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Improved Screw Steering Apparatus.

The engraving which appears on this page is that of Jackson & Brothers' screw steering apparatus, which has just received a thorough practical test upon the yacht *Dauntless*, in the great ocean race. Its construction is extremely simple—a fundamental requirement in anything for this purpose.

The shaft of the wheel has formed upon it two screw threads—right and left hand. Upon these threa s travel nuts, of great strength, so that when the great apparatus in one direction, the nuts approach each other, and contrawise when the motion of the wheel is reversed; the motion of the nuts being communicated to the rudder post through stout arms with lugs, playing upon pivots in the head of the rudder-post.

The holes in the lugs are larger than the pivots, and the latter are provided with composition rollers This apparatus on the *Dauntless* is made of polished composition, and is very ornamental in appearance.

It is now in use on vessels of 1,700 tuns. Each of the thirty Spanish gun boats, built at the Delamater Iron Works, and sent to Cuba last winter, was supplied with this apparatus.

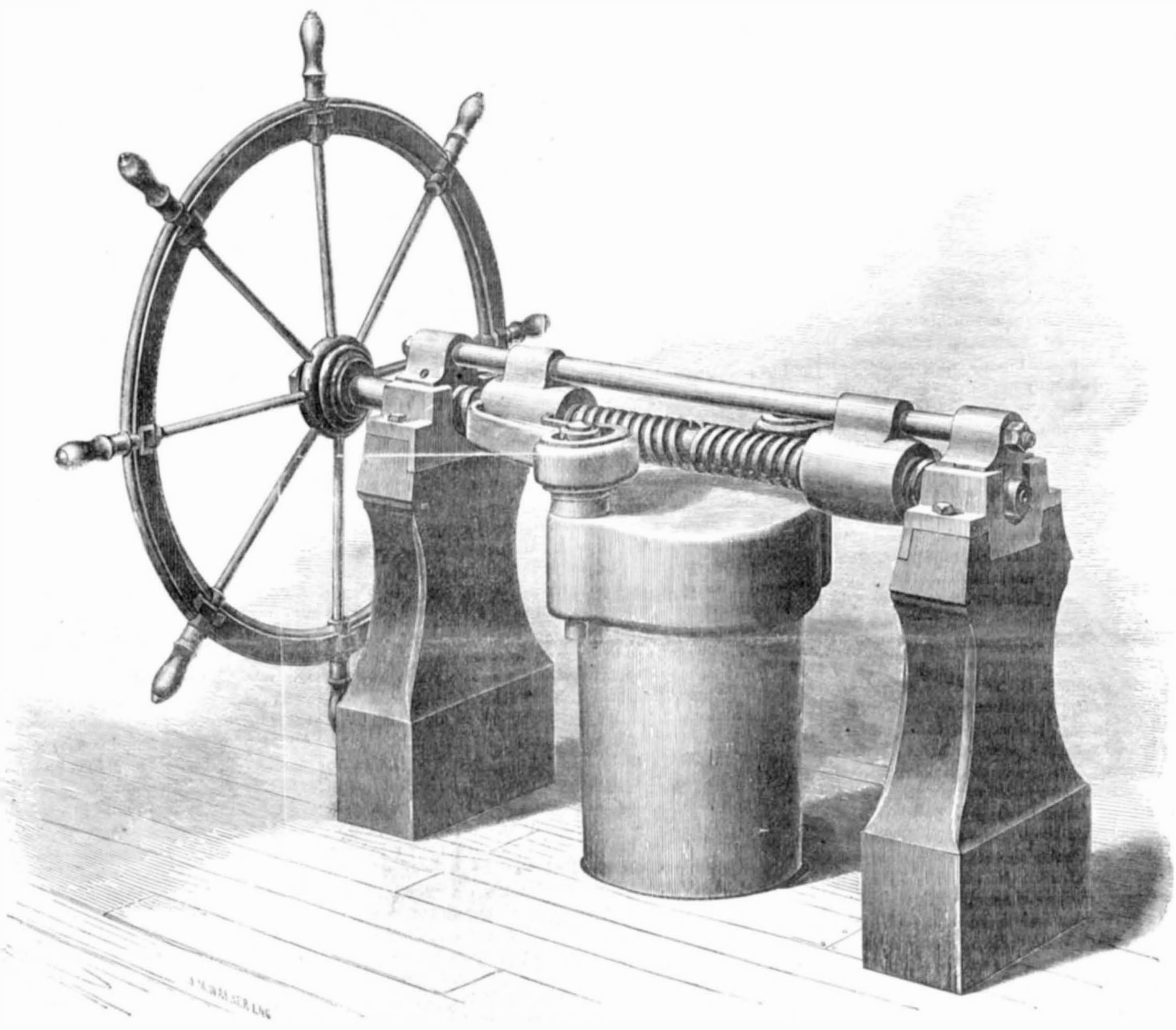
The yachts *Tarolinta* and *Tidal Wave*, well known to all New York yachtsmen, have each one of them, and some twenty or more are on fishing vessels built at Gloucester, Mass. and vicinity.

It is claimed that the apparatus works, with less friction, and is more simple in construction than any in use. The rudder can rise two inches above its natural position without disarranging the apparatus.

The nuts working on the screw are provided with composition boxes. They also work upon a guide-rod, provided with shoulders, which keep the end boxes equally distant and firmly in place.

The device is much neater in appearance than the old style of steering apparatus, and judging from the favor it has received from nautical experts, it is a decided improvement thereon. It appears, also, not likely to give trouble by getting out of repair.

For further information address James L. Jackson & Bros., 315 East Twenty-eighth Street, New York.



JACKSON & BROTHERS' PATENT SCREW STEERING APPARATUS.

The "Siphon-Recorder" for Submarine Cables.

At an entertainment recently given in London by Mr. Pender, the Chairman of the British Indian Submarine Telegraph Company, Sir William Thompson's "siphon-recorder" was exhibited for the first time in England. This remarkable instrument writes down in ordinary ink every fluctuation of the electric current received at the end of a submarine cable, and is likely to displace everywhere the mirror galvanometer, by which, hitherto, all messages through long cables have been received. The older instrument shows every change, by the waving backwards and forwards of a little spot of light, leaving no trace of its wayward motions. It is almost incredible to believe that men should acquire the skill required to disentangle at the moment the complex motions of this little spot, distinguishing the effects of earth currents, old signals, induction, and what not from the true signal; even with the greatest skill many repetitions are required, and some uncertainty often hangs on the interpretation of a word. The new instrument receives and indicates everything indicated by Sir William Thompson's earlier invention, and writes it indelibly; this is accomplished without any sacrifice in the sensitiveness of the instrument. A very fine glass siphon waves to and fro over a running strip of paper without touching it, and from this siphon ink is spirted on to the paper by a series of electric sparks, these sparks being generated by a peculiar induction machine. This fine rain of ink leaves a trace of the position of the siphon at every instant, in a fine continuous line. The siphon follows faithfully the rise and fall of the current, and these alternations are arranged so as to form an alphabet, as in the usual single-needle instruments. The rain of ink opposes not the slightest resistance to the free motion of the siphon. The instrument has been doing commercial work on the French Atlantic cable for a couple of months in the island of St. Pierre, and its use on the Indian lines will be followed by increased speed and accuracy. The wonderful delicacy of the "siphon-recorder" is indicated by the fact that it has recorded messages at St. Pierre sent by a rival company's line, although no metallic connection existed between the two lines, which nowhere approached one another nearer than a quarter of a mile. Tapping a rival line in war is a common incident enough, but to tap it without ever going closer than a quarter of a mile of it, is indeed a novelty.—*London Times.*

Fair of the Tennessee Central Fair Association

The third annual exhibition of the above association will be held at the fair grounds at Murfreesboro', Tenn., commencing on Monday, Sept. 26, 1870, and will continue for six days. The directors offer to receive and place upon exhibition any article of machinery, manufactured goods, or agricultural product, thus relieving the owner from the necessity of a personal visit, and without other expense than the mere freight bill. The very large number of visitors that will attend this fair from all parts of Middle Tennessee will render the occasion a most appropriate one for artisans, mechanics, and manufacturers of all classes of improved labor-saving machinery, and implements for agricultural and mechanical purposes who desire to find a market in this enterprising and wealthy region of the South.

The Use of Mineral Waters.

In our issue of the 13th inst., under the head of "Saratoga Springs," we uttered a warning against the dangerous practice of an indiscriminate use of mineral waters so common at that watering place. In striking confirmation of the views put forth in the article referred to, are the following extracts from an article by Dr. Kessler, of Hartford, in the last number of *The New York Medical Journal.* The writer says, referring to the custom at European springs of taking medical advice before drinking the waters: "A great deal of injury is thereby prevented, and it were certainly in the interest of many patients in this free country if similar restrictions could be established at our own springs. We have, indeed, seen many evils resulting from the careless and indiscriminate use of mineral waters, many aggravations of suffering and many artificially-produced ailments; and where is the physician who has not witnessed the same in the course of his practice? The use of mineral water cannot be advantageous unless prescribed, directed, controlled, and carefully watched by a physician, who is cognizant of its character and effects; he alone can, during the progress of the cure, determine whether it is suitable or not, how long and in what daily quantities it must be taken, whether bathing should be combined with drinking, what should be the proper diet and regimen, and he alone can institute all those modifications necessitated by individual cases, constitutions, and idiosyncrasies.

"As in every treatment, so chiefly in the use of mineral water, and even in sea bathing, a rigorous diet is of supreme importance, and one of the most essential conditions of success. Drinking four or diet glasses of mineral water in the morning and then sitting down to a breakfast of hot cakes and fried ham, or to a more sumptuous dinner table, laden with all the choice luxuries of the season, and all the delicious yet indigestible dishes of salads, and the no less reprehensible ones of pies and pastries, not only annuls the desired effects of the cure, but is productive of harm. But too often the home physician is blamed for having sent the patient to an unsuitable spring; but too often the latter returns, not only unrelieved of his complaints, but even in a worse condition, and yet the cause of all this can frequently be traced to his own imprudence and intemperance."

Claverack College.

The Hudson River Institute and Claverack College has, we are informed, just closed a most prosperous term. President Flack seems to combine rare business and executive faculties with high ability as a teacher. This institution is now empowered to confer degrees the same as other colleges to all young ladies who complete a prescribed course of study. Both male and female students are admitted. We are glad to hear of the prosperity of this long established and popular institution of learning.

THE ARTISAN IN FRANCE, BELGIUM, AND HOLLAND.

In France, the working-life of the artisan begins betimes, the law recognizing the child of eight to be fit for eight hours' labor in the factory or workshop; and when he is four years older, considers him capable of working twelve hours out of the twenty-four. Before a child can thus be turned to profitable account, it must be proved that he has received primary elementary instruction, or that he attends a school in the neighborhood of the shop. Apprentices cannot be taken by any one who is under age, or who has been found guilty of an offense against public morality. The master, or *patron* as he is called now-a-days, is bound to thoroughly instruct the apprentice in his calling, to watch over his conduct like a father, see that he is not employed in any work beyond his strength, or in itself unhealthy; and if he is not fairly proficient in the three *Rs*, or his primary religious education has been neglected, must allow him two hours every day to make good his deficiency. Apprenticeships are commonly of five or six years duration; but when a premium is paid, a couple of years less suffices. As soon as the apprentice becomes a journeyman, he must obtain from the authorities a *livret*, or note-book, inscribed with his name age, trade, and description. In this book he has to enter all his engagements, the date of their commencement and close, advances made by employers, and keep an account of his debts and movements. The livret—soon to be abolished—is a great grievance with the French artisan, although it is after all a sham, the regulations being evaded by common consent of all concerned. Most engagements are made verbally, and in Paris a week's notice terminates them, whether they are made for a week, fortnight, or month. In most factories, the men are fined for leaving the shop during working-hours, for introducing strangers, or for eating, drinking, smoking, singing, or gossiping on the premises; the fines being applied to some purpose for the benefit of the workmen or those belonging to them. A workman can be summarily dismissed for disobedience, incompetence, idling, causing disturbances in the shop, or treating his employer or his employer's family with disrespect. On the other hand, he can throw up his work if put in an unhealthy shop, if deprived of his meal or rest time, if he has work given him not stipulated in his engagement, or if he is struck or otherwise insulted by his patron.

Fine and imprisonment await any one seducing workmen to pass into foreign employment. Any one communicating the secrets of the factory in which he is employed, is liable to a fine of from sixteen to two hundred francs, with imprisonment of from three months to two years; but if the offense is committed for the benefit of foreigners or Frenchmen residing abroad, both fine and imprisonment are heavier—the former ranging from five hundred to twenty thousand francs, and the latter from two to five years. Strikes do not seem to be actually illegal, but the penal code declares that whoever, by the aid of violence, blows, menace, or fraudulent maneuvres, shall bring about, or attempt to bring about, a cessation of work, with the object of forcing a rise or fall in wages, or infringe the free exercise of industry, shall be punishable by from six days to three years' imprisonment, and a fine of from sixteen to three thousand francs; and that workmen, employers, and contractors who, by means of fines, prohibitions, restrictions, or interdictions resulting from a concerted plan, shall infringe the free right of labor, shall be fined to the same extent, and be imprisoned for from six days to three months.

As a rule, twelve hours make a working-day in France, out of which one hour is allowed for breakfast, and another for dinner. In some trades, the men are paid by the hour; but payment by the day is most general, although the piece-work system gains ground every day. In Paris and the towns, six days go to the week; but in the provinces, where wages are lower, they reckon seven, but give the Sunday to the workman. Of course, in all trades, the earnings of an individual depend somewhat upon his industry, skill, and quickness. Taking a fair average, however, we may reckon the weekly earnings of the Parisian artisan at the following rates: Plasterers make $5·50; wheel-wrights from $5 50 to $7·50; coopers, $6·00; masons, $6·50; shoemakers, $6·00 to $7·75; watch-makers, $6·00 to $7·25; tailors, $4·75 to 7·25; painters, farriers, jewelers, and carpenters, $7·25; weavers, $7·25 to $8·25; stone-cutters, $6·70 to $9·50; blacksmiths, $6 50 to $9·50; printers, $7·25 to 9·50; and cabinetmakers, $6·50 to $12·00 a week. Ordinary hatters earn from $4·75 to $5·50; while a good "finisher" may make nearly $15; but he does not do it. He works piece-work, and makes up his week after the following fashion: on Monday he will not work at all; on Tuesday, he earns a franc; on Wednesday, two; on Thursday, four; on Friday, five; while on Saturday, which is pay-day, he will make fifteen francs. Parisian wages certainly fall below the English standard; a London carpenter, for example, receives twelve shillings more for his week's work than his French brother. Women's work, in Paris, as everywhere else, is shockingly remunerated; and while wages have generally risen in the last twenty years, there has been no advance where women are the sole workers. The industrious fingers of the French seamstress, let them work their hardest, will not bring her more than $3·00 a week—an amount representing the average income of the flower-maker, stay-maker, washerwoman, and ironer, although they do manage sometimes to get another half dollar. At dressmaking, sewers get $2·75, cutters, $3·50 a week, the head work-woman receiving perhaps $20 dollars a month; while milliners are boarded and paid from $80 to $240 a year. A female weaver cannot earn more than $2·50 a week, and many of them have to be content with a weekly wage of $1·25.

A workman can board very well in Paris at the rate of three francs a day, or something less than $4·25 a week. Under the imperial régeme, whole quarters of the capital wherein the blouses loved to congregate have been swept away, and they have been driven into the suburbs, which can only be reached at an expenditure either of their time or their money—as it is, they have to pay $20 a year for a single room without a fire-place. It is true, model lodging-houses have been built by the benevolent and the speculative, but those for whose benefit they are intended do not take at all kindly to them. The artisan's pride revolts at anything savoring of pauperism, therefore he shuns the habitations erected by the charitable; and while he acknowledges the superior arrangements of the *cités* built for him, he prefers freedom to comfort. He has enough of discipline, of rules and regulations, at the workshop, and objects to being trammeled by them outside its gates, and declines to take up his abode in a *cité*, on the ground that he chooses to be master in his own home.

There is no want of institutions for benefiting the artisan. There are *crèches*, where children in arms are taken care of, while their mothers are working, at a charge of twopence a day; there are *salles d' asile*, where children of tender age receive instruction in fifteen-minute lessons; there are *écoles primaires*, where older ones are taught reading, writing, arithmetic, grammar, geography, physical science, mathematics, and surveying—the two last named institutions being free everywhere to children whose parents are too poor to pay, and free altogether in the capital. At Chalons, Aix, and Angiers are government schools intended to rear good foremen, where theoretical and practical instruction in various trades are given; and most manufacturing districts have their technical schools, to which the workmen flock with avidity. Then there are savings banks, taking deposits of a franc, and allowing compound interest—every sum of twelve francs having the interest (in 1867, it was three-and-a-quarter per cent) added to it every month. In 1867, there were 1,845,603 accounts held by these banks, giving an average of one depositor for every twenty inhabitants, and an average deposit of £12, 7s. 5½d.; thirty-three per cent of the investors were bonâ-fide workmen, thirteen per cent servants, and four per cent soldiers and sailors. By investing one penny for every working-day in an annuity society, the artisan can insure twenty pounds a year upon reaching the age of sixty; and to have assistance in time of sickness, and burial expenses paid, he has but to join a *société de secours mutuels*, the president of which is named by the Emperor, and the managing committee by the members themselves.

While acknowledging that in the course of a generation wages have increased no more than twenty-three per cent, while lodging has become dearer, and food risen fifty per cent, the French Official Report asserts that the condition of the artisan has much improved. He pays less for clothing and furniture; savings banks have taught him the use of economy; his eyes are open to the folly of early marriage; and intemperance swallows less of his earnings. "Vast promenades, where art has brought together everything that can amuse and enchant, are by degrees drawing the artisan away from the unwholesome tavern-haunts, to bring him and his family to green swards, beneath beautiful trees, beside clear waters, and exciting in him that sentiment for art which beautiful and useful works always create!"

The Belgian may be a better subject, but as a workman he is not to be compared to his lively neighbor. His *fort* lies in producing a cheap article, not a good one, and he gets paid accordingly. In domestic trades, such as carpentering, tailoring, and the like, the careful workman is his own master, renting a small house, with a little shop for his wife, of which he lets off as much as he can spare. Such a man will earn from $1·00 to $1·50 a day; while the young and improvident artisan, who works for others as a journeyman, thinks himself lucky if he gets fifty cents. He, however, never dreams of working upon Mondays or fête days, and relies upon public or private charity to help him to exist; which he contrives to do upon potatoes, vegetable soups, weak coffee, inferior bread, and very little meat. This class are equally badly housed: "they herd together in the most dismal streets of the great cities, or crowd the damp hovels which surround the country towns and the pit mouth; their dwellings are as fine fields for epidemics as it is possible to conceive, as they are seldom able to afford more than one room, to which a lodger is frequently admitted, and the moral taint of overcrowding falls heavily upon them."

Miners, colliers, engineers, and workers in copper, iron, and glass, are better paid, better fed, better clothed, and better lodged. Barring the miners, these are a steadier class of men, living generally in the upper parts of respectable business premises in the suburbs. Most of them can read and calculate tolerably well, but despite these advantages, are hardly as well informed as the same class of English workmen. As to earnings, colliers get from eighty-four cents to $1·00 a day; engine drivers, from $1·25 to $2·00, with extras for fuel saving; mining engineers and and overlookers receive about $400·00 a year; and workers in factories are paid from sixty-two cents to $2·00 a day; females, however, cannot make more than thirty-six cents. The mode of payment is commonly by the quarter-day of two hours; the workman dismissing himself, or being dismissed without notice; contracts between master and man being very rare in Belgium, while apprenticeships are unknown. Like the Frenchman, the Belgian has his Council of Prud'hommes to settle trade disputes cheaply and expeditiously, his friendly societies, and his annuity societies. Trades' unions exist, but have little influence, except in the coal and mining districts.

It is not a far cry from Belgium to Holland, but the difference between the people of the once united lands is something extraordinary. While, as a rule, the Belgian artisan is careless, indifferent, and thriftless, the Hollander is painstaking, industrious, and economical, deeming it almost criminal to spend all he earns. With necessaries as dear, luxuries far dearer, and wages much lower than they are here, a Dutchman manages to have a healthier family and a happier home than the majority of English workingmen can boast. A skilled artisan can hardly earn, even in the larger towns of Holland, more than $4·00 a week, which he may possibly make into $4·50 by odd jobs after working hours, and into $5·50 if his wife takes in washing. In small town he must be content with $2·50. In summer, he will work twelve hours, having half an hour allowed him for his breakfast, the same for his tea, and an hour, or an hour and a half, for his dinner, and a smoke after it. He breakfasts on coffee with with sugar and milk, and a sandwich composed of two slices of white or brown bread and butter, inclosing a thinner slice of highly-flavored black bread; he teas on the same; while his dinner consists of potatoes, followed by a mess of vegetables boiled in fat, fish, and a cup of tea. If he can, he goes home to dinner; if he cannot do that, he cooks his dinner at the workshop, or else repairs to an eating-house, where he can satisfy his hunger upon vegetable diet for the charge of four cents.

