminished; and it consists in the use of a revolving screen, arranged and operating as described.

CLASP FOR PAINT BRUSHES, ETC.—George W. Hupp, Elwood, Ind.—The object of this invention is to provide paint and other brushes with an adustable and detachable clasp for holding the bristles together. This improved clasp is made of metal, and secured to the handle of the brush in such manner that it can be adjusted up and down on the handle, to make up for the gradual shortening of bristles.

FOLDING BUGGY SEAT.—Thomas H. Wood, New York city.—This invention relates to a new fly seat, applied behind an ordinary buggy seat, or to any suitable kind of wheeled vehicle, with an object of being brought out of the way and entirely out of sight when not used. The invention consists chiefly in hinging or affixing the seat to the hinged back plate of the vehicle so that it will be carried back with the same, when to be used, and concealed in the body of the vehicle when not used.

SOLDER KIT.—Michael D. Kelly, Cadiz, Ky.—This invention relates to a new and improved solder-holding apparatus, and consists in a glass bottle for holding the acids and other substances used by watchmakers for fluxes, and one or more boxes, for holding the solder, so combined in one apparatus that the broad box for the solder serves for a stand and support for the bottle, to prevent it from being upset, as is now frequently the case.

DRIVING WHEELS FOR CARPET SWEEPERS.—Alfred J. Knight, Brooklyn, N. Y.—This invention relates to improvements in the driving wheels for imparting rotary motion to the brushes of carpet sweepers, and consists in the construction of side wheels, with india-rubber rolling surfaces, for rolling on the floor, and metallic gears for working the wheels or the brush, the object being to provide wheels which are noiseless, and have sufficient traction, and which will be durable in the working parts.

MILLSTONE DRESS.—Wm. G. Dunniway and Harrison Osborne, New Cumberland, Ind.—This invention relates to improvements in "dress for burr millstones, and consists in making the leading furrow from the eye to the intersection of the short furrow, about double the width that it, or the short furrow is from the intersection outward, where they are of about the ordinary width, whereby the furrow capacity is made uniform from the eye to the skirt, very greatly increasing the ventilation, and increasing the grinding capacity.

KINDLING FAGOT.—Clement R. Jacobi, Brooklyn, E. D., N. Y.—This invention relates to new and useful improvements in fagots for kindling fires, and consists of a small, cheap, and efficient fagot, made of the waste shavings of cork, refuse discarded by the cork manufacturers, and, until now, wholly worthless for all known useful purposes. The said bundle or fagot being formed by rolling the shavings into compact shape, fastening in any way, and dipping in a bath of varnish, or any liquid substance which will adhere and facilitate the ignition.

MULEY SAW HEAD.—Daniel Cilley, Osceola Mills, Pa.—This invention consists in the manner of holding the head pin box, and in the manner of securing, adjusting, and varying the saw.

COMBINED SEED PLANTER, CULTIVATOR, AND HARROW.—Jones K. McClure, Cornersville, Miss.—This invention has for its object to furnish an improved machine, which shall be so constructed and arranged that it may be easily adjustable for use as a cotton seed planter, corn planter, cotton scraper, cotton chopper, harrow, and cultivator, doing its work well and thoroughly in either capacity.

INJECTOR FOR STEAM BOILER.—Jean Pierre Florimond Datichy, Brooklyn, N. Y.—This invention has for its object to provide a self-acting feed apparatus, operating automatically, with more or less rapidity, and supplying water that is heated to a very fine degree of temperature. The invention consists principally in causing steam from the boiler to regulate the feed, in strict accordance with the pressure of the steam in the boiler.

HOD ELEVATOR.—Jesse Powers, Chicago, Ill.—This invention relates to a new apparatus for elevating and lowering hods, during the construction of new buildings.

FRUIT STRAINING APPARATUS.—M. E. Grigsby, Putnamville, Ind.—This invention relates to a new and useful improvement in an apparatus for straining fruit in the process of manufacturing jelly, wines, cordials, etc.