Meat does not come within the Dutchman's bill of fare; if he indulges in it at all, it is on Sunday, and at home with his wife and children. The Dutch artisan is well clothed and admirably housed. He must have a house, let it be as small as it may, to himself, and in every town his wants are studied. Here is a description of a modern block of workmen's houses in Holland:

"Passing down a street, one notices here and there a narrow passage about four feet wide, which at first sight might be taken for a backway to one of the adjoining houses. But entering by this narrow passage, one finds one's self between a double row of neat brick houses, inclosing a garden, divided off by low hedges or palings into a number of small plots, three or four paces square, each one belonging to the house opposite to it. There may be a dozen houses on each side, all precisely alike, and forming a single property. A common pump is somewhere to be seen, probably in the center of the inclosure. The garden-plots serve as drying grounds for the clothes of the family, or for the pots and pans, which are being continually cleaned, and in which the Dutch housewife takes so much pride. On entering one of the houses, one stands in the middle of a room about fifteen feet square, provided with a single window in front; a chimney in one of the side walls is fitted with a small stove, the property of the tenant, which sufficiently answers the purposes of heating and cookery. In another wall, are one or two cupboards, the crockery closet and pantry of the establishment; while a larger recess, fitted with a bed, and concealed by a curtain, forms the sleeping place of the parents of the family. The floor is generally boarded; the walls, about eight or nine feet high, are plastered and whitewashed, unless papered by the tenant. The furniture in the room is generally sufficient for its size, and carefully kept. There is no back door or yard. In a corner of the room is a steep narrow staircase, leading to the room above, where sleep the younger members of the family. There is in one corner of the upper room a closet, communicating with the main drain. An air of order and propriety pervades the whole establishment, and gives evidence that neatness and cleanliness, are regarded among the first of household virtues."

In a town like the Hague, such houses cost about fifty cents or sixty-two cents a week; in country towns, less. There are, however, numerous dwellings, particularly in Amsterdam and Rotterdam, built before the modern regulations respecting housebuilding came in force, of a very inferior description; but, on the other hand, the newer artisan streets are of a still higher class than those described above—more open, more comfortable, and with real gardens. Within the last few years, model lodging-houses have been erected by companies content with five per cent dividends; these buildings are not huge barracks, but rows of two-storied houses, with double fronts looking into separate gardens. Each cottage is tenanted by two families, one occupying the ground, the other the upper floor, each having their own garden plot. The rent of the ground floor is fifty-two cents per week; that of the upper floor, possessing an attic in the roof, sixty-six cents.

So far as the law is concerned, the Dutch workman has little to complain of, if he was of a complaining nature. He is left to work when he likes and how he likes. There is no law of apprenticeship, because there are no apprentices. A boy wishing to learn a trade gets the necessary tools together, and goes to work at nominal wages, his pay increasing with his capabilities; and the plan answers well enough. Combinations for the purpose of altering wages are, however, sternly forbidden by the penal code; consequently, the only trade associations known in Holland are benefit clubs for giving help in time of need; and somehow trade disputes, when there are any, get settled without much trouble. Once or twice such a thing as a strike has occurred, but it speedily died, from want of sympathy. In truth, nothing save a breach in the dike will move a Dutchman out of the even tenor of his way. The Dutch laborer reflects on the value of his earnings; the energies which a warmer blood and a more impetuous temperament would expend in political excitement, he consecrates to the improvement of his own individual lot; the question of the hour, the news of the day possess little interest for him; he prefers his Bible to his newspaper, and his family fireside to the public-house, the reading-room, or the political meeting. Jealous to a degree of the liberty he possesses, he does not sigh for more; and prefers enjoying in peace the advantages already secured to him, to agitating for others which his fathers did without. The Dutch artisan is a model of contentment, and probably the happiest of his race.—*Chambers' Journal.*

Architectural Specifications.

If every church or chapel, every warehouse or shop, and every mansion or cottage were alike, the labor of the architect in drawing up a specification would approach somewhat to that of the lawyer, and architects might hope to lay down for themselves some accepted form, or head and tail of a form, that would for all time serve all possible cases.

But no two of his buildings are alike, or sufficiently alike, to warrant him in making the specification of any one of them do service for any other. There is nothing for it but to sit down and compose a special document for each individual case.

Architects vary very much in the respective modes of composing these documents. Very many of them take an absolute pride in the length of their specifications. They stint the number of their drawings, and trust to the prolixity of their specifications to make up for their shortcomings in delineation. It is a signal mistake. The form, the size, the number, the position of any separate portion of an edifice can be far better and more clearly expressed by delineation than by writing; and, where time admits, these matters should be described by drawing. When this can be done, the shorter a specification can be the better it will be. Its province should be to specially define when or in what order, with what materials or ingredients, and in what style, quality, or manner the works are to be executed, leaving the drawings to explain their form, size or dimension, their number and position in the building; and, indeed, if architects would but observe this rule, we see no reason why some enterprising publisher of office forms might not with great advantage to the profession issue a set of printed skeleton sheets, whereon architects might draft out their specifications—such sheets to set forth the preamble, the general conditions and the trades in usual sequence; each trade sheet containing, pretty widely apart, marginal titles of the usual items of a building, for the architect to expunge or to fill up as he found necessary. On such printed sheets we would have printed in full for use all those stock clauses that every architect embodies, as a matter of course, in his specifications—clauses that, like the laws of the Medes and Persians, "alter not," such as the growth and seasoning, and freedom from sap of the timbers, the thickness of mortar joints, the pargetting of flues, the goodness of stone and the placing it on its natural bed, etc., etc. These are matters that cannot be expressed by delineation, and which make up clauses that not only pertain solely to specifications but are of invariable use—stereotypical clauses, in fact, that may very fairly be stereotyped for all time; and the mind of the architect may be set free from the bother of seeing to their due insertion in the right place.

We need hardly say that the most perfect specifications are, or ought to be, those which are written out by the person who computes the quantities, even though he be not the actual architect of the intended building, but an independent building surveyor. In either case, the usual process is to take out the quantities from the drawings, with the aid of a rough general specification, this latter document being subsequently amplified and perfected by collation from the surveyor's dimension-book. In the process is very often involved a thorough overhauling of the drawings themselves, which, however conscientiously prepared, will seldom be found to stand the test of a bill of quantities.

Specifications of alterations and repairs of buildings should always be drawn up on the buildings themselves, the latter being begun from the roof outside, thence continued to its inside, after that downward from topmost room to basement, ending with the stairs and passages, taken in like order. The greatest mistakes may be made by attempting to compose such specifications in the office, away from the structure to be altered or repaired.

For the avoidance of errors and ommisions in these tiresome documents, young architects will do well to determine for themselves a handy rotation of trades and their respective items or operations; and, having done so, to adhere to it, and gradually acquire the habit of compiling future ones from their own documents alone. Their headings may be as copious and as oft-articulated or dissected as they please to make them, for all this tends to perspicuity, and perspicuity will ward off litigation, the very service a client requires in his architect. As to photographs or clauses themselves, the shorter they are, and the more they can be exchanged for drawings, the better; indeed, we cannot better close these observations than by quoting the pithy remark of an eminent contractor, who, being asked to define in what a specification consisted, declared it to be simply, "Drawings, drawings, lots o' drawings."—*Building News.*

The Chassepot and the Prussian Needle-Gun from an English Point of View.

The *London Globe* thus discusses the relative merits of these famous weapons:

The "Zundnadelgewehr," or needle-gun of the Prussian service, to which the victories of the Prussian arms, in 1866, have been attributed, appears to have been orginally patented in England, as a muzzle-loader, in 1831, by a Mr. Moser, of Kennington. The invention came before its time. Its cold reception in England drove the patentee to seek foreign patronage for his novelty, and Prussia was lucky enough to appreciate and to adopt the new weapon. Dreysa, a gunmaker of Sommaler, applied the breech-loading principle to Moser's patent, and thus amended, the arm, ten years later, was, in 1848, introduced into the Prussian service. The principle, briefly stated, is the driving of a pointed piston or "needle," by the action of a spiral spring (such as is used in the manufacture of children's toy guns), into a small case of fulminate, contained in and situated between the powder and the bullet of a single cartridge. In the action of opening the breech, the spiral spring is set by the trigger, and thus the trigger, when pulled, releases into operation this spiral spring, which, in its turn, forces the needle into the cartridge, and fires the piece.

Upon this oldest form of the Prussian needle-gun, improvements have been made, the chief effects of which have been a reduction of the mechanism of the needle of 1848, and a general lightening of the entire piece. None of these alterations, however, have touched those two apparent evils in the whole form of this arm which militated against its adoption by England in 1850. These are, the positions of the fulminate in the interior of the cartridge, and the looseness of mechanism, involving possibility of the escape of gas round the needle and at the base of the plunger.

To these two particular points, France mainly devoted herself in seeking a superior needle rifle to that of Prussia. In the Chassepot, such an improved arm has been found. A triple wad of vulcanized india-rubber, placed round the axis of its plunger, and with a steel plate, a cushion to receive the force of the rebound, is intended to render the breech gas-tight, but has been found in practice only partially adapted to that object. An ingenious arrangement of notches on the outer girder of iron, before described, enables the gun to be placed at half-cock. The needle is lighter and smaller than in the Prussian gun, and, above all, the cartridge contains its fulminate at the base of the powder, instead of at the base of the bullet. A vacuum, left when the gun is charged, between the base of the cartridge and the front of the plunger, is intended to effect the combustion and removal of any portion of the cartridge case that may remain after firing.

As compared with the Prussian gun, this weapon possesses, besides the specific improvements mentioned, other advantages of superior manufacture and finish. Its cartridge, besides admitting the altogether different principle of firing, contains a larger charge of powder than the Prussian cartridge, with a smaller bullet, which leaves a manifest advantage in carrying to the French weapon; while the fact that the Prussian bullet is purposely made so small as not to touch the barrel in its passage, while the French bullet is of the ordinary size to fit the rifle barrel, would point to the conclusion that the Prussian marksman is at a disadvantage over the Frenchman in respect to his aim. The number of times of firing per minute is about the same in both cases. The cost of the French weapon considerably exceeds that of the Prussian, and the Chassepot is, in addition, a more difficult gun to make. To all the comparative information which has been published about the French and Prussian guns must be added the following from the *Journal du Peuple:*

"At 500 meters the Prussian weapon gives only negative results, while at 1,000 the Chassepot, in the hands of good marksmen, hits the target with great force. We call attention to this point, for, in the war of large bodies of sharpshooters (the only system which we ought to adopt), an arm which is not reliable over 500 meters cannot reach the reserves of the first front, which escapes the effect of the enemy's fire The drawbacks of large bullets have been noticed, the principal being this, that with needle-guns, the firing is rapid, and, therefore, a great amount of powder is burnt; consequently, the cartridge box must be well stored. Now, there is in the weight of ammunition allotted to a foot soldier, a total which cannot be exceeded, namely, 10lbs. What will happen? With that weight of cartridges, the Frenchman will have twice as many shots to fire as the Prussian. Nothing is more difficult than to replace, during fire, the ammunition by a fresh distribution. Thus, the retreat of a division may depend on its finding itself in face of an enemy which has still twenty or thirty cartridges a head to fire. It will be seen that the winning of a battle may depend on the projectile adopted."

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of June, 1870:

During the month, 508 visits of inspection have been made, and 993 boilers examined, 896 externally and 267 internally, and 117 have been tested by hydraulic pressure. The number of defects in all discovered, 371; of which 51 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 11; fractures in all, 36—10 dangerous; burned plates, 40—4 dangerous; blistered plates, 62—2 dangerous; cases of sediment and deposit, 61—2 dangerous; cases of incrustation and scale, 94—5 dangerous; cases of external corrosion, 15; cases of internal corrosion, 9; cases of internal grooving, 6; water gages out of order, 12—2 dangerous; blow-out apparatus out of order, 9—4 dangerous; safety valves overloaded and out of order, 44—7 dangerous; pressure gages out of order, 73—2 dangerous; varying from—47 to +25. These extreme variations are unusual, and result from allowing the gage to run for years without examination or test. A variation of 10 or 15 pounds in either direction is not uncommon, but these should be corrected, and appliances that are so important, and upon which so much dependence is placed, should be correct beyond a doubt.

Boilers without gages, 1; cases of deficiency of water, 7—5 dangerous; broken braces and stays, 10—6 dangerous; boilers condemned, 8.

It will be noticed above that there have been 40 cases of burned plates found among the boilers examined this month. In several instances these have arisen from gross carelessness. Sediment had been allowed to accumulate on the fire sheets, and the burning was inevitable. In two instances the boilers leaked badly, and in the morning the foreman, instead of trying his gage cocks, when he entered the boiler room, unbanked and replenished his fires. The water having nearly all leaked out of the boiler during the night, the sheets over the fire were entirely ruined, and expensive repairs were necessary. The first duty of a fireman on entering the boiler-room is to ascertain where the water is in the boilers. If there is sufficient then replenish the fires. Sediment will accumulate more or less in nearly all boilers. The quantity and character of the deposit may be ascertained by blowing down a few inches each day. If the accumulation is slight, this may be all that is necessary for months, but if there are indications of a deposit that cannot thus be removed, the boiler should be blown entirely down, at least once in two weeks, and all sediment removed, either through the man-hole or handholes. Let the work be thoroughly done, and there will be a saving in fuel as well as in prolonging the working age of the boiler.

Rabies in Canine and Other Animals.

The term canine madness, says a writer in the *Chemist and Druggist*, is not expedient, as it leads persons to form a wrong idea of the disease; they are apt to look upon it as something similar to the condition known as madness amongst men. The term hydrophobia is also objectionable, as rabid dogs have no fear of water.

It is not my intention to enlarge on the pathology of rabies, but merely to point out the symptoms, correct one or two popular errors, and indicate the means to be adopted in case of an animal being bitten by a supposed rabid dog.

Symptoms.—The first noticeable change is a restlessness and disregard of familiar things; a capricious appetite, with a partiality for tearing up and swallowing all sorts of things, as sticks and all kinds of filth. The animal takes to howling, and snaps at anything approaching him; there is a peculiar wild look, the eyes steadily following anything moving in front, and also moving as if fixed on imaginary things; the nose and mouth are dry, there is intolerance of light, and difficulty of swallowing, which ends in paralysis and convulsions. Death occurs in about three or four days from the advent of an attack. There is what is called "dumb rabies," a form of the same disease, though characterized by different symptoms. It is more rapidly fatal, and is accompanied by a paralysis of the lower jaw and a considerable discharge of saliva.

The barking, running, and foaming at the mouth often seen in dogs subject to convulsions, must not be mistaken for rabies. There are no specific lesions to be found in the bodies of rabid dogs; the most suggestive sign is the presence of rubbish and filth in the stomach.

Animals bitten by rabid dogs show symptoms of the disease in from about twenty days to three months; this period of incubation has been known to last as long as twelve months.

In case of a person being bitten by a doubtful dog the only sensible plan is to cauterize the part and lock up the dog for a time. The custom of destroying the dog is founded upon the ignorant idea that should the animal become rabid at some future time the person bitten would suffer. The animal should always be kept alive so as to be certain whether or not it was affected. I believe many persons suffer great anxiety from an innocent bite, which would be prevented by the positive proof of the animal showing no bad symptoms.

Now as to the best way of destroying the poison of a bite. It must be remembered that rabies is a disease due to a specific poison, and that the saliva of an affected animal is charged with it. It never, even in dogs, arises spontaneously; it is communicable to all warm-blooded animals, and may thus be carried by wild ones. By a bite the poison-bearing saliva is introduced into the wound caused by the teeth; from this it passes into the blood-vessels and the disease follows. Various substances destroy the virus, as carbolic acid, nitrate of silver, caustic soda and potash, and the actual cautery.

The difficulty is in at once applying the agent before absorption has taken place. Should no medical man or chemist be at hand, a ligature, as a handkerchief or piece of string, should be tied tightly between the wound and the heart so as to stop the circulation; of course this can only be done on a limb. The part may be sucked if the operator's month have no abrasions. No fluid caustic should be used, as it cannot be certainly applied to the bottom of the wound. No superficial caustic should be used, as the tissues should be destroyed to some depth; for this reason I look upon nitrate of silver as practically useless. To the actual cautery there can be no objection save the difficulty of finding a proper shaped instrument to fit the wound often caused by the long, thin canine tooth. Caustic potash and caustic soda are specially indicated, as they destroy and penetrate the tissues to a considerable depth. As was long since suggested, the best way of applying it is to keep on hand one or two small probes tipped with the caustic. They are made by melting the caustic and dipping in the probes till sufficiently covered; then keep them in an air-tight bottle ready for use. Perhaps I ought to except nitric acid from what I said against liquid caustics.

I do not think that excision of the parts is expedient, unless in such a position as a finger or ear, capable of being removed *in toto*. The cutting out of a part leaves a surface most favorable to the absorption of any virus which might be left. Excision would require a skilled operator; any one with a good nerve and steady hand could apply the caustic.

CAN the large amount of force which is lost in the form of heat in all mechanical operations be utilized? The answer is, unfortunately, it cannot. Heat is the cheapest possible form of force; mechanical force is far dearer, and electricity is the dearest of all. It would, therefore, never be worth while to transform waste heat into any other form of force.—DR. MAYER.

[For the Scientific American].

THE ORTHOPTERS.--THE GRASSHOPPERS AND THEIR ALLIES.

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

"Sounds do not always give us pleasure according to their sweetness and melody; nor do harsh sounds always displease. We are more apt to be captivated or disgusted with the associations they promote than with the notes themselves. Thus the shrilling of the field cricket, though sharp and stridulous, yet marvelously delights some hearers, filling their minds with a train of summer ideas of everything that is rural, verdurous, and joyous."

These words wrote the good old naturalist of Selborne, Gilbert White, and had he lived in this country, he would probably have found in the quaint quarreling of the katydids a mournful charm, an unwelcome feeling, amid present pleasures, of another summer almost slipped away, a prophecy of frosts speedily to come, bringing with them the sear and yellow leaves, the harbingers of the death of one more year, the emblems of approaching age.

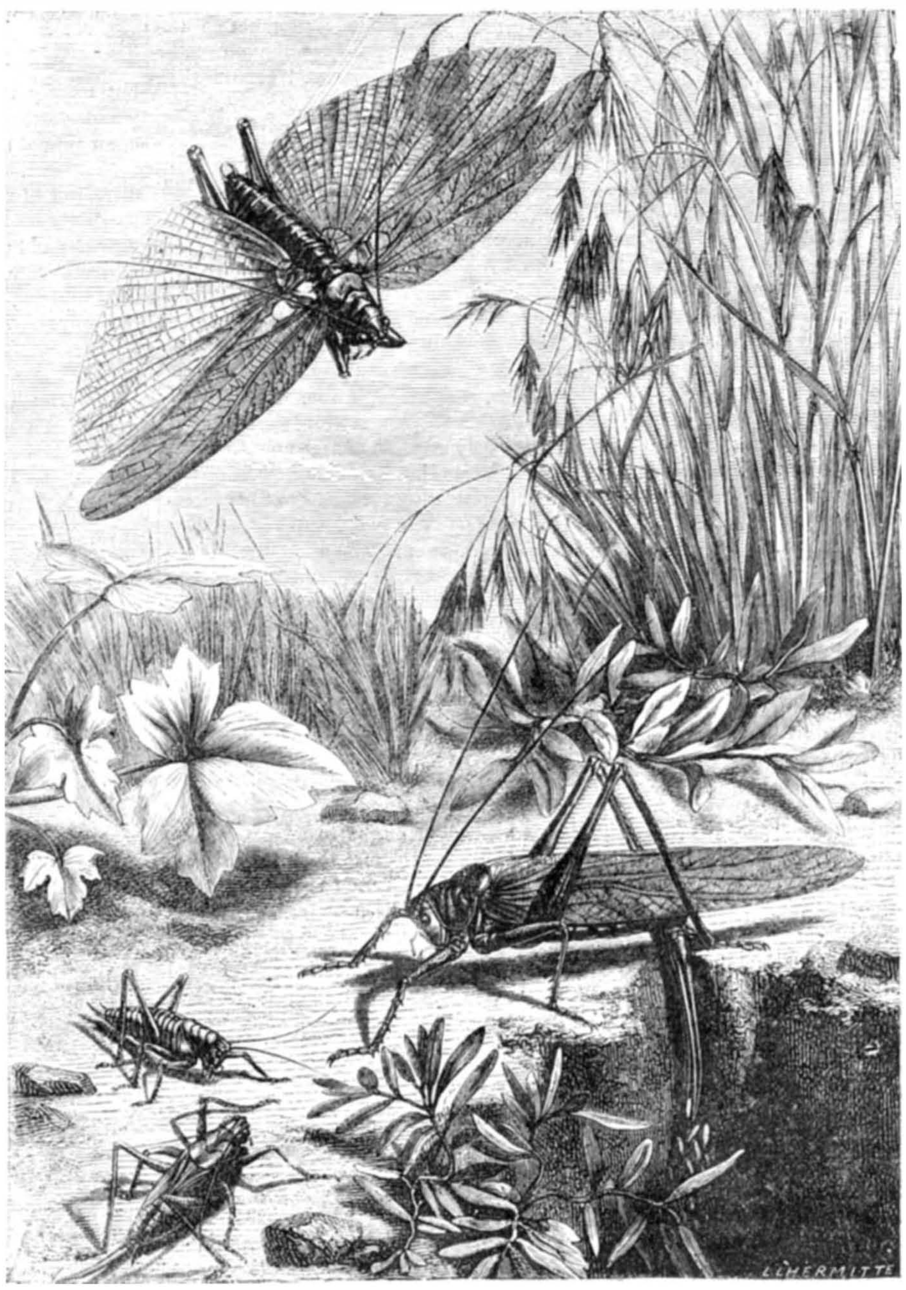
Laying aside sentimental feelings, however, the present is an appropriate time at which to draw the attention of the reader to that order of insects, to which the field cricket, that querulously ushers in the summer, and his first-cousin of the hearth—immortalized by Dickens—and the grasshopper that scoldingly, from his favorite perch in the locust tree, presages the fall, and the cockroach, that swarms in our kitchens, all alike belong. Our fields during the present month are alive with members of this order, which, if it include fewer species than some of the others that we have noticed, is represented by an innumerable host of individuals, and lays claim to our especial attention, as including within its ranks the migratory locust and its allies, the greatest of all insect foes to vegetation. The term *Orthoptera*, or "straight-winged," applied to these, is hardly so happy, because its application is not so apparent at first sight, as the names by which most of the other orders are recognized; the characters of the order are, however, very strongly marked, and are, generally speaking, altogether unmistakable—at least they will be so in the typical members of the group, to the most casual observer, who will only observe systematically. It comprises insects with the mouth organs adapted for biting and not for piercing and sucking—a character that at once distinguishes them from the bugs; the anterior pair of wings are generally thickened, leathery, opaque, and serving as a sheath for the hinder pair; but they are not so solid as, nor shaped like, those of the beetles; as in the latter the hind pair of wings are the largest and are furled when at rest beneath the front pair; but, while those of the Coleopters are folded transversely, those of the Orthopters are shut up longitudinally, just as a lady's fan is closed; and it is from this arrangement of the hind wings, when at rest, that the name of "straight-winged" is said to be given to the order. These wings, too, are veined in a beautiful network pattern very different from those of other insects. A moment's examination of one of the flying grasshoppers in your garden will make all this more apparent than a multitude of words. But the most important difference that the naturalist perceives between these and most other insects is in the history of their development. The little Orthopter, when first hatched from the egg, is not a maggot, grub, or caterpillar, nor does it afterwards pass through a period of suspended activity in a nymph or chrysalis condition. We may say that little grasshoppers do grow to big ones, for as they appear at first they much resemble the perfect form, wanting, however, the wings and reproductive organs. To accommodate their increase of size they cast their skin, like caterpillars, and after several such moultings, they moult to a form which shows us rudiments of the wings, they are then in the pupa stage; one more moult and they appear with wings fully developed and efficient reproductive organs—they are now perfect insects.

In the accompanying cut the larva and pupa stages of the Green Grasshopper (*Locusta viridissima*) are represented in the lower left-hand corner, the pupa being the one beneath.

The Orthopters may be divided into two subdivisions—one embracing the crickets and the grasshoppers, with their elongated hindmost pair of legs, being termed the "jumping" Orthopters or *Saltatoria*; while the less typical group includes the *Cursoria*, or "runners."

Besides the cockroaches already mentioned, the earwigs of Europe, and those most extraordinary insects, which, as their names indicate, present us with the most remarkable protective resemblances, such as the walking-sticks and walking leaves, belong to the latter subdivision. Here also belongs the "praying mantes," which, in attitude of prayer, awaits its prey, and often devours even his own kind—an almost human development of inhuman hypocrisy. The higher group is divided into three families—the *Achetidæ*, or cricket; the *Locustidæ*, or grasshoppers, and the *Gryllidæ*, or locusts. The reader will see that there is here an unfortunate confusion of terms; the Latin term *locusta* being applied, not to the family that includes the migratory locust, but to that which includes the grasshoppers. The male members of these three families are musical, each family, however, having its own special kind of instrument. The grasshoppers, and our friend the katydid belongs to the family, have this musical organ at the base of the wing-covers or anterior wings; the basal position of one overlaps the other, and both are furnished with strong ribs, and it is by the friction of these over one another that the shrilling sounds and the cry-like notes of the katydid are produced. The antennæ of the male insect (the one on the wing) in the engraving, cross this musical organ, which, as we have said, is restricted to the males. The females—strange inversion of our ideas—are the sword bearers; but instead of using these weapons to destroy life we see by the use to which the female figured is putting it, that it is the implement with which she safely deposits her eggs, and thus continues her race.

Those species of grasshopper that live mostly amid the low herbage lay their eggs in the ground; others that frequent trees, lay theirs in the crevices of the bark. In the month of September we have taken numbers of female katydids, with their ovipositors, so firmly driven into the interstices of the bark of the thorny locust (*Gleditschia triacanthus*, that it required considerable force, and as much patience, to extract them without doing injury to the insects. The katydid differs from the insect figured, in the form of the wing-covers, which are much wider, descending on each side of the body, and enveloping it as if in a pod. This character distinguishes the katydid from our other grasshoppers, and gives to it its generic name of *Platyphyllum* (broad wing); its specific name being *perspicillatum*.



TRANSFORMATIONS OF THE GREEN GRASSHOPPER.

Photographic.

HOW TO DIMINISH THE TIME OF EXPOSURE.

M. Bazin lately made a communication to the Photographic Society of France, respecting a process for diminishing by one third the time of exposure in the camera, whatever may have been the formula which the negative was executed. This process consists in augmenting the power of the light on the collodionized plate by additional red rays, independent of the light passing through the objective. This red light is admitted into the camera by making in the four corners of the front, circular openings, which are closed by means of glasses colored red with carmine dissolved in ammonia. These glasses should, besides, be rendered double by means of a ground glass, so placed as to diffuse the luminous rays, the red light striking upon the sensitive layer at the same time that the image is produced by the objective. Under the influence of this red light—the intensity of which should be regulated according to the opening of the diaphragm of the lens, and according to an exposure which should be one-third less than is necessary for obtaining a good negative by the ordinary processes—the developer causes the darker part of the image to come out perfectly, diminishes the crudity of the high lights, and gives much harmony to the picture. The same effect is produced by submitting the sensitive plate to the red light, whether before or after the exposure, but the result is not so good. The other rays have been tried, but the red ray is the only one that has produced satisfactory effects.

In support of this communication M. Bazin showed double proofs made from negatives taken in precisely the same time. That obtained with the addition of the red light gave much more of the details in the very black or dark green parts, with more softness in the light parts, while the proof obtained in the ordinary way presented in the former parts absolute blacks.

HOW TO PREVENT DRYING OF THE FILM WHEN EXPOSED IN THE CAMERA.

The object is to remedy the inconvenience experienced through the drying of wet collodion plates when the exposure in the camera has been very much prolonged. Who has not been a victim to those accidents which render it almost impossible to reproduce objects insufficiently or badly lighted? I avoid this difficulty, says M. Lecourt, by placing at a very little distance before the sensitized plate a second plate, thin, and perfectly clean; I thus maintain the moisture during a sufficient space of time for any exposure whatever, be it an hour or more, without any apparent drying.

Enameling Liquor Barrels.

Owing to the extensive trade in liquor the demand for barrels is constantly increasing, and the growing scarcity of oak timber renders it necessary to find some substitute. This want is likely to be supplied by the process of enameling, some observations on which are made by Mr. Krupsi in a German periodical from which we translate the following:

Up to the present time, these barrels have been made of oak wood, but as this article becomes rarer and more expensive, it became necessary to find a substitute. Iron has been proposed, but, though these have the advantage of greater durability and safety from leakage, there are many disadvantages—such as their greater weight, their liability of getting out of shape, the expansion and contraction by heat and cold, thus having a larger capacity in summer than in winter, and, finally, their expense. These disadvantages are so great that there is no likelihood of iron taking the place of wood in the manufacture of barrels for this purpose.

In Russia, where, with the exception of the western provinces, casks of oak wood are obtained with great difficulty, a substitute has at last been discovered, and quite a trade is done in barrels of pine and deal, enameled on the inside. The enamel prevents the liquid from coming in contact with the wood, and fills the cracks and prevents leakage. These take the place of oak barrels for many purposes, especially for lager-bier barrels. They are mostly bound with wooden hoops. The enameling is done as follows: The barrel is made and hooped, leaving out the bung stave, through this aperture the enamel is applied to the inside and then the bung stave is put in, in the ordinary way. The enamel is made of thirty-three pounds of carpenter's glue, three pounds of finely ground and sifted gall nuts, six pounds of pulverized and sifted glass, and five pounds of sifted cement or fine unslacked lime. The glue is softened with sweet milk instead of water, and boiled down quite thick, then the powdered gall nuts are added, and the whole boiled for half an hour, then the glass powder, and lastly the lime is thrown in. When these ingredients have been thoroughly mixed, five quarts of good linseed oil varnish is added, and the addition of a few pounds of sulphur is also desirable. It is then boiled until it is sufficiently thick, being well agitated all the time to prevent the glass and cement from settling at the bottom. When boiled sufficiently the kettle is immediately placed in ice, which causes the mass to solidify rapidly, so that the undissolved particles will remain in a finely-divided condition in the glue. The enamel is used in a semi-fluid state, and it is best not to prepare very large quantities at once, though it can easily be rendered fluid by heat when it becomes hard.

The casks to be enameled must be perfectly clean and dry, and just before putting on the enamel they should be heated by burning a little alcohol in them. Three coats are given, each one being allowed to dry before putting the next one on. In the case of very large barrels it is necessary to have the bottom well supported, as, when full, the bottom, if not supported, will give way a little, and the enamel not being elastic will crack, which will cause the barrel to leak.

Liquors placed in enameled barrels will not be colored or changed in taste by the coating, as is the case with oak barrels, which, when new, invariably turn the alcohol brown. This enamel, however, will not stand water, therefore when the barrels become dry they must be allowed to float on the water instead of putting water in them.—*Journal of Applied Chemistry.*

THE STRIKE OF THE "RAFFINEURS" AT LA VILLETTE, FRANCE.

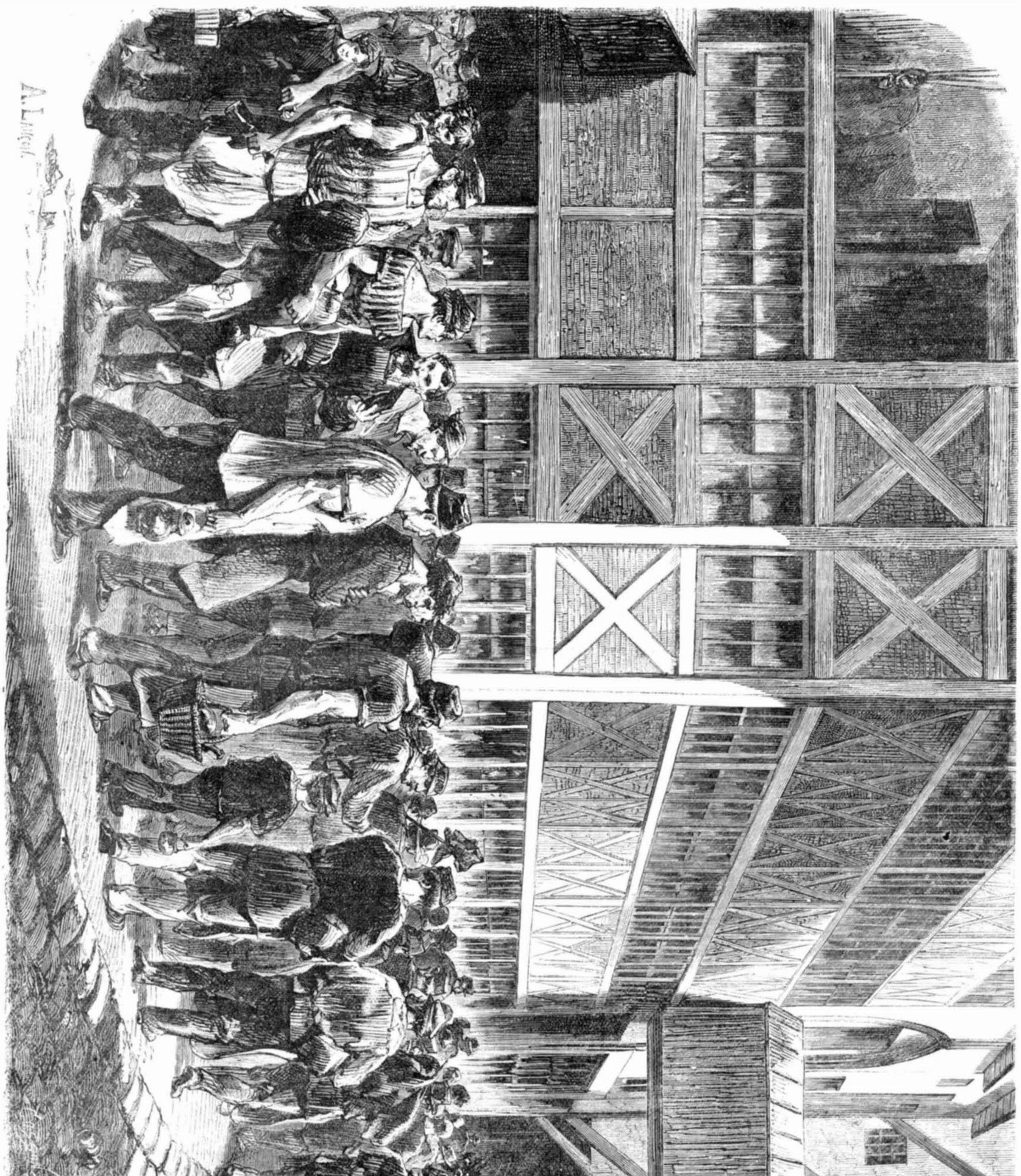
It is impossible to overrate the serious consequences of strikes. Both in Europe and America there have been of late numerous instances of these combinations to raise wages, and the attention of the wise and good has been thereby strongly called to the importance of devising some means of so adjusting the relations of capital and labor that these most disastrous movements shall hereafter find no real or supposed justification.

Our engraving, which we have had sent to us from Paris, represents a strike of the *raffineurs* in the works of MM. Jeanty and Prévost, at La Villette, in France. The peculiar characteristics of the French workingmen are graphically delineated.

What impresses the mind forcibly, both in American and European strikes, is the instantaneousness, promptness, and unanimity with which strikes are decided upon and put into effect. The workmen of a trades' union obey in our days the word of command like soldiers. In the strike we have delineated the day's work had commenced, when the word was suddenly circulated through the shops. Instantly the implements of labor were thrown down, and, seizing their personal effects, the workmen marched sullenly out. This somber, sullen determination is well delineated in the countenances of the strikers.

What will be the conclusion of these demonstrations, as prejudicial to labor as to capital, it is difficult to foresee.

The French Emperor has commanded the prime minister to make a detailed report upon strikes in general, and par



THE REFINERS QUITTING THE WORKSHOP OF MESSRS. JEANTY & PREVOST, AT LA VILLETTE, FRANCE.

ticularly upon the recent strikes in France. The war recently inaugurated will probably defer this report, which will undoubtedly be an important document. The Emperor has asked his Council of Ministers if it would not be possible to avoid such strikes in future by the creation of associations, based upon the model of the English associations, between the employers and workmen. In the present state of affairs, not only do the workmen in a single shop understand each other, but the relations between the trade societies are developing in all countries. The society known in France as the *Internationale* represents the interests of all the societies of workmen in Europe and America. The Parisian sections of this vast association have just published the constitution which establishes between them a solid and permanent confederation. More than twelve hundred members were present at the recent general convention.

In the present crisis would it not be wise to recall the saying of Cobden: "Let us make every effort to fill the deep gulf which the past has dug between capital and labor."

Correspondence.

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

Are Tin Fruit Cans a Source of Metallic Poisoning?

MESSRS. EDITORS:—Under the above heading, in the SCIENTIFIC AMERICAN of June 18, there is an article from the pen of Miss Julia Colman, of Brooklyn, who, that paper states, "has achieved considerable popularity as a temperance lecturer, and has made the subject of food and nutrition a favorite study." Under a favorable editorial notice Miss Colman's article reads as follows: "So far as the evidence of the senses goes housekeepers know that cooking tomatoes in tin 'ruins the basins,' as one good woman said; and another admitted that she commonly used up at least one 'basin' in a season for this purpose."

The above statement, as it stands, ignores the very principles upon which the preservation of fruit in air-tight cans depends, and that is that the oxygen of the atmosphere is excluded to such an extent that the fruit itself is not affected, and until this is done there is not the slightest danger of the tin having been corroded, for it is well known that tin corrodes very slowly, even when exposed to the atmosphere. Miss Colman having satisfied her own mind that the acid of the fruit does act upon the can, goes on to say: "Whether the acid acts after the expulsion of the free oxygen or during the canning process, I do not know."

It cannot act to any perceptible extent during the canning process, for there is not sufficient time. Whether it acts or not after the air is excluded is more a question of fact than philosophy, and to make the same appeal that she does to the evidence of our senses, I think I can find more tin cans in good preservation that have contained fruit for years than she can find of tin 'basins' that have been ruined in a season by having tomatoes cooked in them. She says zinc is more readily oxidized than tin, and yet some of the caps of our glass cans are made of that substance. She might have added that zinc, when it does oxidize, is more poisonous than tin, and yet she finds no example of poisoning from this use of zinc, but does of tin. She states that "many if not all the tin cans are freely soldered with lead." Solder, as generally used, is a compound of metals which must have the quality of melting at a lower degree than the metal that it is designed to unite, and to effect this a small portion of lead is made an ingredient, when the solder is intended for uniting tin. But if through cupidity the manufacturers have adulterated or substituted lead for solder it is a thing not generally known.

For my own part I have been canning fruit, both for home use and for sale, for a good many years, and have received cans from different sources, but always from Western manufacturers, and, so far as my experience goes, I can give to the above imputation a positive denial. But, admitting solder to be more unsafe than tin itself does open to a question of some importance.

There is a new process of soldering cans on the inside, and it is claimed for this process that the can is stronger, and also that they can be made at less expense, and for this reason some Western establishments purchase cans made at Baltimore, where this process seems to be generally employed. Inside soldering, spreading, as it does, over a large proportion of the inner surface of the can, brings in contact with the acid of the fruit at least fifty times more surface than when the can is soldered on the outside. Add to this, if it is true, that they have substituted lead for common solder, and we may here detect a source of metallic poisoning.

Miss Colman says she has no desire to create a false alarm, and in justification of herself quotes other authorities. "Professor Youman thinks it is a small matter." But she finds "that many medical authorities disagree with him." One says: "It ought to be known to housekeepers that acid, fatty, saline, and even albuminous substances may occasion colic, vomiting, etc., after having remained some time in tin vessels." And again, Professor Edwards, of the Women's Medical College of the New York Infirmary, says that tin cans, as prepared, are very unsafe; that the acid of the fruit dissolves the lead solder, and sometimes eats through the entire plate, causing the can to leak; and also that serious cases of poisoning have occurred from eating their contents. This is the only direct testimony that she offers. Now I do not impeach the Professor's veracity, but do his judgment and want of discrimination, because the statement he makes is so completely at variance with the experience and observation of others. There are many ways by which fruit cans can be and are brought to a similar condition to what he describes, but he has presented the one most unlikely, if not impossible, and that is that the destruction was commenced by the acid of the fruit acting upon the inner portion of the can, and that the fruit was poisoned while its external appearance was yet good. Now, if the fruit was not sufficiently heated, or if the can was so slightly defective as to escape detection—things that sometimes do occur—the fruit would soon be brought to the same condition that it would be if left standing in open vessels. The partially confined and vitiated air would soon effect an opening sufficient to let the liquid portions escape, when this acid substance together with the *now* free action of the atmosphere acting upon the can both inside and out, would soon bring it into the condition the Professor describes, all of which only makes a case coinciding with that quoted, that "it is dangerous to eat acid, fatty, saline, and even albuminous substances after having remained some time in [open] tin vessels." I say *open* tin vessels, because he says that the cans had been eaten through, so that they leaked before his patients eat the remaining contents, and some space of time (how long he does not state), must have intervened between these two eatings—long enough, doubtless, to have spoiled the fruit. Now, if these philanthropists, including the SCIENTIFIC AMERICAN, would escape the charge of trying to create a false alarm, let them make good the statement that lead is being used for soldering fruit cans, and that the acid of the fruit does corrode the inside portion of the can to a dangerous extent, while the air is yet excluded. These with *inside soldering*, are, to my mind, the only points in this connection that are worthy of notice. It is also the duty of manufacturers to come out and clear themselves of these charges, if they are innocent.

In looking over the above I find one thing I intended to state omitted, namely, that what are called porcelain kettles should supersede tin or iron vessels for cooking all acid fruits or vegetables. Such vessels are not expensive, and the meterial will not corrode with anything belonging to the culinary department. A. D.

Hydrate of Chloral.

MESSRS. EDITORS:—My experience with hydrate of chloral differs from that of Dr. Howig. I have taken it some six or seven times, varying in quantity from five to twelve grains. It has invariably caused sleep—real sleep—of three hours duration, but never longer.

As no two organisms are exactly alike, nor are any two in the same relation to a positively normal state, so it is difficult to make a valuable comparison between any two—the one inferred to be healthy, the other acted upon by this substance as a medicament. I will state that my digestion is good, and that my health rarely fails, except sometimes, upon sudden and great changes in the weather, neuralgic "twitches" keep me wakeful. Hydrate of chloral produces a rather oppressive drowsiness soon forgotten in sleep; this sleep, however, has invariably, with me, been an unfinished one, accompanied with some lassitude, and an impulse to sleep again. The elasticity which usually exists during the day, even after some wakefulness, is lost, and, to my mind, it is clear that the effect of this salt is discernible disagreeably twelve hours or more after its administration.