WATER WHEEL.—Joseph Bastion, Canton, N. Y.—This invention relates to a new and useful improvement in water wheels, whereby they are made more powerful and useful than they have hitherto been, and consists in the manner of arranging the buckets in the wheel, and in a self-adjusting shute cone, and arrangement of the shutes.

MACHINE FOR DRESSING STONE.—A. G. Anderson, Quincy, Ill.—This invention has for its object to furnish an improved machine for dressing marble and other stone, which shall be simple in construction and effective in operation, doing its work uniformly and well.

SAFETY CAPS FOR CANS.—Horace C. Alexander, New York city.—This invention has for its object to improve the construction of safety caps for cans, so as to make them neater in appearance and simpler in construction while being equally effective in use.

STEAM GENERATOR.—Robert Patterson, Catskill, N. Y.—This invention relates to a new and improved method of generating steam, and consists in an apparatus whereby heat is transmitted to the water by means of steam, and not by bringing the water in contact with fire surface metallic plates, and in the use of an absorbant generating and condensing medium.

LINK FOR ENDLESS CHAIN HORSE POWER.—G. L. Sheldon, Hartsville, Mass.—This invention relates to a new and useful improvement in links used in forming the revolving chain apron of the well-known endless chain or railroad horse power.

FIRE ESCAPE.—L. Wahle, Davenport, Iowa.—This invention relates to a new fire escape, of that class in which lazy tongs for elevating and lowering a flexible ladder, are employed. The invention consists in the novel construction of screw power for operating the said pivoted frame; also in the application of a device for adjusting the jointed frame and ladder in any desired inclination, and finally in the apparatus for stretching the hair ladder.

AUTOMATIC FEEDER AND INDICATOR FOR STEAM BOILERS.—Alfred D. Clark, Greenfield, Ohio.—This invention has for its object to automatically alternately introduce and cut off a supply of water to a steam boiler according to the needs of the case, and also to indicate by a whistle or bell every such introduction and shutting off.

COFFIN.—Isaac C. Shuler, Amsterdam, N. Y.—This invention consists in providing wooden coffins with metal beading, for the purpose of causing them to simulate the more expensive class of coffins having inserted or raised panels.

PUMP.—H. M. Wyeth, Newark, Ohio.—This invention consists in the combination with an ordinary double-acting atmospheric pump, provided with a cap tightly packed, through which the pump-rods work in stuffing boxes, of a pipe passing vertically through the cap and thus communicating with the interior of the pump, by which arrangement, when the spout through which the water raised by the atmospheric pump flows is closed, the apparatus is converted into a force pump, so that it can be made a double-acting atmospheric pump and a double-acting force pump combined in a single cylinder and working with a single lever.

APPLICATION FOR BOTTLING LIQUIDS.—Charles A. Gregory, Poughkeepsie, N. Y.—This invention has for its object the construction of a machine or apparatus for filling bottles, and by the use of which the labor of the ordinary way may be very much reduced, and loss by spilling or overflowing of the bottles be obviated.

BOILER TUBE CLEANER.—John Green, Boston, Mass.—This invention relates to a new implement for cleaning boiler tubes, and consists in the combination of two or more curved and elastic grapple scrapers with a spiral augur.

TANNING.—John Campion, Woburn Centre, Mass.—This invention relates to improvements in tanning skins of animals, and consists in forcing the tanning liquor through the skins in liming, dressing, and tanning them, by hydrostatic pressure applied to one side of the skin, so as to force the liquor through from one side to the other.

STEREOSCOPES.—Edwin K. Page, Havana, N.Y.—This invention relates to improvements in stereoscopes, and consists in the application to the lens frame of a lazy tongs extension frame for holding pictures, the said frame being connected to the lens frame in a peculiar way, and formed at the outer end with a picture holder, and also arranged to fold up against the side of the lens. The invention also comprises an arrangement of the eye shades for folding down upon the lens on the one side and the central dividing screen to fold down on the other side, and the whole forming a protecting case for the lens.