The bowels, generally regular, have been affected in opposite ways, sometimes a looseness has followed, and then a constipation, but always a change unaccounted for, except by this dose. My belief is that the affinities in this salt are so slight that decomposition follows immediately upon administration, and that chlorine—not chloroform—is freed in the stomach. Take the trouble to cover the stopper of a bottle containing hydrate of chloral with black silk, and press it closely in, and you shall soon have the characteristic bleaching of chlorine.

I shall take this substance when I must—not oftener.

Baltimore, Md. R. H. A.

To Preserve Green Grapes.

MESSRS. EDITORS:—A very simple and successful method of preserving the green grapes of wild vines, is one employed in this State, which may be interesting to some of your readers. The grapes must not be too old; the best time is just before the seed begins to harden. They are, after being picked and freed from stems, put into bottles (strong wine or champagne bottles are best) so as nearly to fill the latter. These are then filled with fresh and clean water. After this they are all placed in a large kettle, partially filled with cold water, and the temperature raised nearly to the boiling point. The water in the bottles expands by the heat, and part is driven out. As soon as sufficiently heated, they are taken off, enough water poured out of each bottle to merely allow a well-fitting cork to be pressed in tightly. After being corked they are sealed up with sealing wax or common beeswax. As the bottles cool down a partial vacuum is left in the neck of each.

Grapes thus preserved have kept for years in this climate, where canned fruit almost invariably spoils during the hot summers. They can at any time be opened and prepared like fresh grapes, no difference will be found in the taste. It is better to use the water, also, in which they were kept, as it contains a large percentage of tartaric acid, which gives them the pleasant sour taste. I hope some will try this method and profit by it. A. F.

Indianola, Texas.

[To prevent breakage in heating, put some pebbles in the bottom of the kettle, so as to keep the bottles from touching the metal.—EDS.

Speed of Circular Saws.

MESSRS. EDITORS:—Permit us to answer Mr. C. H. Crane, of Alabama, through your valuable journal, in regard to his test in sawing, page 52 present volume of SCIENTIFIC AMERICAN. Last March we set up a direct-action circular saw mill for John Dickerson, of Lafayette, Allen Co. The description of the mill is as follows: 2 flue boilers, 42 in. × 18 ft., engine, 10 × 14 in., the saw frame is of iron, suitable for two saws 54 and 32 in., with a log turner attached for turning logs by steam.

On the last day of June, by his request, we went to see him saw. He raised the steam to 100 lbs., and then began to saw. The first log was sycamore, turned four times and sawed into ¾ in. boards, 841 ft. in 12 minutes. The second log was elm, turned twice, and sawed into ½-in. boards, 1,085 ft. in 9¾ minutes. The third log was live oak, turned once, and sawed into ½-in. boards, 405 ft. in 5 minutes.

The sawing, backing, setting, and turning, were all done in 26¾ minutes, and the amount of lumber sawed, 2,331 ft. They have since sawed hickory, with the same feed, 3½-in. boards, 21 in. wide.

Can any one equal this? CARNES, AGETER & CO.

Lima.

The Rotoscope and Gyroscope.

MESSRS. EDITORS:—An article on page 20, of the present volume, by Mr. Manning, deserves notice. The several propositions, and assertions in that article, at variance with well-known principles of rotary motion, it were missspent time to quote and reply to. I will, however, for the benefit of those who do not understand these principles, by taking a slight glance into the history of the gyroscope, show that the device of Mr. Manning, as well as the machine itself, is much older than he may suppose; and by an investigation of its phenomena, on well-known principles of nature, demonstrate that they are such as they should be—that there is no analogy between them and those of the celestial bodies.

From time immemorial, the tendency of bodies to retain the parallelism of their axis of rotation has been observed, as exhibited in the solar system, the spinning of the top, the artificial globe, and various other machines.

So far as my information extends, the first instrument made to illustrate this principle, was devised by the celebrated Laplace, to illustrate the precession of the eqxinoxes. This apparatus consisted of two concentric rings, revolving on axes at right angles to each other, with a small spheroid in the inner ring. To this machine, as the parent, all the gyroscopes may be referred.

When a youth—I am now in the seventy-ninth year of my age—long before matches were thought of, when old men lit their pipes with flint and steel and sun glasses, there was in use a small apparatus for striking fire, consisting in a semi-cylindrical tin box, a few inches long, at one end of which was mounted on an axis a steel disk about two inches in diameter. When this disk was given a rapid motion by unwinding a chord from the axis, on the application of a flint, a stream of sparks would flow into the tin box. If, whilst the wheel was in a rapid vertical rotation, we attempted to change the direction of its axis horizontally, a strong tendency would be felt in the wheel to leave the vertical, and assume a horizontal position.

About forty years ago, with a view to illustrate the principles of rotary motion, Walter R. Johnson made an improvement on the apparatus of Laplace, by adding another ring, and other appendages, which apparatus he called the rotoscope. Of the numerous interesting experiments that he made, I will give but one. He says: "Take the wheel and its supporting ring from the frame." It is then a gyroscope. "Connect with the ring at a point opposite to the axis of the wheel, a wooden rod, from nine to twelve inches long. Attach the end of the rod, remote from the wheel, to a cord suspended from the ceiling. Set the wheel in rapid motion, and then bring its axis and the rod up to a horizontal position. Then suddenly abandon it with the hand; instead of hanging vertically down, the axis of the wheel and rod will for some time be kept horizontal, continually performing a a circuit around the cord. If the velocity of the horizontal revolution be diminished, it will incline downwards. But if the velocity of revolution be augmented, the wheel and ring will rise in opposition to gravity until it strikes the suspending cord."

About twenty-five years afterwards, Abner Lane, of Conn., invented it over again, or perhaps copied it from Mr. Jackson's description and drawings.

A description and figure is given, Vol. XI, page 200, SCIENTIFIC AMERICAN. Several editorials and communications afterwards appeared in the SCIENTIFIC AMERICAN on the subject, one communication describing a device and experiments similar to that of Mr. Manning. The writer stated that when the gyroscope was exactly balanced it would have no revolving motion, but when the wheel preponderated, it would move in one direction, and when the weight preponderates, in the other direction.

This historical sketch, meager as it is, has taken so much space that the discussion of the phenomena must be deferred for another article, in which will be clearly demonstrated on well established principles in mechanics, that the phenomena of the gyroscope should necessarily be such, as they are determined by direct observation.

Jackson, Tenn. J. B. CONGER.

Tempering Saws.

MESSRS. EDITORS:—As your paper takes the lead in all that relates to machinery, tools, etc., I hope I am not intruding on your valuable time in making observations in regard to that most important of all tools, a saw. I say a saw, but I mean all kinds of saws.

I used the second saw mill of Page's (Baltimore) manufacture that came to Louisiana, sometime about 1846, and am now running the same old machine. I have been, from that day to this, putting in order cross-cut and circular saws. I use still one of Hoe & Co.'s lever, die, and punch gummers to gum out both cross-cut and circular saws, and find it yet about as good as most of the new inventions.

I commenced to write this article about the tempering of saws. If there is anything done in a less mechanical manner than this tempering of cross-cut and circular saws, I would like to see it. Nine tenths of the new cross saws of all the new as well as the old shape of teeth should be left where they are made.

Why, saws are brought to me that the very best file will hardly touch; as for setting with a saw set, it is next to impossible. Put them under the gummer and they crumble like glass. Some parts are twice as hard as other parts. Many of the circular saws are no better; some few teeth are so hard that it is with the greatest difficulty they can be reset. This has become such an evil with us, who use a great many saws, that now, when we go to purchase saws of any kind, we carry a saw set and file to find out their temper. In gumming out a cross saw, it requires a new file for every saw. Will you please to call the attention of all kinds of saws manufacturers to this evil of hardening their saws too much? A cast-steel saw of any kind requires very little tempering. When I order saws of any kind new, I have to order the softest on hand, any other will be returned.

Iberville, La. M. P. M.

Bleaching Clothes.

MESSRS. EDITORS:—My laundress boils a bunch of peach leaves with her clothes to whiten them. Is it an idea, or is there any chemical action produced? The clothes are certainly very white when they come from her hands.

Columbia, S. C. J. R. B.

Speed of Thought.

When it comes to the relation of mental action and time, we can say with Leibnitz, "Calculemus," for here we can reach quantitative results. The "personal equation" or difference in rapidity of recording the same occurrence, has been recognized in astronomical records since the time of Maskelyne, the royal astronomer, and is allowed for with the greatest nicety, as may be seen, for instance, in Dr. Gould's recent report on transatlantic longitude. More recently the time required in mental processes and the transmission of sensation and the motor impulse along nerves have been carefully studied by Helmholtz, Fizeau, Marey, Donders, and others. From forty to eighty, a hundred, or more feet a second are estimates of different observers, so that, as the newspapers have been repeating, it would take a whale a second, more or less, to feel the stroke of the harpoon in his tail. Compare this with the velocity of galvanic signals, which Dr. Gould has found to be from fourteen to eighteen thousand miles a second through iron wire on poles, and about sixty-seven hundred miles a second through the submarine cable. The brain, according to Fizeau, takes one-tenth of a second to transmit an order to the muscles, and the muscles take one-hundredth of a second in getting into motion. These results, such as they are, have been arrived at by experiments on single individuals with a very delicate chronometric apparatus. I have myself instituted a good many experiments with a more extensive and expensive machinery than I think has ever been employed, namely, two classes, each of ten intelligent students, who with joined hands represented a nervous circle of about sixty-six feet, so that a hand pressure transmitted ten times round the circle traversed six hundred and sixty feet, besides involving one hundred perceptions and volitions. My chronometer was a "horse-timer," marking quarter seconds. After some practice my second class gradually reduced the time of transmission ten times round, which had stood at fourteen and fifteen seconds, like that of the first class, down to ten seconds; that is, one-tenth of a second for the passage through the nerves and brain of each individual; less than the least time I have ever seen assigned for the whole operation; no more than Fizeau has assigned to the action of the brain alone. The mental process of judgment between colors (red, white, and green counters), between rough and smooth (common paper and sand-paper), between smells (camphor, cloves, and assafœtida), took about three and a half tenths of a second each; taste twice or three times as long, on account of the time required to reach the true sentient portion of the tongue. These few results of my numerous experiments show the rate of working of the different parts of the machinery of consciousness. Nothing could be easier than to calculate the whole number of perceptions and ideas a man could have in the course of a lifetime. But as we think the same thing over many millions of times, and as many persons keep up their social relations by the aid of a vocabulary of only a few hundred, or, in the case of some very fashionable people, a few score only, of words, a very limited amount of thinking material may correspond to a full sense of organs of sense and a good development of the muscular system. The time-relation of the sense of vision was illustrated by Newton by the familiar experiment of whirling a burning brand, which appears as a circle of fire. The duration of associated impressions on the memory differs vastly, as we all know, in different individuals. But in uttering distinctly a series of unconnected numbers or letters before a succession of careful listeners, I have been surprised to find how generally they break down in trying to repeat them between seven and ten figures or letters, though here and there an individual may be depended on for a large number. Pepys mentions a person who could repeat sixty unconnected words forward or backward, and perform other wonderful feats of memory, but this was a prodigy. I suspect we have in this and similar trials a very simple and mental dyanometer which may yet find its place in education.—*Dr. Holmes.*

SCIENTIFIC AND PRACTICAL FACTS AND ITEMS.

BY SEPTIMUS PIESSE.

SATURATION.

Acids and alkalies neutralize each other in certain definite proportions. When so neutralized, both alkali and acid are said to be "saturated." As both these materials are extensively used in the arts and manufactures, and also in certain beverages, the following table of saturation will be found useful for reference. The proportions given can easily be multiplied where large quantities are required, such as by dyers, brass-founders, etc. One drachm of carbonate of potass requires to saturate it 55 grains of tartaric acid, or 50 grains citric acid. One drachm of bicarbonate of soda requires 54 grains of tartaric acid, or 48 grains of citric acid. One drachm of crystallized carbonate of soda requires 30 grains of tartaric, or 27 grains of citric acid. One drachm of carbonate of ammonia requires 53 grains of tartaric, or 46 grains of citric acid. Reversing the materials, one drachm of tartaric acid requires to saturate it 65 grains of carbonate of potass, 66 grains of bicarbonate of soda, 70 grains of carbonate of ammonia, or 119 grains of crystallized carbonate of soda. One drachm of citric acid is saturated by 71 grains of carbonate of potass, 75 grains of bicarbonate of soda, 78 grains of carbonate of ammonia, 131 grains of crystallized carbonate of soda. Eight ounces of lemon juice, or two ounces of strong vinegar, are saturated with 60 grains of carbonate of potass, 62 grains of bicarbonate of soda, 67 grains of carbonate of ammonia, or 110 grains of crystallized carbonate of soda.

SOUND AND ELECTRIC FIGURES.

What are termed sound figures may be produced in various ways. One way is to fix a plate of glass at its centre with Burgundy pitch to an upright support on a stand, then to dust the plate with fine dry sand or other suitable powder, such as lycopodium. If now the plate be made to vibrate by drawing over its edge a violin bow, or some horsehair tightly stretched from the two ends of a cane well rosined, the dust will arrange itself in due time into certain forms, lines, or figures. The same will occur by tying over a broad-mouthed glass or goblet with bladder that has been moistened and allowed to dry to a drum-like surface, and dusted with lycopodium or very fine sand, and then put upon a piano. Certain lines are soon visible after the instrument has been played upon, particularly when one chord only has been struck, so as to lessen the vibration. The blowing of a cornet, using one key, or the tuning of one note of any instrument, near the stretched membrane, will cause it to vibrate, and the dust to arrange itself into form. Thus these experiments clearly exhibit the effects of sound; and by due study of the dust lines we may see what sound, one long passed, has been. A somewhat similar application of this experiment has recently been made by a German philosopher to the study of the nature of electrical discharges between metallic conductors. It is found that when an electric discharge takes place between a horizontal plate of metal powdered with lycopodium, forming the positive pole, and a ball or point placed below it, the dust remains attached to the plate on a well-determined area.

EARNSHAW'S KEY OF MUSICAL KEYS.

This instrument, invented by Mr. E., of Sheffield, England, is chiefly intended for the use of the musical student in the early stages of his task; but it will also be of great use to persons more advanced. One important advantage will be found in the definiteness and precision which it gives of musical intervals, whether tonic, diatonic, chromatic, perfect, augmented, or diminished, of scales, modes, keys, enharmonic relations, signatures, concords, inversions, and of chords perfect and imperfect. Most of these are subjects which every student finds more or less perplexing. This instrument is adapted to relieve him of the difficulty.

STANLEY ELECTRIC DISK.

The science of electricity is one of the most promising to study. Almost every person who has studied it deeply has made discoveries which have proved beneficial to man. By its aid the baser metals are coated with gold and silver. Works of art are produced, and our taste refined. The telegraph is becoming our universal messenger. The lighthouses are illuminated by electricity. By a knowledge of its nature we protect our ships and buildings from the dire effects of electric clouds. Electricity is the acme of heat, force, light, and magnetism; what we now know about it is sufficient to teach us how very much more there is yet to learn of this subtile agent. Hitherto, electrical apparatus has been expensive; but by bringing his perfect practical knowledge to bear upon the subject, Mr. Stanley, of Great Turnstile, Holborn, London, G. B., has produced an Electric Disk with Leyden jars, etc., by which a hundred experiments can be easily shown at the cost of a few shillings. As the boy makes the man, so will his toys indicate the bearing of his mind; and where there is a tendency shown by youth for the study of scientific truth, a better toy could not be given to them than Stanley's Electric Disk.

Gum or Rubber Springs.

Of the various materials used in the construction of railway cars, says the *Car Builder*, there are doubtless none of which so little is generally known as the india-rubber gum spring, and the process of its manufacture. The crude rubber has become such an important article of commerce, and in its various modifications is applied so extensively to mechanical purposes, that a brief account of its production, and the process by which it is manipulated into car-springs, will, we doubt not, be interesting to our readers.

Much the largest portion of the crude gum imported into this country comes from Brazil. A considerable quantity is produced in the East Indies, but the quality is inferior. The market is supplied with various kinds—fine and coarse Para, Central American, strip Central, Carthagena, Guayaquil, Java, etc. The finest quality comes from the Brazilian port of Para, and is the product of the extensive region embraced in the valley of the Amazon and its tributaries.

The gum, when received at the factory, is first cut up and passed through a washing machine, where all the dirt is extracted. It is then sheeted out and hung over stretchers in a drying room, which is warmed by artificial heat. In going through this process it will lose from five to thirty-five per cent in weight, according to the quality of the gum used—some being, when purchased, comparatively pure and dry, and some filled with sand and water, and, in some cases, with particles of wood. The better the grade of gum the less will be the waste. After it is thoroughly dried, it is weighed off in batches, say from thirty to fifty pounds, and a certain proportion of dry white lead and bolted whiting mixed with it. This is done in a machine consisting of two cylinders or rolls, about fifteen inches in diameter, heated by steam. Between these rolls the gum is passed, along with the lead and whiting, until the parts are thoroughly mixed and ground, when the proper amount of sulphur is added. This ingredient is not used for the purpose of adulteration, but is merely a vulcanizing agent, its action being analogous to that of yeast in bread-making. The mass or batch of gum, which now resembles putty somewhat in appearance, is next put into a warmer—a machine similar to the mixer—and kept in a condition for the calender—another machine with three large cylinders some four feet in length and two feet in diameter. These cylinders or rolls are kept heated by steam; the gum is put between them, and rolled out into sheets of about one sixteenth of an inch in thickness, and then passed to a mandrel (which corresponds to the size of the hole in the spring), and wound up until the required diameter is obtained. The ends of the roll of gum thus formed are then trimmed off, and the entire roll thoroughly coated with soapstone dust, to prevent its sticking to the mold into which it is then placed: this mold is twenty-four inches long, the iron being about an inch and a quarter in thickness and the inside diameter the same as that of the roll. After being driven into the mold the iron bolt or mandrel is withdrawn, caps two inches thick placed on the ends, and the bolt replaced and keyed up. The caps have three ears, through which bolts are put and fastened with nuts. The mold is then placed in the heater—a large wrought iron cylinder, some six feet in diameter, and thirty feet in length, which is headed up and bolted—and steam gradually admitted until about three hundred degrees are reached. In this condition the mold remains from four to ten hours, being carefully watched. The time is determined by the size of the spring, one of small diameter requiring less time than a larger one. When properly cured, the mold is taken from the heater, and, when cooled, the caps are removed, and the spring taken out and placed in a lathe, where it is cut into the required lengths. The springs thus formed are ready for shipment.

A rubber spring, when properly made, is, without doubt, the best for the purposes required of any that has thus far been produced; but, when improperly made, it is one of the poorest. The materials which enter into its composition are liable to adulteration to a very great extent by the admixture of base ingredients, which impair its elasticity and durability, thus confirming the truth of the maxim that the cheapest is by no means the best. Springs can be made to weigh less by using less lead and more whiting in their manufacture; and the essential qualities of the spring are impaired just to the extent to which this is done—the lead having a metallic and durable body, and the whiting a perishable one. The best springs are made by using good Para gum with a suitable admixture of fine sheet Central or Carthagena, and a proper proportion of white lead and whiting. Some idea of the extent of the adulteration of low priced springs may be formed from the fact that fine Para gum is worth in the importer's hands $1.07 per pound, and sheet Central sixty cents per pound; while the manufactured spring is sold at forty to forty-five cents per pound.

THE PUBLIC DEBT.—The Government has, besides discharging all current obligations, paid on the public debt the large sum of $17,034,123! Since the incoming of the present administration the debt has been decreased over $156,000,000. The decrease since last March is over $69,000,000. During the year 1869 the average monthly reduction was over $7,000,000, while thus far in the present year the average monthly decrease has been over $13,800,000! Thus the average monthly reduction for the present year is nearly double that of last year, which shows a constantly increasing efficiency and economy in the revenue collections.

ELECTRICITY OF THE ATLANTIC CABLE.—According to Prof. Zantesdeschi, the Atlantic submarine cable may be considered as a Leyden jar, in which, when the inner insulated wires are carrying a message from America to Europe, those forming the outer layer should reconvey it from Europe to America. He therefore suggests that instruments be established at each end of the cable, by which the sender of the message can ascertain, by indications at his elbow, whether his dispatch has been received at the opposite extremity as he transmitted it.

MCBETH, SHAFFER & CO.'S UNIVERSAL WOOD WORKER.—In our description of this machine, published and illustrated upon page 79, current volume, we omitted to mention that it was covered by patent dated November 27, 1866, obtained through the Scientific American Patent Agency.

Improved Rotary Pump.

The family of rotary pumps is a large one. Notwithstanding some defects which radically pertain to this class of machines, they possess certain advantages, such as compactness, power of acting at the same time both as atmospheric and force pumps, fewness of parts, absence of valves, power of continuous action without air chambers, etc., which peculiarly fit them for certain kinds of work. As exhausters for mines and gas works, they are found to work admirably, while their application to the raising of liquids to any required hight within practicable limits, also renders them applicable to clearing mines of water, and for many other purposes which we need not name.

Our engraving shows a new form of rotary pump, for which it is claimed that its construction prevents loss of work by leakage, that it requires less power to drive it than other pumps of its class, and that owing to its simplicity of construction it is not liable to get out of order.

Fig. 1 is a perspective view, and Fig. 2 a detail showing the internal construction.

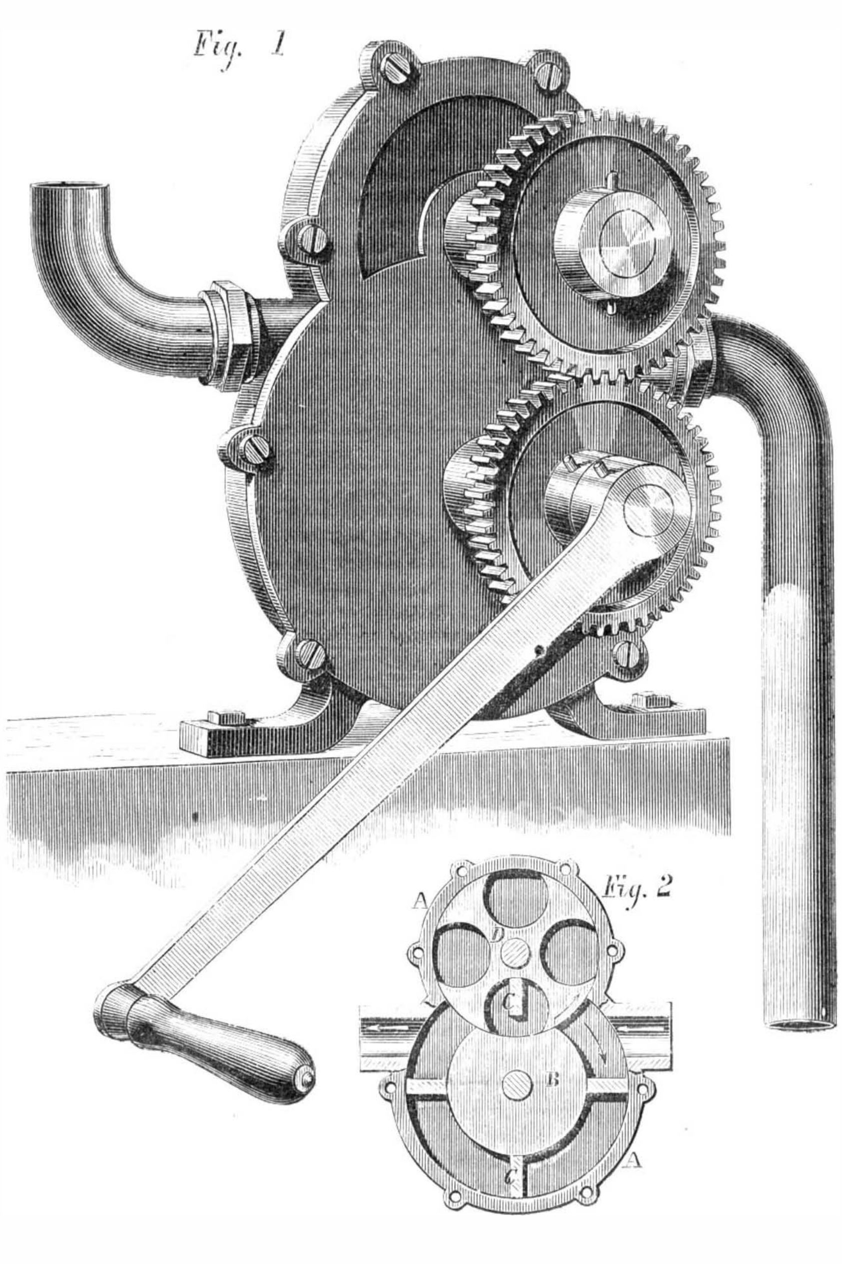
It will be seen that the pump consists of a combination of a paddle or bucket wheel, with a cut-off wheel. The packing is stationary.

The case, A, is made in the form of two intersecting cylinders, the portion of each cylinder comprised by their mutual intersection being removed. A cylindrical projection, B, cast with the case, leaves an annular space between it and the outer rim of the case, in which space the buckets or paddles, C, play. These paddles are attached to, and project from the side of a disk, not shown, which disk overlaps the cut-off wheel, D, its edge meeting a properly formed shoulder in the outer shell or case, so as to make a water joint.

The buckets, C, pass into and meet the sides of cylindrical recesses in the cut-off wheel, D, as shown. The bucket wheel and the cut-off wheel move in opposite directions, the one being rotated by a gear, impelled by a gear on the shaft of the other, as shown in Fig. 1, and the direction of the flow being indicated by the arrows in Fig. 2. The buckets, C, moving away from the cut-off wheel, D, constantly increase the space for receiving the water which therefore flows in to fill the space. On the opposite side the buckets, C, constantly approaching the wheel, D, reduces the water space, and therefore forces the water out of the discharge pipe.

The wings of the cut-off wheel always keep the space between the supply and discharge pipes interrupted, and in conjunction with the packing block, C, prevent the return flow of the water.

This pump was patented, June 21, 1870, by August Leuchtweiss, Twelfth street, between Vine and Race, Cincinnati, Ohio, through the Scientific American Patent Agency.



LEUCHTWEISS' IMPROVED ROTARY PUMP.

Improved Cradle.

It is comparatively rare that we can present inventions of special interest to our lady readers. Yet here is something which they all will do well to examine.

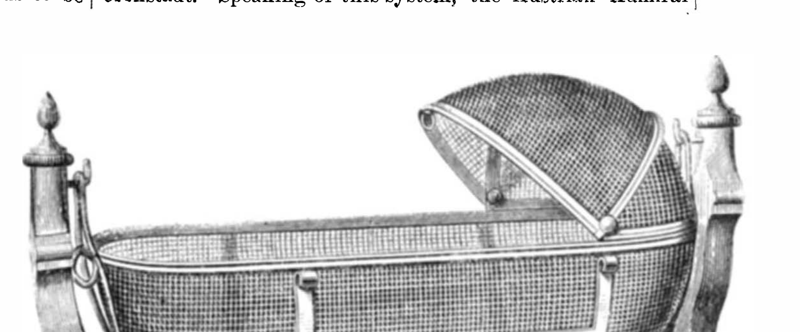
The cradle illustrated in our engraving seems to us to be one possessing peculiar advantages, and calculated to greatly increase the comfort and happiness of a large and important class of community.

In the first place it is very graceful in design, and it is not only airy in appearance but in reality, perfect ventilation being secured.

Secondly, it affords perfect immunity against the attacks of flies and mosquitoes. It would seem that the application of the hood to the beds of adults would prove an excellent thing in sections where mosquitoes are numerous.

The cradle is made of wire netting supported by a suitable metallic framework. The wire of which the netting is made is galvanized or otherwise protected from rust in some suitable manner. A hood of the same material is pivoted at the head of the cradle, so that it can be let down into the position shown in the dotted outline or raised as desired. When closed it forms a hemispherical dome, which, while excluding insects, admits a free circulation of air, permits free movement of the child's head and arms, and does not obstruct the sight of the child by the nurse, as the meshes permit distinct vision.

Patented, January 11, 1870, through the Scientific American Patent Agency, by L. Chevalier, of Williamsburgh, N. Y., and R. Brass, of Waterbury, Conn. The manufacturers are Koch, Chevalier & Brass, 168 Johnson street, Williamsburgh, N. Y., to whom orders or letters for information may be addressed.



CHEVALIER AND BRASS' WIRE CRADLE.

Reflectors on French Ships.

A French paper says it is intended to supply several vessels of the fleet with an apparatus intended to light up the line of the horizon in dull weather, or any point of the sea coast at which it may be expedient to disembark at night. This apparatus, placed in the fore part of the ship, is composed of an electric light and a powerful reflector. The light is produced by the combustion of two cones of coal, in communication with a magneto-electro machine. This is itself put in motion by a small steam engine connected with the ship's engines. The reflector, on Fresnel's system, is analogous to that employed in lighthouses. This apparatus possesses such great illuminating power that, when directed upon a point of any coast, it is clearly visible at a distance of about two miles without its being possible for the enemy on the coast to distinguish the ship bearing the light. The iron-clad frigate *Heroine* carries one of these lights, which has been useful in gloomy weather to the transatlantic packets. It is said the Russian Government has ordered several of them from the French inventor, and proposes placing them in the port of Cronstadt. Speaking of this system, the Austrian Admiral Tegethoff, the victor of Lissa, used to say that if he had then the assistance of such lights he should have annihilated the Italian squadron while anchored in the roads of Ancona. It is, in fact known that one night, shortly before the battle of Lissa, the Austrian fleet approached within reach of the cannon of Ancona. Admiral Tegethoff thought he could distinguish through the darkness a thick smoke, showing that the Italian vessels were getting up their steam and were about to weigh anchor. Such a reflector as that recently invented would have permitted him to see that he was mistaken, and that the fires of the hostile squadron were not lighted. The fate of these motionless vessels would soon have been decided.

Hot Boxes.

A correspondent of the *Iron Age* writes from Philadelphia —"Cannot some live Yankee supply a cure for 'hot boxes' on railway trains? With the constant improvements in railway machinery, this would seem to be a simple invention, and yet it hasn't arrived. The question was suggested by a detention to your correspondent the past week by which your readers lost their no doubt valued (if not valuable) correspondence. The Pacific express, the lightning train from Chicago, made its usual excellent time as far as Harrisburg, and should make no stop from that city to Philadelphia, a run of 105 miles. In half an hour the train was stopped with two journals smoking in a forward car. Buckets of water and greasy waste cured this, and the run, after the loss of fifteen minutes, was continued below Lancaster. Shortly again the train halts, and this time a lively tongue of flame is issuing from a journal on a rear car. Three successive stops were made on account of this trouble before reaching Philadelphia, and the loss of time in the aggregate very considerable. Now, we respectfully submit that as somewhat greater problems in machinery have been solved, that the remedy for this nuisance lies within the possibility of human genius. To the man who *does* it we promise a customer *certain* in one of the leading railways, if we can judge any thing from the remarks of a prominent railway official on that 'hot-box' train."

Purification of Lard.

Take 28 pounds of perfectly fresh lard place it in a well-glazed vessel that can be submitted to the heat of a boiling salt-water bath, or of steam under a slight pressure. When the lard is melted, add to it one ounce of powdered alum and two ounces of table salt. Maintain the heat for some time—in fact, till a scum rises, consisting in a great measure of coagulated proteine compounds, membrane, etc., which must be skimmed off. When the liquid grease appears of a uniform nature it is allowed to cool. The lard is now to be washed. This is done in small quantities at a time, and is a work of much labor; which, however, is amply repaid by the result. About one pound of the grease is placed on a slate slab, a little on the incline, a supply of good water being set to trickle over it. The surface of the grease is then constantly renewed by an operative working a muller over it, precisely as a color-maker grinds paints in oil. In this way the water removes any traces of alum or soap; also the last traces of nitrogenous matter. Finally, the grease, when the whole is washed in this way, is remelted, the heat being maintained sufficiently to throw off any adhering water. When cold, the operation is finished.—*Druggists' Circular.*

On Organic Matter in Water.

An English chemist was some time ago called on to assist a large manufacturer of lemonade, who suddenly found it impossible to make lemonade that would keep. After a day or two it became turbid, and its odor anything but agreeable. On investigating the liquid under the microscope it was found full of small spherical cells with, in most cases, a very bright nucleus. After examining all the materials employed, it was detected that the fault was with the water. On putting a few grains of pure crystalline sugar into some of the water, it became turbid in a few hours, and contained the cells above described. On inquiry it turned out that the well from which the water used in the preparation of the lemonade was obtained, had been slightly contaminated with sewage. This led the experimenter to mix a minute quantity of sewer water with a sugar solution; very soon the cells made their appearance. Filtering through the finest Swedish paper does not remove the germs. Boiling for half an hour in no way destroys their vitality. Filtration through a good bed of animal charcoal seems to be the only effectual mode of removing them; but it is necessary to air the charcoal from time to time, else it loses its purifying property.

White Brass.

In our issue of May 28th we noticed the manufacture of white brass at the Thames Foundery in England. Several inquiries were addressed to us to know where the new article could be obtained. We are now able to refer our readers to the advertisement of the "American White Metal Company," who have imported a small supply for the purpose of testing the market.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE INFLUENCE OF WAR UPON INVENTIONS.

We have formerly expressed the opinion that the history of a people could be written from a careful study of the catalogue of inventions for any given period. Such a test would not apply to ancient history before the arts and sciences had reached their present advanced stage; but since patents have become common, and international laws have been passed in reference to them, whether a country was in a state of war or at peace with all the world could be detected from an inspection of the inventions demanded by the wants of the time. There is no doubt that war has exercised a great influence upon inventions. When the existence of a nation is at stake all good citizens feel called upon to put forth every effort to save it, and it is thus that the inventive faculties are sharpened, and unusual applications of machinery or discoveries in science are made. During the earlier wars of Napoleon the French navy was unable to compete with the English, and as a consequence the ports of France were blockaded. This occasioned a serious interference with many trades; the manufacturers of soap, especially, felt the want of soda ash, which they had been in the habit of importing from Spain. It became necessary to find some method by which this article could be manufactured from sea salt. However powerful the English navy might be, it could not prevent the tides of the ocean from overflowing vast tracks of meadow land and thus cut off the supply of salt. We all remember the grand discovery of Le Blanc, of a method of making soda ash out of common salt, that grew out of the necessities of the French nation at this period. It was a discovery of the utmost importance, and in its consequences has not been surpassed by any application of science to the arts that has ever been made. During the same period of the French wars a scarcity of gunpowder called up the question of a cheap manufacture of niter, and as a result of the investigation we have niter beds for the artificial production of the chief constituent of gunpowder. The study of how to prepare niter beds has led to the more important research into the growth of crops, the value of nitrogenous manure, and numerous other questions in agriculture. If any of our readers will take the trouble to look through the list of patents published by us during the late civil war in this country, they will find abundant confirmation of our theory that war has a great influence in directing the inventive talent of the country into certain channels. A very large proportion of the patents taken out were for improvements in fire-arms, or for something relating to the wants of the army. Such capital discoveries as those of soda ash and artificial niter cannot be expected to come very often; but less important inventions are made in time of war that afterwards prove of service, and are kept alive long after the original occasion of their introduction has ceased. The Crimean war involved the sending of provisions a great distance, and this led to the method of drying and compressing many articles of food into compact packages; and out of this want has grown the large business of hermetically sealed cans and desiccated vegetables. We derive the benefit of cheaper food from the unfortunate necessity that then prevailed of sending rations to the army. Some of the leading inventions in the application of electricity to the explosion of torpedoes were made in the interest of war, and in times of peace we apply the principle to the work in mines, to all blasting and engineering problems, and should have great difficulty to get on without this powerful agent. To clothe and feed a vast army concentrates the talent of the best men upon the question of ways and means, and as soon as the answer is obtained for the army it applies equally well for the nation. How to transport troops and the material of war occasions improvements in the construction of roads and bridges, and in the power to be employed for the purpose. We have as a result better engines, more compact vehicles, cheaper roads, which we obtain as a legacy from troublous times. It is a curious fact that the study of fulminates and percussion powder, without a knowledge of which the needle gun would be of no avail, enables us to make cheaply the cyanides that we require in photography and electro-plating. The inventor of a certain class of fulminating powders could hardly have anticipated to what peaceful uses his discovery would some day be applied.

Necessity is the mother of inventions. Steel guns were a necessity. The Bessemer process, which met with such opposition at the start, relieved this necessity, and the Germans were among the first to profit by it, and the blast furnaces of Krupp were able to furnish the Prussian army with the finest steel cannon that had been produced in any part of the world, and when the time came for converting warlike weapons into plowshares and pruning hooks, the same steel was employed and its use further extended into railroad iron and all kinds of machinery. It is a fortunate circumstance for Germany that the war of 1866 established the steel industry upon a sure basis and laid the foundation for manufactures that may be the means of saving the nation, in its present emergency, from a disastrous overthrow.

Our thoughts have been led into this channel by the impending struggle between France and Prussia—the two nations from whom we have received some of the most important inventions and grandest discoveries of modern times. What influence this unfortunate war may have it is impossible to predict. If it were to continue for a considerable length of time, so as to divert the studies of the scholars and practical men of both countries into devising some measures for surmounting the obstacles imposed by the war, we could not fail to hear of important discoveries. It is a severe ordeal for them to pass through, and all of us would be willing to take the chances of peace for providing us with all that we require, rather than that the people of those countries should be made to suffer; but now that the war has begun, and no influence of our Government can prevent it, it becomes an interesting question to watch for the inventions and discoveries likely to grow out of it. As nearly every able-bodied man is in the army, the crops, if reaped at all, must be gathered by improved agricultural implements. The farmer must learn how to make for himself many things that he formerly obtained by exchanging the produce of his farm. Every class of society will be injuriously affected, and to keep out starvation and want will call into exercise the dormant energies and powerful intellect of both nations. It is a melancholy spectacle, and fraught with serious consequences, and no possible discovery or invention can compensate for the loss of blood and treasure that must follow in the path of such a war.

PAPER MONEY VS. GOLD.

Men are prone to be dissatisfied with what they have, and to desire that which they have not or cannot have. In accordance with this peculiarity of human nature, our present currency has been denounced with great bitterness as being filthy trash undeserving the name of money, and as unfit for the purposes of commerce. Commerce, however, seems to have got along very well with it. It must be granted that it has its inconveniences. One is often forced in accepting a stamp to accept with it a singularly adherent and vile smelling accumulation of desiccated lager, gin, soda-water, fruit juice, perspiration, etc., which it has gathered in its travels through horse-cars, and hotels, back slums and brothels, bars, and the filthy paws and pockets of boot-blacks.

Dirt and counterfeit imitations are the worst drawbacks of paper currency. But it has its conveniences as well as inconveniences. Its portability and the fact that when worn it can be exchanged for new currency without loss are qualities which specie currency—for which there has been so much clamor—does not possess.

We have been led to these remarks by an article published in an English cotemporary in regard to the gold currency of England.

This journal asserts that the sovereigns of the British mint become so worn in fifteen years as to be too light for circulation. At that time, it says, they should go into the crucible. But this loss in weight is not an apparent loss, but a real and unrecoverable loss of the precious metal.

The journal referred to (*Mechanics' Magazine*) has made a calculation that to make this loss good and keep the currency at a standard value it would be necessary to renew it at the rate of eight millions per annum, while the speed of reproduction of the mint is only five millions annually. It argues from this that the final destruction of the gold currency as legal money is certain, unless prevented by a greater issue of paper currency.

There is no denying these facts, and there is no dodging the inference that paper currency is to be the money of the future, not only in this country, but abroad.

The article referred to goes on to show that although the gold coin has been supposed to be the currency of English commerce, yet that paper money built every town and village in Scotland, constructed all its docks, harbors, roads, factories, and public works, opened its mines, and reclaimed much of its soil from barrenness.

The question now arises whether a specie basis for the increased paper currency demanded by the commerce of the world can be secured. We are inclined to think not, and also that such a basis is neither necessary nor so desirable a one as government credit. We do not, however, intend to discuss this question. The facts to which we have called attention are, however, so significant of the tendencies of the time in regard to money that they are worth more than a passing thought.

THE SALE OF EXPLOSIVE ILLUMINATING FLUIDS.

We have much in this country to be ashamed of as a nation; but of all the things tolerated which daily disgrace us, the permitted sale of articles of a dangerous nature by those conscious of the danger, to the ignorant and unconscious, is one of the most crying of our many sins against civilization.

How much longer are we going to allow dishonest and unscrupulous rogues to deal with death in the shape of burning fluids? Scarcely a week passes but news reaches us of some person or persons—generally women or children, or both—dangerously or fatally burned by an explosion of the vapor, or the instant combustion of something of this kind, consequent upon the fall of a lamp or some other familiar cause.

We have now before us documents sent by Wm. H. Coleman, of Geneva, N. Y., which indicate that fluids of a dangerous character are not only extensively vended in that town, but that probably in most of the towns and villages of the United States these death-dealing agents find their way, if not regularly, at least with sufficient frequency to amply account for the numerous accidents reported.

A Western manufacturer has, according to these documents, been making and vending an article known as the "Danforth Petroleum Fluid," in the use of which serious accidents having occurred, the fluid was submitted to Professor Towler, of Geneva Medical College, for test. That gentleman found that this fluid contained naphtha, and that it was "highly explosive, not only when treated with oxygen, but also when its vapor is mixed with common air, which vapor is given off at ordinary temperatures."

Mr. Coleman adds: "This evaporation goes on rapidly. A lady who had used the fluid told me that she once set away a lampful for company use, and on bringing it out again but a spoonful or two was left. It will be observed, by the way, that the fluids burns twice as fast as kerosene, so that a gallon actually costs eighty cents."

Among the various tests made by Prof. Towler's is one that on account of its simplicity might well be practiced by all users of petroleum oils. It is described by him as follows:

"Level a piece of glass (two inches square, for instance), on the top of a bottle, and pour a little kerosene on the middle and let it spread. If the kerosene is pure (properly rectified) it is impossible, with a burning match to kindle the thin layer of this into flame, as long as the glass itself is not mad hot."

With the fluid under consideration a flame was produced long before the match came in contact with the thin layer of fluid beneath.

We are informed that the establishment which makes this fluid employs 1,000 men, and has 700 offices.