WATER CLOSET APPARATUS.—John Keane, New York city.—This invention relates to improvements in apparatus for governing the flow of water to and from the basins of water closets.

ROD COUPLING.—J. Hanna, Petroleum Centre, Pa.—This invention relates to improvements in rod couplings, and consists in an improved means for connecting the socketed metallic joints for wood rods to the same.

SHOE STRING FASTENING.—Chas. M. O'Hara, Bolivar, Tenn.—This invention relates to improvements in shoe string fastenings, to be used in substitution of tying the knots in the strings after the shoes are laced up. It consists of two plates of metal connected to one stud, one being shaped in a peculiar way, and adapted to receive the strings and spring down upon them when wound around the stud between it and the other, so as to hold them securely. The same plate is provided with a tongue or spur for passing through an eyelet or other hole in one of the flaps of the shoe for attaching thereto.

WELL AUGER.—John Wilson and G. H. Balsley, Hamilton, Mo.—This invention relates to improvements in augers for boring wells in the earth, and consists in an improved arrangement of the bits for the better working in coarse gravel, and adapted equally as well as others for work in other substances. It also consists in the application to the auger rod, a short distance above the auger, of a bucket, and above this a radial cutter or reamer, for enlarging the bore and delivering the cuttings into the bucket to be raised out thereby.

ANODYNE COUGH SIRUP.—Lucy J. Buttrill, Jackson, Ga.—This invention has for its object to furnish a simple, reliable, and efficacious medicine for the cure of coughs, cold, bronchitis, affections of the throat, croup, asthma, consumption, chronic affections of the lungs, and all pulmonary diseases.

Official List of Patents.

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FOR THE WEEK ENDING July 12, 1870.

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105,157.—SAFETY CAP FOR CANS.—H. C. Alexander, New York city.

105,158.—FAN CASE FOR GRAIN AND SEED SEPARATORS.—C. L. Allen (assignor to himself and Wm. Shick), Flat Rock, Mich.

105,159.—MACHINE FOR DRESSING STONE.—A. G. Anderson, Quincy, Ill., assignor to himself and A. W. Anderson.

105,160.—MANUFACTURE OF TOBACCO PAPER.—R. Antiguedad, New York city.

105,161.—AWL.—Samuel Babbitt (assignor to himself and J. L. Hussey), Brazil, Ind.

105,162.—DOUBLE-ACTING FORCE PUMP.—Allen Bagley, Ypsilanti, Mich.

105,163.—WATER WHEEL.—Joseph Bastion, Canton, N. Y.

105,164.—BIRD CAGE.—Thomas H. Bradley, St. Louis, Mo.

105,165.—HORSE HAY RAKE.—Alzirus Brown, Worcester, Mass.

105,166.—LATHE FOR TURNING WOOD.—J. C. Brown, Washington, D. C.

105,167.—DAMPER.—Micajah C. Burleigh, Somersworth, N. H.

105,168.—MEDICAL COMPOUND.—Lucy J. Buttrill, Jackson, Ga.

105,169.—APPARATUS FOR TANNING.—John Campion, Woburn Center, Mass.

105,170.—SUSPENSION GATE.—Edward Chadderdon, Howard, Mich., assignor for one half to Albert Stineback.

105,171.—LANTERN.—David Challinor, Birmingham, Pa.

105,172.—COTTON-BALE TIE.—Wm. Chambers, New Orleans, La.

105,173.—PRUNING SHEARS.—Athanasius B. Chapman, Clyde, Ohio.

105,174.—MULEY-SAW HANGINGS.—Daniel Cilley, Osceola Mills, Pa.

105,175.—COFFEE POLISHER.—Edward J. Codd, Baltimore, Md.

105,176.—SPAWNING SCREEN.—Alfred S. Collins, Caledonia, N. Y.