Now, all we have to say about its proprietor is, that if the facts stated about the commodity are true, it is time a vigilance committee was organized to rid the world of such an unprincipled swindler. When they have done with him they might continue their labors in other directions to public advantage.

Mr. Coleman has been at the pains to collate some facts in regard to the treatment of naphtha fluids by insurance companies, and finds a wide difference in their rules upon this important matter. As this is a subject of general interest, we copy his summary:

"The 'Etna,' of Hartford, Conn., says nothing; the 'Hartford' gives 'written permission' for storage of petroleum, naphtha, benzine, etc.; so do the 'Security,' 'Niagara,' 'Manhattan,' and 'North American'—all of New York. The 'Continental' does allow fluids (otherwise forbidden) to be used as lights. The 'Springfield' (Mass.) imposes an additional charge on buildings where camphene, spirit gas, burning fluid, phosgene, or any other inflammable liquids are used for lights; and forbids the storage of gunpowder, crude coal oil, naphtha, and benzine without written permission. The 'Home Insurance Co.' (N. Y.) is the only one that approaches the right ground. Its policy says: 'If the assured shall keep gunpowder, fireworks, nitro-glycerin, phosphorus, saltpeter, nitrate of potash, petroleum, naphtha, gasoline, benzine, benzole, or benzine varnish, or keep or use camphene, spirit gas, or any burning fluid or chemical oils, without written permission in this policy, then in every such case this policy shall be void. Kerosene oil, however, *may be used for light* in dwellings, and kept for sale in stores in quantities not exceeding five barrels—to be drawn by daylight only.'"

We agree with Mr. Coleman that the "daylight" clause is only necessary where the fluids stored are such as ignite below the legal standard of 110° Fah.

IMPORTANT TO MANUFACTURERS AND IMPORTERS.

The law respecting trade-marks, forming part of the new patent system, makes special provision for the protection of "any lawful trade-mark" to the exclusive use of which any person or firm domiciled in the United States, and any corporation created by the authority of the United States, or of any State or territory thereof, or any person, firm, or corporation resident of or located in any foreign country which affords similar privileges to the United States, are entitled, or which they intend to adopt and use for exclusive use. Such trademark protection can be secured in the Patent Office by the parties entitled to such protection, they having to furnish six copies of the proposed trade-mark, together with such statements and descriptions as are necessary to make the nature of the class of merchandise to which the trade-mark is applied and other minor items fully understood. Such trade-mark remains in force for thirty years,and can be renewed for thirty years more. The official recording fee is twenty-five dollars, that for extension being the same. At present only residents of France and Russia will enjoy the same privileges, under this law, as residents of the United States, but it is to be hoped that other countries, especially England, will soon afford similar protection to foreigners, which will entitle their citizens to the benefit of this act. All manufacturers and importers of special goods will find it to their advantage to improve this opportunity for protecting their articles of manufacture and merchandise. They will thereby obtain an honest monopoly and security against fraudulent or unscrupulous competitors.

Our Patent Agency is prepared to furnish the necessary documents, descriptions, oaths, etc., required for securing trade-marks, and to give advice on the subject to applicants on the most liberal terms. A pamphlet about being published by us gives full directions on the subject. Address Munn & Co., 37 Park Row, N. Y.

VISIT TO THE DELAMATER IRON WORKS, NEW YORK.

Last December, was announced in this and other journals an almost, if not quite, unprecedented feat of naval construction, namely, the designing, building, and launching of thirty gunboats in four months' time, by a single establishment, the Delamater Iron Works, situated at the foot of West Thirteenth street, New York. Yet even this did not fully tax the capacity of the works, which, we are informed, could turn out one hundred such vessels, completely equipped for sea, in six months, should occasion demand it.

As may be supposed, an establishment of this kind is well worth a visit from any who are interested in marine engineering. It would, however, be a mistake to suppose these works exclusively confined to this department of engineering. In a recent visit we were surprised to find a much larger variety of work in progress than we had supposed was usual in this establishment. Upon inquiry we were informed that the works have quite a number of specialties, upon which they are constantly running, other than the manufacture and repair of marine boilers, engines, screw propellers, etc.

A brief enumeration of these specialties, as showing how much can be profitably done by skillful organization of inventive talent, financial ability, and labor, may not prove uninteresting to our readers.

These are the most extensive marine-engine works in the United States. When running up to their full capacity they employ a force of 2,500 men in the various departments. They employ, we are told, a larger force of constructing engineers than any other establishment in the country. These engineers are men of high ability, working under one general supervision, bringing to bear variety of experience, in all departments, upon the mechanical problems which constantly arise in the construction of novel and experimental machinery, in which branch these works have acquired a high reputation. This wide range of talent and experience particularly adapts this establishment to the development of new ideas and devices, as it gives full knowledge of all mechanical resources depending upon character of materials or peculiarities of construction. Any piece or set of machinery of whatever size or character can be designed and constructed here throughout.

Among the specialties which form the staple of the work performed, we may mention the Delamater Propeller Wheel, extensively and favorably known in every part of the world. These works were the first to build propeller engines in this country, and have ever since ranked first in this branch of business.

Several kinds of stationary engines are also manufactured, one of which, the horizontal Rider Governor Cut-off Engine, was described recently in these columns. Two styles of these engines are built, one of long stroke and high finish, designed for such as wish a handsome, showy engine, and one of short stroke, for such as wish economical power. The working parts are alike in both styles, the only difference being in length of stroke and finish. Great pains were taken to develop and perfect this engine before putting it into market, and the result is shown in a valve gear that, possessing a degree of delicacy which renders it a formidable competitor to the very best engines in market, still is so simple as not to prove troublesome where high skill in its attendance is unattainable.

Another specialty is Bacon's Trunk Engine, for stationary, marine, and hoisting purposes, which combines durability, compactness, and cheapness in a very high degree. It is claimed that these engines occupy less space in proportion to power developed than any other engine in use.

Another specialty, occupying an entire floor in these works, is the manufacture of Captain Ericsson's Caloric or Hot-air Engines. These engines are well and widely known as the most economical of small motors, occupying little space, requiring no water and scarcely any attention in running, and being entirely free from any danger of explosion. The number of these engines in process of construction indicates an extended demand for them, which we were wholly unprepared to credit previous to our visit to these works.

Experiments in new motors are in progress, with good prospects of successful issue, which, when accomplished, will be laid before our readers.

Still another specialty is the Reynolds Hoisting Machine, driven by friction gearing instead of toothed gearing, which, besides being exceedingly convenient to attach and detach from the main shaft, may be run at greater velocity with a heavy load than is possible with toothed gearing.

Besides these most prominent branches of manufacture, are manufactured and put up mining and pumping machinery of the most improved construction, and telo-dynamic machinery for transmitting power to great distances by means of wire rope. The value of this method of transmitting power is becoming daily more generally known, and as a consequence the demand for machinery of this class is constantly increasing.

All these varied and extensive branches of work are conducted in a quiet, efficient manner, which speaks volumes for the directing and organizing skill of the head of the establishment.

Any of our readers who desire a more minute description of the various specialties to which we have alluded, may, we presume, obtain it on application at the works, where they will find a corps of accomplished engineers ready to advise them on any subject connected with the mechanic arts.

SPONTANEOUS GENERATION.

There are reasons why even the most accurately performed experiments, even if they result apparently in the spontaneous appearance of living organisms, should be regarded with doubt, so far as they are assumed to sustain the theory of spontaneous generation.

We do not at this time, however, propose to discuss these reasons. Our purpose is to review an account of some very remarkable experiments performed by H. Charlton Bastian, as described by him in the columns of *Nature.*

We have not space to discuss these papers at length, as they occupy a considerable portion of several numbers of the periodical referred to. We shall confine ourselves exclusively to the experiments and their results, which were of the most remarkable nature.

It is generally agreed among biologists that living organisms will withstand a much higher degree of heat in dry air or a vacuum than in a liquid medium.

From the experiments of Pasteur, Balbiani, Berthelot Broca, Brown-Sequard, and many others, it has been fully determined that a temperature of 130 deg. C., equal to 266 deg. Fah., in dry air or *vacuo*, is sufficient to destroy all vital action; and that 100 deg. C.—212 deg. Fah.--is sufficient to destroy the eggs and germs of such organisms as are found in infusions as well as their spores and germs.

Mr. Bastian started upon his experiments with the idea that it would be possible to so modify the celebrated experiments of Schwann that the conditions would be more satisfactory to the evolutionists, and at the same time not less in accordance with the views of the panspermatists.

He says: "The withdrawal of all air from the flasks in which the boiled solutions were contained, rather than the admission of calcined air, seemed to be the kind of modification which was desirable. Then the contamination of the boiled fluids with possible atmospheric germs would be as effectually provided against as it air had been only allowed to enter after it had been calcined, and the seemingly obvious advantage would be attained that there would be even greater freedom than usual for the commencement of evolutional changes, on account of the diminished pressure upon the fluids contained *in vacuo.* It was presumed, also, that changes might go on for a certain extent before the evolution of gases had been sufficient to exercise such a repressive influence as to prevent their continuance."

The flasks employed were capable of holding about two ounces of fluid. These proved to be quite large enough, and their small size made it easy to manage the whole process with a very slight amount of assistance. After each flask had been thoroughly cleaned with boiling water, three-fourths of it was filled with the fluid which was to be made the subject of experiment. With the aid of a small hand blow-pipe and the spirit-lamp flame, the neck of the flask, about three inches from its bulb, was then drawn out till it was less than a line in diameter. Having been cut across in this situation, the fluid within the flask was boiled continuously for a period of from ten to twenty minutes. At first ebullition was allowed to take place rapidly (till some of the fluid itself frothed over) so as to procure the more thorough expulsion of the air; then the boiling was maintained for a time at medium violence over the flame of a lamp, whilst the greatly attenuated neck of the flask was heated in the flame of a spirit-lamp placed at a corresponding level. The steam for a time poured out violently into the flame of the spirit-lamp; and whilst the assistant turned down the flame of the lamp so as to diminish still further the violence of the ebullition, a blow-pipe flame was directed upon the narrow orifice of the neck of the flask, which sealed it hermetically. Immediately that the orifice was closed, the heat was withdrawn from the body of the flask.

Mr. Bastian believes that an almost perfect vacuum can be obtained in this way, but in case the vacuum should not prove to be perfect, he thinks "there would not be any material abatement from the severity of the conditions which the panspermatists have a right to demand. If, on the one hand, absolutely the whole of the air had not been expelled from the flasks during the process of ebullition, what remained would necessarily be mixed up with a very much larger quantity of continually renewed aqueous vapor, and the effect would probably be that any living things would be just as effectually and destructively heated as if they were lodged in the boiling solution itself; whilst if, on the other hand, the boiling had been arrested for one or two seconds before the complete closure of the almost capillary orifice at the mouth of the flask, even if any air entered, it would have had first to pass through the blow-pipe flame, and then through the white-hot capillary orifice—it would, in fact, have been calcined as in Schwann's experiment."

The flasks thus prepared were then suspended beneath the mantelpiece in Mr. Bastian's study, and kept at a temperature of from 75 to 86 degs. Fah.

Several sets of experiments were performed. In one set the fluids employed were raised to a temperature of 300 degs. Fah., considerably above the limit at which all vitality is, according to the experiments above referred to, destroyed.

The infusions and solutions employed were all filtered previous to being placed in the flasks. They were beef juice, vegetable infusions, mixed animal and vegetable infusions, and saline solutions. Some of the infusions had a distinct acid reaction. In some of the flasks no life appeared, but in a large majority, even those heated and kept for some time at a temperature of over 300 degs. Fah., a variety of living organisms were found.

We have not space to definitely review each of the large number of experiments performed. We shall confine ourselves to a few of the most striking and important. Those who wish will have the opportunity to peruse an account of them at length in a book, shortly to appear, entitled "The Beginning of Life."

A flask containing an infusion of hay, together with a few grains of phosphate of soda, *in vacuo*, which had been hermetically sealed seventeen days previously, after the fluid had been boiled, was opened on January 25, 1870.

The fluid itself was not turbid or cloudy, though it had become darker in color. The bottom of the flask was irregularly lined with granular and slightly flocculent material.

On microscopical examination of two or three drops, there were seen many actively moving monads; some bacteria of medium size; many quite irregularly-shaped particles in active movement; many flattened bits of protoplasmic-looking material with irregular and slightly curled edges, slowly moving, and ranging in size from 0·0001 of an inch to 0·0002 of an inch in diameter (other masses of this kind were distinctly hollow though mostly irregular in shape); and lastly there were several large irregular masses of fibres, the nature of which could not be determined.

A flask containing a solution (neutral) of crystallized white sugar, tartrate of ammonia, phosphate of ammonia, and phosphate of soda, *in vacuo*, which had been hermetically sealed nine days previously, after the fluid had been boiled for twenty minutes, was opened on January 4, 1870.

Before the flask was opened the solution itself was clear and without the least trace of a pellicle on its surface, though for the last three or four days a very fine deposit was seen on certain parts of the bottom and sides of the flask.

When examined microscopically, a very few monads and bacteria were found in the first few drops of the fluid, which had been poured out before the whole was shaken. The remainder was then poured into a conical glass, and after having been allowed to stand for a time, the supernatant fluid was removed, and the last few drops containing the sediment were examined. In this were seen many bacteroid particles and monads of different sizes, exhibiting the most active movements.

The following experiment, with which we shall conclude this review, was one of a set performed with strong tubes, in which not only so perfect a vacuum was produced as to render them good water hammers, but in which the fluids were raised to 307·4 degs. Fah., and kept so heated for *four hours:*

A tube containing the infusion of turnip was opened at the end of the twelfth day, when it was found that the fluid had been changed to a decided, but light brown color, and there was some quantity of a blackish brown granular sediment at the bottom, though the solution was free from all deposit when placed in the digester. After this tube was suspended in the warm place, as the others had been, it remained in the same position till it was taken down to be opened. A slight scum or pellicle was observed on the surface—covering this partially—on the sixth day. During the succeeding days it did not increase much in extent, though it became somewhat thicker. Although very great care was taken, still the slight movement of the flask, occasioned in knocking off its top, caused this pellicle to break up and sink to the bottom.

The contents of the flask emitted a somewhat fragrant odor of baked turnip, and the reaction of the fluid was still slightly acid. On microscopical examination, there was found very much more granular *débris* of a brownish color, which probably represented the brownish sediment seen when the tube was removed from the digester. There were, also, a very large number of dark apparently homogeneous reddish brown spherules, mostly varying in size from 0·000133 of an inch to 0·000005 of an inch in diameter, partly single and partly variously grouped; the nature of these was doubtful, though they were probably concretions of some kind. There were also other indeterminate flat and irregular masses, which seemed more to resemble protoplasmic substance in its microscopical characters.

In addition, many irregular and monad-like particles were seen in active movement, though there were no distinct bacteria. Several rod-shaped bodies 0·0005 of an inch in length were seen, however, resembling ordinary bacteria, except that they were unjointed and motionless. In one of the drops examined there was a delicate tailed monad in active movement—a specimen of *Monas lens*, in fact, 0·0001464 in diameter, having a distinct vacuole in the midst of the granular contents of the cell. Another ovoid body was seen, about the same size, without a tail and motionless, though it contained two nuclear particles within.

These experiments are doubtless destined to renew with vigor the battle of the panspermatists and the heterogeneous evolutionists. They are remarkable both on account of the extreme accuracy with which they appear to have been performed, and for the results obtained.

THE ORANGE JUDD HALL OF NATURAL SCIENCE.

The gift of Orange Judd, of this city, one hundred thousand dollars to the Wesleyan University, at Middletown, Conn., to found a Museum of Natural History, and a school of chemistry and technology, is one of the noblest benefactions of modern times.

A few years ago Mr. Judd was a student at that college. He was a poor boy, and compelled to make his way in the world, and encounter at the outset the difficulty of finding any school in which to study the natural sciences. With rare industry and perseverance he has been able to overcome all of these obstacles, and to create for himself a fortune that he now seems disposed to devote to the good of his fellow-men.

The Museum and Laboratory is 62 feet front, and 94 feet deep, and is practically five stories high, as the basement is mostly above the surface. It is built of Portland sandstone, and is essentially fire proof, as the cornices, doors, and window frames are of iron, and the roof of slate, and an iron and brick floor, supported on brick and iron pillars and walls, completely shuts off all fire communication between the chemical department in the first story and basement, and the natural history and cabinet rooms above. The window sashes are the only wood work exposed to fire from without, and the building is 76 feet distant from any other.

The internal arrangement of the building is in accordance with the experience of the best experts in the county.

The President of the College, Dr. Cummings, Professors Johnston and Rice, in company with Mr. Judd, and the architect, Mr. Rogers, visited the laboratories of Yale, Harvard, Columbia, Brown, and Amherst Colleges, and after consultation with the professors of these institutions, decided upon the details of construction, and the result has been the most complete museum and laboratory to be found in the county. Such a school cannot fail to greatly add to the usefulness of the Wesleyan University, and it is to be hoped that the alumni of the College, inspired by Mr. Judd's noble example, may be led to contribute the necessary funds towards founding the professorships required by an efficient department of natural history and technology.

SCIENTIFIC INTELLIGENCE.

TO DETECT LEAD IN DRINKING WATER.

Mr. Wm. H. Chandler, of the Columbia School of Mines, remarks, for the determination of small quantities of lead, to evaporate the water with about two fluid ounces of an acid solution of acetate of ammonia—this reagent prevents the separation of the sulphate and carbonate of lead during evaporation. After concentration any iron and lime salts that may fall down can be removed by filtration. If any lead be present it can be precipitated in the usual way by sulphureted hydrogen, and may afterwards be converted into the sulphate of nitric and sulphuric acids.

ANALYSIS OF SUGAR CANE.

It is now universally conceded that plants obtain their mineral constituents from the soil, and what these constituents are can be accurately determined by chemical analysis. Unless the mineral matter removed by the crops be from time to time replaced, the soil will be exhausted, and no further produce can be raised upon it. On this account every new analysis of the ashes of corn, wheat, tobacco, or other crop, is of value, and M. Popp has rendered a service by examining different varieties of sugar cane in a more careful manner than has hitherto been done. He finds the fresh sugar cane stripped of its leaves to be composed as follows:

	America.	Middle Egypt.	Upper Egypt.
Water	72·22	72·05	72·13
Cane sugar	17·80	16·00	18·10
Glucose	0·28	2·30	0·25
Cellulose	9·30	9·30	9·10
Mineral salts	0·40	0·35	0·42
	100·00	100·00	100·00

The ashes of the American sugar cane and leaves showed the following composition.

	Ashes of sugar cane.	Ashes of the leaves.
Potash	7·66	10·65
Soda	6·45	3·26
Lime	12·53	8·19
Magnesia	6·31	2·45
Oxide of iron	0·56	0·85
Silica	43·75	65·78
Phosphoric acid	5·45	1·25
Sulphuric acid	16·53	2·18
Chlorine	0·21	1·65
Carbonic acid	0·00	3·55
	99·75	99·81

It would be easy to compute from these analyses the amount of potash, soda, silica, etc., removed by a tun of sugar cane, and also o ascertain what kind of soil is best adapted for the grow h of such a crop. The plant by its vital force is able to secrete carbon, oxygen, and hydrogen in just the proper proportions to form cellulose and sugar. It is certain that we can control the growth of the stalk by the abstraction or addition of mineral matter to the ground, it would be an equally important discovery if by some practical addition and subtraction of carbon, oxygen, and hydrogen, one could increase or diminish the percentage of sugar at will. In this age of synthesis such a discovery does not appear to be impossible, and we may some day have conservatories for the sugar cane into which gases can be pumped, and the yield of sugar be varied at will.

NEW SOURCES OF RUBIDIUM AND CAESIUM.

Mr. E. Sonstadt has found these rare metals in a number of new substances. If oxalate of ammonia be added in excess to sea water, and the well-washed precipitate ignited, moistened with nitric acid, and examined in the spectroscope, the *a* lines of rubidium and caesium will be distinctly visible in the spectroscope. The same water evaporated to dryness and examined in the usual way will show no trace of these lines, hence the value of testing with oxalate of ammonia previous to evaporation. The presence of the rare earths in sea weeds naturally follows after their detection in the salt water, and the author had no difficulty in finding them.

Various sea shells, and the lime obtained direct from sea water showed at once the rubidium and caesium lines, and the same is true of marine lime stones. The alkalies, rubidium and caesium can no longer be styled rare, since even in a few grammes of sea water they can be more easily recognized than bromine or iodine. The next point in the investigation is to ascertain to what useful purposes they can be applied.

PREPARATION OF BROMIDE OF SODIUM ON THE LARGE SCALE.

M. Castelhaz, a manufacturing chemist, states, in the first place, that, according to the communications received by him from several physicians who have applied bromide of sodium in their practice, instead of bromide of potassium, the efficacy of the former is far greater than that of the latter. As regards the preparation of this salt, the author says: "The best plan is to prepare first, bromide of ammonium, by causing bromine to fall drop by drop into dilute, but pure, liquid ammonia contained in a series of Wolff's bottles, in order thus to prevent the loss otherwise inevitably resulting from the volatilization of the products formed by the great heat disengaged on the bromine and ammonia uniting. The liquids, after saturation, are evaporated in a cast-iron retort, to which an earthenware receiver is fastened, wherein are collected the vapors of water, any excess of ammonia, and some bromide of ammonium, which is accidently carried over. The bromide of ammonium thus obtained is converted into bromide of sodium, by being mixed with pure carbonate of soda, and the application of sufficient heat to volatilize and sublime the carbonate of ammonia formed by the reaction. This mode of preparation yields after re-solution of the bromide in water, and evaporation similar to that used for chloride of sodium, perfectly pure and anhydrous bromide of sodium."—*Chemical News.*

NEW METHOD OF ESTIMATION OF GRAPE SUGAR.

Mr. K. Knapp's new method is based upon the fact that an alkaline solution of cyanide of mercury is completely reduced to the metallic state by grape sugar. The method is executed as follows: 10 grms. of pure and dry bicyanide of mercury are dissolved in pure distilled water; to this solution are added 100 c. c. of caustic soda solution (sp. gr., 1·145); and, next, as much distilled water is added as will be required to make a bulk of 1,000 c. c. A series of experiments made by the author brought to light the fact that 400 milligrms. of cyanide of mercury are, when in alkaline and boiling solution, completely reduced to metal by 100 milligrms. of pure grape sugar. The titration is done as in Fehling's method—40 c. c. of the alkaline cyanide solution are boiled in a porcelain basin; and the sugar solution (not stronger than about half a per cent) is added until all the mercury is precipitated. In order to test the course of the operation, a single small drop of the fluid is put upon a Swedish bit of filtering paper stretched over the mouth of a small beaker-glass, while the bottom of that glass is covered with rather strong sulphide of ammonium. As long as any cyanide remains undecomposed, a brownish spot will appear. The author states that, with a little practice, even 1·10th c. c. of the above dilute sugar solution can be readily estimated.—*Chemical News.*

METHOD FOR RENDERING WOOD DIFFICULTLY COMBUSTIBLE, AND FOR PRESERVING IT WHEN UNDERGROUND.

The wood, says Dr. Reinsch, which must not be planed, is placed for twenty-four hours in a liquid composed of 1 part of concentrated silicate of potassa and 3 parts of pure water. After having been removed from this liquid, and dried for several days, the wood is again soaked in this liquid, and, after having been again dried, painted over with a mixture of 1 part of cement and 4 parts of the liquid above alluded to. After the first coat of this paint is dry, the painting is repeated twice. Of the paint mixture alluded to, two large quantities should not be made up at once, because it rapidly becomes very dry and hard. Wood thus treated is rendered uninflammable, and does not decay underground.—*Chemical News.*

The Bloomfield, N. Y., Gas Well--Testing the Quality of the Light.

The possibility of obtaining, in many places, a supply of natural gas directly from the rocks, not only adequate in quality and quantity for illuminating purposes, but also as a fuel in its most perfect form for driving machinery on the grandest scale, seems about to be realized. The village of Fredonia, in this State, has been lighted chiefly with natural gas for many years. At Erie, Penn., twelve different gas wells are now pouring out their inexhaustible stream of gaseous fuel—one of them driving a large flouring mill, supplying the heat to the boilers, formerly obtained at the expense of ten tuns of coal daily, and furnishing, besides, all the light needed, while another well yields enough to propel the pumping engines of the city water works. Some of the wells at Erie have been in use for several years. Our readers are, no doubt, aware that the wonderful gas fountain in West Bloomfield, Ontario Co., which for the last five years has been an object of so much curiosity and scientific research, has more recently become a matter of importance as a most valuable source of light and heat, capable of being speedily utilized. The project of supplying Rochester with this gas is seriously entertained. About a year ago a company of the most respectable and wealthy gentlemen of Elmira purchased this property with a view of turning it to some valuable account.

To satisfy themselves of its true value and of the uses to which the gas might be most profitably applied, Prof. Lattimore was engaged by the company to make a scientific investigation of the chemical qualities of the gas, and also to ascertain the daily product. His investigations, which were commenced some weeks ago, at once indicated a gas of a high degree of purity, and especially free from those qualities which are so objectionable in ordinary coal gas. The volume of gas issuing daily from the well proved to be surprisingly great; it is enormous, far exceeding the quantity produced by any other well in the world. Prof. Lattimore has made a second visit to West Bloomfield this week, spending two days at the well for the purpose of completing his investigations. The illuminating quality of the gas—its candle power—was the special subject of investigation. This was determined by a series of most rigid experiments by means of the most delicate and highly improved photometrical apparatus known to gas engineers. These interesting tests were witnessed by a large number of the stockholders, all of whom expressed their delight and surprise at the unexpectedly favorable results obtained.

The Exposition of Textile Fabrics at Indianapolis.

The Indianapolis journals comment favorably upon the exhibition of textile fabrics now open in that city. From Ohio, Illinois, Iowa, Kentucky, Minnesota, Indiana, and other States manufacturers have come, bringing with them samples of cassimeres, tweeds, jeans, blankets, flannels, and other woolen fabrics that are all that can be desired. There are some lots of goods on exhibition which in point of excellence of material and finish excite the admiring comments of all who examine them. There are cassimeres and flannels that are just as good as can be manufactured abroad, and much better than nine-tenths of our own people believe can be made in our home mills. And yet it is done, and the people have not yet discovered of what great value our home manufactures are, and what an immense wealth they will shortly represent. These expositions of goods being daily manufactured, gotten up by the Woolen Manufacturers' Association are having the effect to make more generally known the worth and quality of the fabrics they make, and through their influence we predict that it will not be long until our citizens become aware of the fact that it is not necessary to import from the "old country" their cloths, cassimeres, flannels, etc., when they can get as good if not a better article of home manufacture. It is not long since that the manufacture of jeans and linsey in this country was considered the acme of cloth-making on this side of the Atlantic.

Not alone to woolen fabrics is this exposition confined, but from the far South, from South Carolina, Alabama, Georgia, and other Southern States, come manufacturers to exhibit what they are doing there in making cotton goods. We find on exhibition sheetings, shirtings, and drills that are as good as we get from the Eastern factories. This in itself shows that a new spirit of enterprise has found position in the hearts of our people.

How Icebergs are Formed.

Mr. Dunmore, the photographer who accompanied the Bradford art expedition last year to Greenland, publishes in the Philadelphia *Photographer* a very interesting description of the appearance of Greenland, its glaciers, etc. He says:

"The glacier comes moving slowly down from the mountains, a great river of ice, thousands of feet deep, sometimes ten miles wide, to the fiord or bay at the foot of the mountain. The Alpine glaciers roll down into the warm valleys, and there, warmed by the sun, melt away like a piece of wax before a candle, and form brooks and rivers. But in Greenland they cannot do that, it is too cold. Therefore, as the ice at the mouth of the glacier is pushed forward to the water's edge, it must break off in pieces and fall in; and such pieces are icebergs. When they break off, the glacier is said by the natives to 'calve,' or an 'iceberg is born.'

"I can give you no idea of what a beautiful sight it is to see an iceberg break off; but we, who have seen it, will never forget it. Think of a mass of ice as big as the space of ground covered by the city of Boston, falling into the sea, and of the tremendous crash that occurs when it breaks away from its fellows, and they give it a parting salute as they groan and growl their last farewell. Now see the waves leap up forty feet into the air, washing and lashing the glacier with spray, and sweeping everything away not strong enough to bear the shock; then watch the new-born berg as it rocks in the sea like a huge porpoise, up and down, dropping here and there portions of itself, which dive down and reappear in all directions, and you can imagine faintly what it is to see a glacier 'calve an iceberg.' It is a long time before the trouble of the waters ends, or before the new-born babe ceases to be rocked, and is still enough to have its picture made. It is a sight one never tires of.

"The next day our party started to go on top of the glacier. It was very hard to get on to with our cooking utensils and photographic traps, it was so very steep. We traveled six miles on the top of it. The sight was grand from there. It was about two miles wide, and the length of it we could not tell, as it was hundreds of miles. The depth of it was from five hundred to eight hundred feet. We made a few pictures, ate our dinner up there, and then started back."

A Mountain Railroad.

Mr. H. J. Kerr Porter thus describes in the London *Times* his ascent by the Rigi Railway: "A wagon laden with about a tun and a half of timber prepared for sleepers was ready, and on this twenty-five passengers took their seats, and we started, propelled by the engine, which is of peculiar construction. In twenty minutes we traversed 4,700 feet, and were about 1,170 feet above the level of the lake from which we had started. We found thirty-three men at work laying down sleepers and rails; the transverse sleepers are six inches wide by four inches; the ordinary rails are bolted to those sleepers, which are two feet apart, and at six inches outside the metal rails, longitudinal beams six inches by six inches are bolted to the sleepers; in the center a metal rail is firmly bolted, in which there are openings to receive the cogs of the center wheel of the engine, which revolves with the axle, the steam power being applied to a cog wheel on each side, at equal distance from the ordinary wheels and the center one above described; the brakes are applied to the ordinary wheels, which are like the wheels of any carriage, and are about two feet six inches in diameter. The boiler and furnace are not placed horizontally, as is usual, but stand upright, having while on a level, a considerable incline forward; when ascending the mountain the boiler is consequently quite perpendicular, and the floor of the tender perfectly level, the tender and engine being in one, and supported by the four small wheels, one of which I have described above.

Economy in Railway Management.

Economy, in its true sense, seems to be very imperfectly understood; at least those who undertake to practice it take widely different views in regard to what they consider economy. What some would consider economy would be called wasteful extravagance by others. There are many managers, with a reputation as first-class business men, who entertain false notions in regard to economy. Such are those who seem to consider economy to consist in hoarding every dollar they get hold of, and never paying one out until it is *absolutely necessary*—in fact, to hang on to it with the grip of a miser.

It is no economy to save a dollar if it costs five dollars to do it; yet there are many who practice this sort of saving and call it economy. Perhaps there are no more shrewd business men in the country, as a class, than our railroad managers; yet, although they are usually men of sound judgment, they frequently err in regard to the practice of economy.

It is the practice with many, on roads running through timbered portions of the country, where wood is the only fuel used, to purchase soft wood, as it can be had for considerably less per cord than hard wood. Of course they do not do this with the idea that a cord of soft wood will make as much steam as a cord of hard wood; but they fail to make correct estimates of the difference in the real value of hard and soft wood. Some very nicely conducted experiments have shown that soft wood is the most expensive compared with hard wood; that is to say, the difference in the price of the two kinds of wood is not in proportion to their steam-making qualities, the difference, as prices generally range, being in favor of hard wood. And even if this were not the case, it takes a much larger quantity of soft wood to perform the same amount of traffic, and of course the hauling is more expensive, and on many roads the same price is paid for sawing.

All things considered, the *cheap* wood is the most expensive. It would be well for the railroad community if the results of experiments testing the steam-making qualities of the different kinds of wood were published. Then a price could be established, taking certain kinds of hard wood as a basis, and in this way we would be sure at all times to get the full value of the money expended.

There is a great deal of "economy" practiced in the purchase of all kinds of railroad supplies, and in this matter the railroad men of the country have, to use a common expression, "beaten themselves." As soon as manufacturers discovered a disposition on the part of railroad men to get the cheapest article in market, they commenced the manufacture of inferior goods, and this has been practiced to such an extent that it has become a difficult matter to get a genuine article of any kind on the whole list of railroad supplies.

A few days since the writer passed over a railroad in one of the Western States, and happening to meet an old acquaintance who is an engineer on the road, he received and accepted an invitation to take a ride on the engine. As it was some minutes before his train was to leave we took a walk about the station. In the course of the walk he stopped suddenly and picked up a piece of broken link, which operation I noticed with considerable curiosity. He noticed that I watched him with some interest, and said, "What do you suppose I am going to do with this piece of old iron?" I remarked that I did not know, unless it was to save it. He smiled and said, "That was it exactly." He was going to put it on the tender where he had more old iron. He always made it a practice to pick up all the old iron that came in his way that he could handle easily, and when he had a quantity of it on his tender he would throw it off on to some convenient scrap heap. "In this way," said he, "I save tuns of old iron every year that would otherwise be lost. The boys laugh at me, but I don't care for that. "Now," he added, "the company I am running for are sadly in need of more passenger cars, and they are economizing in every possible manner to get means to pay for them. They cut down our wages and reduce the number of brakemen, run the shop short-handed, discharge men off the track, reduce the help at stations, and so on, all for the sake of saving money to buy rolling-stock, when there is property enough in the shape of car wheels, axles, track iron, old springs, and everything in that line lying along the line of the road to pay for a first-class passenger train. There is a place up here a few miles where a whole freight train was wrecked two years ago—thrown off the track by expansion of iron. Most of the running gear is there yet; some of the axles are bent, but I think some of them might be used again. I don't understand why they don't get this stuff together and convert it into cash. It would bring a pile. All along the line there is property of this kind which might be collected with very little expense, and I cannot understand why it is not done." "Yes," he continued, "they are always preaching economy, but they 'save at the vent and waste at the bung.' They measure the oil I use by drops, and furnish a cheap, miserable, nasty stuff at that; they know just how many sticks of wood I burn, and how many ounces of waste or old rags I use. This is all right enough; I find no fault with that. But then they will go and pile six hundred or a thousand dollars' worth of ornament on a locomotive, named after some nabob, and the fireman has to work day and night, and furnish his own emery and acid to keep her looking anyhow. There should be another brakeman on this train, but they can't afford it, although there is useless fancy work enough on this engine to pay a brakeman for a year and a half."

Time was up now, and as he pulled the throttle, he pointed to the tender, and said, with a smile, "There is some more economy—green wood."—*Railroad Gazette.*

DR. R. J. GATLING, the inventor of the celebrated Gatling gun, left for Europe on Saturday, the 6th inst., in the steamer *Italy*.

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. B., of Pa.—It is impossible for us to infer from your letter the cause of the moldy smell pervading your Brussels carpet, as you state there is no dampness to account for it. A practical remedy for the trouble is equally hard to suggest that will not be attended with inconvenience or injury to the carpet. Most things that will destroy mold fungus will injure the colors. The best thing we can think of is carbolic acid, but that is difficult to apply uniformly in so small a quantity as would not also give rise to offensive odor. It is also questionable whether this substance would not affect some of the colors. Perhaps some of our correspondents, under whose notice this falls, may suggest something to help you.

D. L. R. of Ala.—The "anomaly" to which you refer, has been long understood and known, as you will find by reference to works which treat of friction. It generally takes more force to overcome the friction of a body starting from a state of rest, than to overcome the friction after it begins to move. It is supposed this fact is accounted for by the slight indentation of the bearing surfaces while at rest, which does not occur while they are in motion. We have, however, always considered the accuracy of this explanation as questionable.

L. H. B., of Pa., wants some one to invent something in the chemical way that will keep flies out of the house. He draws a most distressing picture of the sufferings of himself and his neighbors this season from these pests, which he says are more numerous than ever before. If he would employ screens, made of mosquito netting for doors and windows, we think he would find them all that he desires. They are very cheap, and we find them here perfectly effectual.

J. J. K., of Wis.—What is meant by fractional distillation is the separation of different volatile liquids from each other by distillation at different temperatures. The most volatile will pass off at certain degree of heat, when the heat is raised to, and maintained at a higher temperature the next in degree of volatility is distilled over, and so on.

J. T. C., of D. C.—The causes of boiler foaming may be classed in two categories. Impurities in the water used, and want of proper extent of water surface to allow the steam to be quietly liberated from the water. It is generally on this latter account that the upright boilers are more apt to foam than horizontal ones.

T. P. B., of Cal.—Zinc will not answer for the sheathing of wooden hulls, because it becomes covered with oxide, and does not maintain a clean, bright surface. When it is attached to the bottoms of iron vessels, however, it acts differently, galvanic action increasing the chemical action, and keeping its surface bright.

E. H., of Ill.—Electricity, when voltaic or frictional, is conducted by the entire thickness of the conductor. The same areas of cross section in conductors of the same materials, will give the same conducting power, no matter what may be the shapes of these cross sections.

H. C., of N. Y.—We do not believe the formation of the insoluble sulphide of lead by means of the use of sulphide of potassium will answer for the pipes of soda water fountains. We think the use of lead for pipes in these fountains should be prohibited unless they are lined with tin.

C. C. C., of Iowa.—We have no doubt that the plant you send us will work into good paper. There are many others that can be so utilized. The question concerning their use is simply one of economy in manufacture.

A. C. C., of Ohio.—Use shoemakers' wax as a preservative for twine that has to be used under water. Melt the wax, and soak the twine in it. Or, soak thoroughly in raw linseed oil, and allow it to dry thoroughly before use.

C. H. D., of N. Y.—No way of separating water from milk that will leave the nutritious ingredients fit for domestic use, has yet been discovered, except evaporation.

J. A., of Pa.—Your method of describing a square within another square, that shall equal one fifth of the larger square, is a well-known solution of an old geometrical problem.

D. C. L., of ——., wishes to learn of some cheap ingredient which, added to coal tar, will add to its drying properties on iron.

D. L. M., of Vt.—Oxygen is undoubtedly greater in quantity than any other elementary substance of our globe.

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.

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.

Recent American and Foreign Patents.

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

WYETH'S IMPROVED PUMP.—A useful adjunct to the kitchen or flower garden, to the farmhouse, or country home, or even to dwellings in towns not provided with water-works,is designed to be provided by a double-acting atmospheric and force pump, for which a patent was obtained through the Scientific American Patent Agency, July 12, 1870. The apparatus may be thus described: Two boxes, an upper and a lower, are arranged in the pump-cylinder,at a suitable distance from each other. Two rods of unequal length, having their lower ends attached to these boxes (the longer to the lower box and the shorter to the upper box), pass upwards through stuffing boxes, in a tightly-packed cap, fitted on the top of the pump cylinder, and are connected at the upper ends by links to the lever, one at each side of its pivot, in such a way as to insure direct vertical action of the rods and obviate all lateral pressure in the stuffing boxes. Standards rising above the top of the pump support the pivot of the lever. When the ever is operated, reciprocal action is imparted to the boxes through the links and rods, so that as one ascends the other descends; thus causing a continuous flow of water from the pump. A pipe passes vertically through the cap, on the top of the pump cylinder,through which the water will rush when the apparatus is used as a force pump; while a spout is provided at the side of the pump cylinder to discharge the water, when it is employed as an atmospheric pump. When the spout is open the pump operates simply as an atmospheric pump. If a plug is inserted in the spout, the water, finding no outlet by that channel, will be urged upwards and make its exit by the pipe in the cap, and the apparatus is changed into a force pump. By these means, both these pumps are combined in a single cylinder, and operated by one lever, the distinctive advantages of each kind being available almost instantaneously and at pleasure. Parties desiring further information may address the patentee, H. M. Wyeth, at Newark, Ohio.

MITERING MACHINE.—Ephraim Shaw, Tarr Farm, Pa.—This invention relates to a new instrument for cutting single or compound miters, and consists in the employment of a double joint for securing the saw guide.

CAP FOR PROTECTING NECKS OF BOTTLES.—George C. Furber, Yreka, Cal.—The object of this invention is to provide simple and efficient means for protecting the necks of bottles in forming packages of medicine or other articles, liquids, or compositions.

COMBINED HAY FORK AND KNIFE.—Leverett W. Stuart, Narrowsburgh, N. Y.—This invention relates to a new and useful improvement in an implement for handling and cutting hay, it being a combined hay fork and hay knife.

MEDICAL COMPOUND.—W. S. Crooker, Shamburg, Pa.—This invention relates to a new and useful compound, to be used as a medicine for the cure of diseases, to be taken internally, or applied as a linament to the surface of the body.

HEMMER.—Milo Harris, Jamestown, N. Y.—This invention relates to improvements in hemmers for sewing machines, and consists in the combination with the scroll plate, which turns the edge of the goods of a former or guide, having spiral ridges, arranged in the scroll, to act in a manner as a guide, and insure the turning of the hem.

COMBINED PUNCH AND BENDING MACHINE.—David G. Morris, Catasauqua, Pa.—This invention has for its object to furnish an improved machine, designed more especially for bending and punching hooks, and which shall be simple in construction, convenient in use, and effective in operation.

WATER-CLOSET APPARATUS.—William G. Stuart, Springfield, Mass.—This invention has for its object to improve the construction of valves and other regulating apparatus for water closets, and other uses, where an intermittent flow of water or other liquid is required, and which shall be simple in construction, reliable in operation, and not liable to get out of order.

VALVE.—Josiah W. Carney, Charlestown, Mass.—This invention has for its object to furnish an improved spring attachment for the valve stems of stop valves, stop cocks, faucets, etc., which shall be simple in construction, will make the valve self-closing, and which may be attached to valves already in use, without disturbing the plumbing.

BOOK-DRAWING ATTACHMENT.—J. C. Terry, Springfield, Conn.—This invention relates to the application to books of drawing attachments, whereby they may be removed from the shelves of libraries, cases, and the like, with greater facility than can now be done,and without injury to the books, The invention consists in the application to the covers of the books, in any position where they will be accessible when the books are packed on the shelves, of straps, buttons, projecting ribs, or other devices, affording a means of taking a secure hold to draw the books out.

TRUSSES.—Henry Fuller, Cattaragus, N. Y.—This invention relates to a new and useful improvement in trusses for the treatment of hernia, or rupture.

FARM GATE.—Amasa Hathaway, Prairie du Lac, Wis.—This invention relates to a new and improved method of operating gates for farms and other purposes, and consists in an arrangement whereby the gate is made to open and close by its own gravity.