105,177.—SAFETY HOISTING APPARATUS.—C. W. Copeland, New York city.

105,178.—THILL COUPLING.—P. S. Crawford, Union, assignor to J. N. Widden, Rockford, Ill. Antedated June 30, 1870.

105,179.—CYLINDER STOVE.—John Currier and Abiel Pevey, Lowell, Mass.

105,180.—PROCESS AND APPARATUS FOR HARDENING FILES, etc.—Samuel Darling (assignor to Darling, Brown & Sharpe), Providence R. I.

105,181.—INJECTOR FOR STEAM BOILERS.—J. P. F. Datichy, Brooklyn, N. Y.

105,182.—APPARATUS FOR SPONGING CLOTH.—I. A. Davis, Philadelphia, Pa.

105,183.—ICE-CUTTING MACHINE.—Abraham Deutschel, Cleveland, Ohio.

105,184.—MOWER AND REAPER SICKLE SHARPENER.—Elihu Doud, Oshkosh, Wis.

105,185.—SNOW PLOW.—J. N. Drake, Liberty, Mich.

105,186.—MILLSTONE DRESS.—W. G. Dunniway and Harrison Osburn, New Cumberland, Ind.

105,187.—KNITTING MACHINE.—W. Franz, Bucyrus, and Wm Pope, Crestline, Ohio.

105,188.—BORING MACHINE.—J. W. Frazee, Peoria, Ill.

105,189.—MACHINE FOR MAKING HORSESHOE NAILS.—P. N. Gallaer and I. C. Tate, New London, Conn.

105,190.—GAS MACHINE.—Joseph P. Gallagher, St. Louis, Mo.

105,191.—PESSARY.—W. R. Gardner, Leonardsville, N. Y.

105,192.—SADIRON HANDLE.—Joel Gleason, Whitestone, N. Y.

105,193.—WASHING MACHINE.—Isaiah W. Graffam, New Bedford, Mass.

105,194.—BOILER-TUBE CLEANER.—John Green, Boston, Mass.

105,195.—BRIDGE.—T. B. Gregory, Champaign, Ill.

105,196.—FRUIT-STRAINING APPARATUS.—Mary E. Grigsby, Putnamville, Ind.

105,197.—COMBINED LATCH AND LOCK.—Theodor Hahn, New York city. Antedated June 30, 1870.

105,198.—HORSE-DETACHING APPARATUS.—J. C. Hancock, Charlestown, and E. P. Richardson, Somerville, Mass.

105,199.—ROD COUPLING.—Francis J. Hanna, Petroleum Center, Pa.

105,200.—SEEDING MACHINE.—John D. Harrison, Middletown, Ohio.

105,201.—COMBINED HINGE AND RING FOR LOCKETS.—Geo. Hartje, New York city.

105,202.—CLIP FOR HARNESS.—J. S. Hays (assignor to himself and Philip Miller), Williamsport, Pa.

105,203.—FIRE EXTINGUISHER.—Ludwig Herman, Detroit, Mich.

105,204.—OSCILLATING ENGINE.—Thos. Hill, Vallejo, Cal.

105,205.—GUARD FOR AX HANDLES.—Lara B. Hoit, Cedar Falls, Iowa.

105,206.—SASH HOLDER.—Josiah Hoisinger (assignor to Benjamin Honsinger), Harrisburg, Pa.

105,207.—FEED-WATER HEATER FOR LOCOMOTIVES.—J. S. Hooton, New Carlisle, Ind.

105,208.—CRAB FOR HAND-HOLE PLATES.—J. S. Hooton, New Carlisle, Ind.

105,209.—FEED-WATER FILTER.—J. S. Hooton, New Carlisle, Ind.

105,210.—CLAPBOARD GAGE.—E. Horton, Dundee, N. Y.

105,211.—COTTON HARVESTER.—D. C. Hubbard, Point Coupee Parish, La.

105,212.—CLASP FOR PAINT BRUSH.—Geo. W. Hupp, Elwood, Ind.

105,213.—KINDLING FAGOT.—Clement R. Jacobi, Green Point, N. Y.

105,214.—STATION INDICATOR.—Egbert Jamieson, Chicago Ill.

105,215.—VENTILATOR.—H. S. Janes, Oshkosh, Wis.

105,216.—TEMPLETS FOR PANELING MACHINE.—N. Jenkins, New York city. Antedated June 29, 1870.

105,217.—WATERCLOSET VALVULAR APPARATUS.—J. Keane, New York, assignor to himself and George H. Brown, Milbrook, N. Y.

105,218.—KALEIDOSCOPE.—Matthias Keller, Boston, Mass., assignor to himself, S. B. Holden, and L. L. Holden.

105,219.—SOLDERING KIT.—M. D. Kelley, Cadiz, Ky.

105,220.—AUTOMATIC SLUICE GATE.—Jacob Keplinger, Farmersville, Ohio.

105,221.—FARM FENCE.—Peter Kidney, Olmsted Falls, Ohio.

105,222.—FOLDING SEAT.—G. W. King, Oswego, N. Y., assignor for one third of his right to A. P. Grant.

105,223.—DRIVING-GEAR WHEEL FOR CARPET SWEEPERS.—A. J. Knight, Brooklyn, N. Y.

105,224.—FEVER-AND-AGUE MEDICINE.—Samuel Laighton, Newark, N. J.

105,225.—CULTIVATOR.—Jonathan Lewis, Washington, D. C.

105,226.—LEMON FRUIT SIRUP.—Schuyler W. Mahan, Adrian, Mich.

105,227.—RASPBERRY AND STRAWBERRY FRUIT SIRUP.—S. W. Mahan, Adrian, Mich.

105,228.—CARRIAGE AND CAR WHEEL AND AXLE BOX.—J. A. Maynard, Newtonville, Mass.

105,229.—COMBINED SEEDER, PLANTER, CULTIVATOR, AND HARROW.—J. K. McClure, Cornersville, Miss.

105,230.—FLOOD FENCE.—D. J. Miller, Indianapolis, assignor of one half interest to Fielding Beeler, Marion county, Ind.

105,231.—COMBINED FENDER AND FIRE SCREEN.—J. Miller and W. H. B. Flender, Washington, Pa.

105,232.—WEATHER STRIP.—Wm. Miller, Chicopee, Mass.

105,233.—FRAME FOR SENSITIZING PHOTOGRAPHIC PAPER.—L. V. Moulton, Muskegon, Mich.

105,234.—FIREPLACE GRATE.—Emma Norman, New Orleans, La.

105,235.—SUCKER-ROD COUPLING.—Jacob Odell, Petroleum Centre, Pa.

105,236.—SHOESTRING FASTENING.—C. M. O'Hara, Bolivar, Tenn.

105,237.—PEN RACK.—Mathew Reardon, New York city.

105,238.—APPARATUS FOR STAKING HORSE-POWERS.—B. F. Osgood, Coloma, Mich.

105,239.—FARM FENCE.—T. W. Owens, Granville, Ohio.

105,240.—MACHINE FOR TIGHTENING ROPES, ETC.—Arthur Paget, Loughborough, England. Patented in England, April 21, 1868.

105,241.—BRICK KILN.—C. A. Parker, New Orleans, La.

105,242.—HARNESS MAKERS' EDGING TOOL.—F. M. Patterson and H. P. Miller, Seymour, Ind.

105,243.—STEAM GENERATOR.—Robert Patterson, Catskill, N. Y.

105,244.—MACHINE FOR SHARPENING THE TEETH OF SAWS.—H. J. Perkins (assignor to G. S. Snyder), Williamsport, Pa. Antedated July 1, 1870.

105,245.—SAD IRON HEATER.—Ezekiel Phillips, Blackstone, Mass.

105,246.—HOD ELEVATOR.—Jesse Powers, Chicago, Ill.

105,247.—MANUFACTURE OF LEATHER.—Wm. Pyle, Wilmington, Del.

105,248.—SCAFFOLDING.—Alfred Ray and Benj. F. Monson, Shelbina, Mo.

105,249.—RAKING ATTACHMENT FOR FURNACE.—John Rice, Oswego, N. Y.

105,250.—SPOOL MACHINE.—J. F. C. Rider, South New Market N. H., and E. P. Brownell, Providence, R. I.

105,251.—DUMB HORSE VELOCIPEDE.—S. D. Roberts and M Dingee, Brooklyn, N. Y.

105,252.—BATTERY INSULATOR.—O. W. Robertson, Milwaukee, Wis.

105,253.—FOLDING CHAIR.—Augusta M. Rodgers, Brooklyn, N. Y.

105,254.—REFINING SUGAR.—John Rogers and and L. Reid, Brooklyn, N. Y.

105,255.—PRUNING SHEARS.—John G. Rogers, Dowagiac, Mich.

105,256.—LAMP CHIMNEY CLEANER.—James Ryan, Brooklyn, N. Y.

105,257.—CANDLESTICK.—Henry Rider, New Bedford, Mass.

105,358.—FAUCET.—Julius Schaefer and Gustav Schock, New York city.

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REISSUES.

4,065.—SPECTACLES.—Louis Black, Detroit, Mich.—Patent No. 96,287, dated November 2, 1869.
4,066.—CARPET LINING.—G. W. Chipman, Boston, Mass.—Patent No. 60 475, dated December 18, 1866.
4,067.—PROCESS OF EXTRACTING FATTY SUBSTANCES.—Wm. Coffin, Glendale, N. J., assignee of C. F. A. Simonin and E. W. Coffin.—Patent No. 102,166, dated April 19, 1870.
4,068.—SAW.—James Davis, for himself, and Ford W. Davis, assignee of James Davis, Philadelphia, Pa.—Patent No. 72,983, dated January 7, 1868.
4,069.—MANUFACTURE OF STEEL.—William Fields, Wilmington, Del.—Patent 102,796, dated May 10, 1870.
4,070.—MACHINE FOR COMPRESSING CARRIAGE WHEELS.—Henry Killam, New Haven, Conn.—Patent No. 69,818, dated October 15, 1867.
4,071.—WHIP SOCKET.—John O. Merriam and Edwin Chamberlin, Troy, N. Y., assignees of C. B. Morehouse.—Patent No. 52,459, dated February 6, 1866.
4,072.—MANUFACTURE OF GLUE.—T. P. Milligan and Thomas Higgins, Brooklyn, N. Y., assignees of Emerson Goddard.—Patent No. 44,528, dated October 4, 1864.
4,073.—CAR COUPLING.—Manuel Van Slyke and D. W. Wood, Rome, N. Y.—Patent No. 96,514, dated November 2, 1869.

DESIGNS.

4,214.—DOOR BELL.—William Allport, New Britain, Conn.
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EXTENSIONS.

SHOEMAKERS' EDGE PLANES.—Isaac A. Dunham, North Bridgewater, Mass.—Dated June 24, 1856.
SAFETY HATCHES FOR WAREHOUSES.—Wm. H. Thompson, Boston, Mass., and E. P. Morgan, Biddeford Me.—Dated June 24, 1856; additional improvement, dated April 14, 1857.
CONCENTRATING APPARATUS FOR SULPHURIC ACID.—W. T. Clough, Newark N. J.—Dated July 1, 1856.

Inventions Patented in England by Americans.

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1,578.—LOOMS.—James Lyall, New York city. May 30, 1870.
1,584.—ELECTRO-MAGNETIC MOTOR FOR PANORAMAS, ETC.—Louis Finger, Cambridge, Mass. May 31, 1870.
1,585.—INK OR MUCILAGE STAND.—F. T. Grimes, Liberty, Mo. May 31 1870.
1,601.—SPRINGS FOR SEATS, MATTRESSES, ETC.—J. P. Ryan, Augusta, Me. June 2, 1870.
1,598.—SELF-ADJUSTING COUPLERS FOR RAILWAY CARRIAGES.—W. V. Pulliam, Kansas City, Mo. June 2, 1870.
1,601.—CARDING AND SPINNING MACHINE.—John Goulding, Worcester, Mass. June 2, 1870.
1,353.—BALL FLOATS.—L. L. Lee, Milwaukee, Wis., and L. L. Weeks, New York city. May 12, 1870.
1,594.—PEAT MACHINE.—C. Laxton, Hudson City, N. J. June 1, 1870.
1,599.—COUPLINGS FOR RAILWAY CARRIAGES.—R. Campion and J. W. Thompson, Jr., Camden, N. J., and J. H. Michener and S. L. Ward, Philadelphia, Pa. June 2, 1870.
1,603.—MODE OF PREVENTING THE CORROSION OF IRON EXPOSED TO WATER OR DAMPNESS.—Cornelius Godfrey, New York city. June 2, 1870.
1,611.—MEANS FOR PREVENTING ALTERATION IN BANKERS' CHECKS.—J. B. Newton, Newport, R. I. June 3, 1870.
1,637.—RAILROAD RAILS.—C. T. Forrest, San Francisco, Cal. June 6, 1870.
1,638.—METALLIC PAINT FOR SHIPS' BOTTOMS.—J. G. Tarr and A. H. Wonson, Gloucester, Mass. June 6, 1870.
1,644.—TREATMENT OF SLAG, ETC.—H. Baldwin, Jr., Philadelphia, Pa. June 7, 1870.
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OFFICE BOARD OF CITY HALL Commissioners, Southeast corner of Sacramento and Montgomery sts., San Francisco, June 22, 1870.

The Board of City Hall Commissioners hereby give notice that they will be prepared to receive at their office, on or before the 1st DAY OF NOVEMBER NEXT, designs and plans for the new City Hall of San Francisco.

The Commissioners, in order to obtain the very best design and plan, invite the fullest competition among architects, and to this end have resolved to offer the following premiums:

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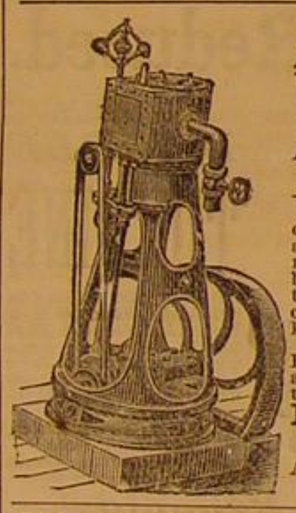
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Pamphlets, containing instructions to Architects, can be had at Wells, Fargo & Co.'s, 84 Broadway, New York.

Any design or plan in which the requirements of the Board, as set forth in the printed instructions, have not been reasonably complied with, will be rejected from the competition.

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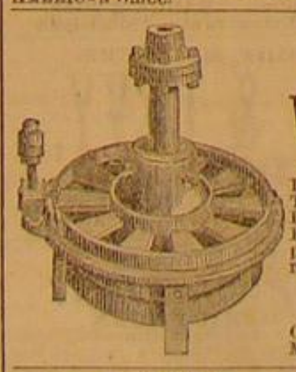
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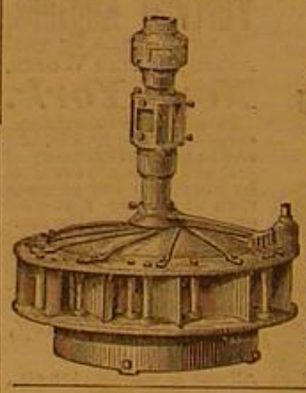
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