NON-CONDUCTING CASING.—F. Y. Arnold, Philadelphia, Pa.—This invention relates to a new and useful improvement in means for preventing loss of heat in steam pipes, steam boilers, and furnaces and pipes for heating and conveying air, gases, or water.

KETTLE BAILS.—James Britton, Williamsburgh, N. Y.—The object of this invention is to strengthen the ears, and points of connection of the bail of a tea-kettle with the ears, and so to form the handle portion of the bail that it shall fit the hand.

COOLER.—G. R. Bowman, Hagarstown, Md.—This invention relates to a new and useful improvement in an apparatus for cooling liquids, as water, ale, beer, etc, by means of ice or ice and salt, or other refrigerating substance, material, or composition.

SHUTTLE HINGE.—F. B. Jones, Louisville, Ky.—This invention relates to a new and useful improvement in butt hinges for shutters, more especially designed for inside window shutters which have rabbeted edges, but which are applicable to other purposes.

ACID RESISTING INK.—C. F. Parknin, Charleston, S. C.—The object of this invention is to provide an ink for filling out checks, drafts, bonds, notes, etc., which shall be proof against the action of acids, and thus prevent the fraudulent alteration of such papers.

SUBSOIL PULVERIZER.—G. S. Newsom, Nashville, Tenn.—This invention has for its object to furnish an improved machine for subsoil pulverizing, which shall be simple in construction, effective in operation, and easily operated.

ARCHING BRICK.—W. F. Quinby, Wilmington, Del.—This invention has for its object to construct brick which can be used for arched roofs, ceilings, and door or window linings, without requiring forms or other supports. The invention consists in the construction of segmental brick which have grooved ends, so that they can rest against and lock into one another to form a strictly self-supporting arch.

CAR COUPLING.—S. O. Campbell, Centertown, Mo.—This invention relates to a new car coupling which is so constructed that it can be used without a link, the coupling boxes being directly locked together by the pin. The invention consists in constructing the coupling boxes with horizontal fingers at their outer ends, so that they may fit under and between each other to receive a pin for locking them together.

ROCK DRILL.—Hermann Osterkamp, Eschweiler City, Prussia.—This invention relates to a new construction of rock drill which is to be operated by compressed air or gas. The invention consists in a novel construction of slide which is arranged by a reciprocating motion to impart rotary, and regulate the reciprocating motion of the drill.

CULTIVATOR.—J. B. Tibbits, Portland, Mich.—This invention has for its object to improve the construction of horse-power hoes and cultivators, so that the hoes, shovels, or plows may be readily adjusted to turn the soil towards or from the plants, as may be desired.

COTTON AND HAY PRESSES.—C. W. Stopple, Houston, Texas.—This invention relates to improvements in cotton and hay presses, of that class wherein the follower is worked by a screw, and consists in hinging the yoke which supports the screw nut, upon the top or end of the case, so that when the follower is drawn out, the yoke and follower may be swung around for convenience in filling the case. It also consists in constructing the yoke in two parts, and arranging them so as to admit of applying a nut with flanges above and below the yoke permanently connected to it, or formed on it.

SELF-RAKING ATTACHMENT FOR HARVESTERS.—Charles Barns, West Liberty, Iowa.—This invention has for its object to improve the construction of the improved harvester rake, patented by the same inventor, March 30, 1869, so as to make it more convenient in use, and more effective and satisfactory in operation.

RAILROAD SWITCHES.—James Davis, New Orleans, La.—This invention relates to improvements in railroad switches, and consists in an arrangement for automatically shifting and locking the switches by the action of broad flanges on the front wheels of the car or locomotive, or by shifting wheels attached for the purpose, the said flanges or shifting wheels being arranged to act upon shifting levers connected with the switch bar, so that when acted upon and moved by the wheels, they will shift the switches. The said flanges or wheels also act upon spring locking catches, arranged in connection with the shifting levers for locking them, to unlock them before the shifting action takes place.

GRAIN SCOURING MACHINE.—William McLaughlin, Jersey City, N. J.—This invention relates to improvements in machines for scouring and hulling grain, and consists in arranging a scroll-shaped grove in the face of one of the stones, preferably the runner, beginning at the center, and gradually approaching the skirt, and in arranging the said grooved stone with another stone, having a smooth face, which will confine the grain in the scroll groove, and cause it to be subjected to the action of the stones during several revolutions, the said groove preventing the escape of the grain as soon as it does in the stones on ordinarily arranged machines and causing a more uniform action.

BLIND FASTENER.—John W. King, New York city.—This invention relates to a new and useful improvement in the mode of fastening window blinds or shutters, and consists in the arrangement of a catching device and lever, whereby the blind or shutter is securely fastened when closed, and can be opened only from the inside.

TWEER.—Edmund Youngs, New York city.—This invention relates to a new and useful improvement in tweers for blacksmiths' forges, whereby important advantages over the tweer irons now in use are secured, and it consists in an air chamber with a conical top, with a central conical perforated cap through which the air is discharged, and with an orifice through its bottom for cleaning out the same.

UNIVERSAL LATHE DOG.—John S. Skinner, Lebanon, N. H.—This invention relates to a new lathe dog or chuck, which is so constructed that it can be adjusted for shafts of suitable size. The invention consists in making the dog of two separate jaws, and in connecting them by right and left hand screws, and by a guide bar, which may also be adjustable.

ANIMAL TRAP.—William Ball, Oregon, Mo.—This invention relates to a new improvement in animal traps, and consists mainly in an arrangement in a vertical cylindrical case divided horizontally into two compartments of a vertical shaft, with wings in one of the said compartments dividing it into several sections, and having a coil spring attached to it, tending to revolve it. Each section is provided with bait hooks arranged to trip the spring-restraining devices, and an opening in the side of the case admits the animals to one of the sections, whereby nibbling the bait he trips the spring holder and is carried past the opening to a dark space, and another section is brought opposite the opening, from the dark space openings guarded by folding doors lead to the compartment above or below, where the animals, seeing light, will go, and be retained until taken out.

HEMP-DRAWING FRAME.—George Davis and John R. Hoover, Elizabethport, N. J.—This invention relates to improvements in machines for drawing hemp, and consists in mounting the teeth of the combs on oscillating arms in revolving disks, and arranging them so that when engaging with the hemp they will have a forward pitch, calculated to have the best effect in engaging and acting on the fibers, and when disengaging to be pitched backward so as to draw out of the fibers without deflecting them from the course they should follow in passing from the comb cylinder to the delivering rollers.

HORSE-POWER.—James W. Murrell, Eldorada, Arkansas.—This invention relates to improvements in horse powers, and consists in the employment on the driving shaft to which the sweep is connected, and which is mounted vertically in a suitable portable frame, which also supports the counter shafting, of a horizontal drawing wheel, provided with oblique teeth, gear ing into a pinion, also having oblique teeth, and arranged to revolve in a vertical plane and impart motion to a horizontal shaft, the teeth on both the driving wheel and pinion representing inclined planes, which may be varied to a considerable extent in the angle of the pitch, as found most desirable, according to the case in hand.

MACHINE FOR DRYING PHOSPHATES.—Ernst Frank and John B. Adt, Baltimore, Md.—This invention has for its object the drying of fish or such other animal substances as are used in the manufacture of ammoniated super-phosphates, and the drying of such super and mineral phosphates as are used in the preparation of artificial guanos or any other fertilizers, such drying being effected by giving the material a regular continuous movement over a furnace containing burning fuel.

ATTACHMENT FOR PREVENTING THE STRAINING AND BREAKING OF PAPER DURING ITS MANUFACTURE.—Lorenzo Dean, Fort Edward, N. Y.—This invention has for its object to prevent the straining and breakage of the paper sheet at any point during its passage through the machine prior to its reaching and passing between the calender rolls, having especial reference to the prevention of breakage while the sheet is passing from the drying to the calender rolls.

MANURE DRAG.—Josiah D. Heebner, Norrittonville, Pa.—This invention consists of a bar provided with a sufficiency of metal teeth projecting downward from one side of proper dimensions for the purpose,and furnished with handles like those of a plow, and with a standard projecting upwards in combination with a beam jointed at its rear end to the top extremity with a clevis to which to attach draft animals, and made in two sections, which are hinged together, the object of this last arrangement being to enable the operator to dump the drag by pressing with his foot on the rear end of the beam, and thus throwing the joint upwards.

MACHINE FOR ASSISTING IN REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.—This invention has for its object the disintegration of the fibers of Esparto grass, straw, or other fibrous material to a condition in which it is ready to undergo a further dis integrating process by a chemical solution, in a boiler, and which produces a textile stock, which may be spun, woven, or felted, or reduced to a pulp for the manufacture of paper and for other purposes.

BOILER FOR REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.—This invention relates to the reduction of Esparto grass, or straw, or other fibrous material, to a textile stock, whence paper or felt may be manufactured, by boiling or "cooking" the grass within a revolving boiler containing any suitable chemical solution.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,793.—FAUCET.—I. Carey, Morristown, N. J. June 23, 1870.

1,823.—APPARATUS FOR DISTILLING PETROLEUM.—J. L. Heverin and J.L. Bewley, Freedom, Pa. June 27, 1870.

1,826.—FRICTION BRAKE.—E. W. Sandford and W. Leaver, Brooklyn, N.Y. June 27, 1870.

1,829.—BREECH-LOADING FIREARMS AND CARTRIDGES.—C. E. Snyder, Baltimore Md. June 27 1870.

1844.—COFFEE AND RICE HULLER.—H. T. Pratt and J. Carver, Alden, Mass. June 28, 1870.

1,848.—PRESERVING ANIMAL AND VEGETABLE SUBSTANCES.—E. R. Ken Hamilton, Canada. June 29, 1870.

1,854.—APPARATUS FOR DELIVERING MAIL BAGS AND PARCELS TO RAILWAY TRAINS IN MOTION.—W. McCabe, Rochester, N. Y., and F. W. Glen, Oshawa, Canada. June 29, 1870.

1,857.—CHLORINATING GOLD, SILVER, AND COPPER ORES.—Chas. Stetfield Austin, Nevada. June 30, 1870.

1,856.—STEAM GENERATORS AND FURNACES.—S. L. Wiegand, Philadelphia Pa. June 30, 1870.

1,880.—JOURNAL BEARINGS AND AXLE-BOXES.—G. F. Lynch, Milwaukee Wis. July 2, 1870.

1,890.—APPARATUS FOR THE PRODUCTION OF ICE.—S. Bennett, Jefferson La. July 4, 1870.

1,914.—FURNACES FOR HEATING METALS AND ORES.—W. A. Sweet, Syracuse, N. Y. July 6, 1870.

1,954.—OIR CABINETS.—M. H. Wiley, ——, Mass. July 9, 1870.

1,955.—WARP TENSION AND LET-OFF MECHANISM FOR LOOMS.—E. B. Bigelow, Boston, Mass. July 11, 1870.

1,969.—APPARATUS FOR DRYING MALT, GRAIN, ETC.—A. R. Petracchi Helen Merrill, Robert Heneage, and H. Spendelaw, New York city. July 12, 1870.

1,847.—WOOD SCREWS.—G. C. Davies, Dayton, Ohio. June 29, 1870.

1,853.—COPYING PRESSES.—J. Fenson, Toronto, Canada. June 29, 1870.

1,867.—BOAT DETACHING APPARATUS.—O. T. McIntosh, New York city, July 1, 1870.

1,944.—LOCKING AND RELEASING HOOKS.—J. Bozorth and H. Fredericks, Camden, N. J. July 8, 1870.

1,960.—REAPING AND MOWING MACHINES.—W. A. Wood, Hoosick Falls N. Y. July 11, 1870.

1,962.—BRICK MACHINE.—B. M. Gard, Urbana, Ohio, and E. R. Gard, Chicago, Ill. July 12, 1870.

1,977.—DISH-WASHING APPARATUS.—J. L. Simonds, Boston, Mass. July 13, 1870.

1,979.—COFFEE CLEANER AND POLISHER.—W. Newell, Philadelphia, Pa July 13, 1870.

1,981.—APPARATUS FOR MANUFACTURING CARPETS.—W. Wallace and C. McAllister Philadelphia, Pa. July 13, 1870.

2,010.—ROTARY ENGINE.—Richard Dudgeon, New York city. July 15, 1870.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

RAILROAD-CAR BRAKE.—William G. Creamer, New York city, has applied for an extension of the above patent. Day of hearing Oct. 19, 1870.

POWER LOOM.—Alexander Smith and Halcyon Skinner, Yonkers, N. Y., have petitioned for the extension of the above patent. Day of hearing Oct 19, 1870

SEWING MACHINE.—Isaac M. Singer, New York city, has applied for an extension of the above patent. Day of hearing Oct. 19, 1870.

DIAPHRAGM FLUID METER.—J. H. Darlington and William Piper, New York city, have petitioned for the extension of the above patent. Day of hearing Oct. 26, 1870.

MACHINE FOR FOLDING PAPER.—C. O. Crosby, New Haven, Conn., has petitioned for an extension of the above patent. Day of hearing Dec. 7, 1870.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING August 9, 1870.

Reported Officially for the Scientific American

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106,104.—BUTTER WORKER.—Joseph P. Adams and John P. Corbin, Whitney's Point, N. Y.; said Adams assignor to said Corbin.

106,105.—NON-CONDUCTING CASING FOR BOILERS, STEAM PIPES, ETC.—F. Y. Arnold, Philadelphia, Pa.

106,106.—MACHINE FOR TRIMMING & SHEARING HAIR CLOTH ETC.—Olney Arnold and Isaac Lindsley, North Providence, R.I., assignors to Pawtucket Hair-cloth Co.

106,107.—ANIMAL TRAP.—William Ball, Oregon, Mo.

106,108.—RAKE ATTACHMENT FOR HARVESTERS.—Charles Barns, West Liberty. Iowa.

106,109.—SUPPORT FOR TABLES.—Jas. Blake (assignor to himself and Geo. Blake), Scranton, Pa.

106,110.—SUPPORT FOR TABLES.—Jas. Blake (assignor to himself and Geo. Blake), Scranton, Pa.

106,111.—HAMES CAP FOR HARNESS.—Lot Bonine(assignor to himself and W. W. Camp), Vandalia, Mich.

106,112.—PREPARATION OF ALBUMEN. — Gustav Bourgade, New York city.

106,113.—WATER COOLER, ETC.—G. R. Bowman, Hagerstown, Md.

106,114.—SHUTTLE WORKER.—Henry W. Boynton, Haverhill, Mass.

106,115.—KETTLE BAIL.—Jas. Britton (assignor to himself and Garrett Brower), Williamsburgh, N. Y.

106,116.—MECHANISM FOR ACTUATING THE PICKER STAFF LOOMS.—M. C. Burleigh, Somersworth, N. H.

106,117.—MILK SAFE.—J. H. Bush, Bengal, Mich.

106,118.—CULTIVATOR AND HARROW.—E. T. Russell assignor to himself and John N. Greene, who assign one third their right to J. M. Tilford, all of Indianapolis, Ind.

106,119.—RAILWAY CAR COUPLING.—S. O. Campbell, Centertown, Mo.

106,120.—BORING MACHINE.—W. W. Carey and G. W. Harris Lowell, Mass.

106,121.—VALVE FOR STOP COCKS.—J. W. Carney, Charlestown, Mass.

106,122.—PIPE JOINT.—Patrick Clark, Rahway, N. J.

106,123.—SAW HANDLE. — William Clemson, Middletown, N. Y.

106,124.—RAILROAD-CAR STOVE. — James M. Comins, New York city.

106,125.—MANURE CART.—T. L. Cotten (assignor to M. J. Cotten), Madison Co. Miss.

106,126.—SLEIGH AND CARRIAGE FOR CHILDREN.—B. P. Crandall, Jr., Williamsburgh, N. Y.

106,127.—MEDICAL COMPOUND AND LINIMENT.—W. S. Crooker, Shamburg, Pa.

106,128.—SPOOL-THREAD CASE.—John D. Cutter, Ne York city.

106,129.—DUPLEX WRENCH.—Augustus B. Davis, Philadelphia, Pa.

106,130.—DRAWING FRAME FOR HEMP, ETC.—Geo. Davis and J. R. Hoover, Elizabeth Port, N. J.

106,131.—RAILWAY SWITCH.—Jas. Davis, New Orleans, La.

106,132.—AUTOMATICALLY-OPERATED WATER-CLOSET SEATS —Perry W. Davis, Portland, Oregon. Antedated Aug. 4, 1870.

106,133.—APPARATUS FOR REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.

106,134.—Attachment to Paper Machines to Prevent the Straining and Breaking of the Paper During Manufacture.—Lorenzo Dean, Fort Edward, N. Y.

106,135.—Boiler for Reducing Fibrous Materials to Textile Stock.—Lorenzo Dean, Fort Edward, N. Y.

106,136.—Clothes Wringer.—Charles H. De Knight, Pittsburgh, Pa.

106,137.—Washing Machine.—Charles H. De Knight, Pittsburgh, Pa.

106,138.—Nut Lock.—Jas. Dennis, Churchville, N. Y.

106,139.—Planing Machine. — Frank Douglass, Norwich, Conn.

106,140.—Spinning Ring.—William F. Draper, Hopedale, Mass.

106,141.—Electro-magnetic Low-water Alarm for Steam Boiler.—Wright Duryea, Glen Cove, N. Y.

106,142.—Electro-magnetic Low-water Detecter for Steam Boiler.—Wright Duryea, Glen Cove, N. Y.

106,143.—Manufacture of Paper Pulp.—Asahel K. Eaton, Piermont, N. Y.

106,144.—Washing Machine. — William Eaton, Norwich, N. Y.

106,145.—Pianoforte.—Loring Farnsworth (assignor to himself and W. H. Flinn), Nashua, N. H.

106,146.—Automatic Reel for Clothesline.—Wm. Farrah, Des Moines, Iowa.

106,147.—Apparatus for Drying Phosphates. — Ernst Frank and John B. Adt, Baltimore, Md.

106,148.—Truss.—Henry Fuller, Cattaraugus, N. Y.

106,149.—Device for Packing Bottles.—Geo. C. Furber, Yreka, Cal.

106,150.—Lubricator.—William Gee, New York city.

106,151.—Tuck-creasing Attachment for Sewing Machines.—H. C. Goodrich, Chicago, Ill.

106,152.—Car Brake. — Merritt W. Griswold, New York city.

106,153.—Scroll Saw. — Nicholas B. Hadley, Providence, R. I.

106,154.—Stove Grate.—R. Ham (assignor to Cox, Church & Co.,) Troy, N. Y.

106,155.—Hemmer for Sewing Machine. — Milo Harris, Jamestown, N. Y.

106,156.—Farm Gate.—Amasa Hathaway, Prairie Du Lac, Wis.

106,157.—Skylight.—George Hayes, New York city.

106,158.—Manure Drag.—J. D. Heebner (assignor to himself and D. S. Heebner), Norrittonville, Pa.

106,159.—Railway Car Coupling.—J. W. Hess, Montandon, Pa.

106,160.—Machine for Turning Logs.—Wm. E. Hill, Erie, Pa.

106,161.—Cultivator. — Seth B. Hoisington, Galesburg, Ill.

106,162.—Apparatus for the Manufacture of Bessemer Steel.—A. L. Holley, Brooklyn, N. Y.

106,163.—Balance. — Woodbury Storer How, Cincinnati, Ohio.

106,164.—Sad and Crimping Iron.—Charles Hyatt, Buffalo, N. Y.

106,165.—Rotary Blower.—Wm. G. Hyndman, Cincinnati, Ohio.

106,166.—Billiard Cue.—M. V. Ingersoll, Norwalk Bridge, Conn.

106,167.—Machine for Sharpening Harvester Cutters.—W. S. Ingraham, Evanston, Ill.

106,168.—Bung Borer.—W. A. Ives, New Haven, Conn.

106,169.—Hinge.—Wm. Johnson, Milwaukee, Wis.

106,170.—Hinge.—F. B. Jones, Louisville, Ky.

106,171.—Process of Separating Nails from Felt.—W. Jones, New York city.

106,172.—Machine for Bending Clevis and Stirrups.—W. C. Kaiser, Louisville, Ky.

106,173.—Lamp Shade and Reflector.—Jas. M. Kenerson, (assignor to himself and Edmund Burke), Newport, N. H.

106,174.—Platform Scales.—Michael Kennedy, New York city

106,175.—Attaching Rubber to Wringer Shafts.—S. R. Kenyon, Greenville, R. I., assignor to himself and W. D. Vernam, Elizabeth, N. J.

108,176.—Shutter Fastener.—John W. King, New York city.

196,177.—Grain Separator and Scourer.—W. C. Knox, Jacksonville, Ill.

106,178.—Sleeping Car.—G. S. Koontz and John B. Hill, Washington, D. C.

106,179.—Belt Guide.—C. P. Leavitt, New York city.

106,180.—Pressure Gage. — Charles Liedke, Sandusky, Ohio.

106,181.—Stable Cleaner.—T. F. Longaker, Philadelphia, Pa.

106,182.—Egg Beater.—Thomas Marsh and James Berney, Pawtucket, R. I.

106,183.—Fence.—David McCurdy, Ottaowa, Ohio.

106,184.—Grain-scouring Machine.—William McLaughlin, Jersey City, N. J.

106,185.—Steam Engine.—Joseph P. Merriam, Sandusky, Ohio.

106,186.—Metallic Heel for Boots and Shoes.—E. T. Miller (assignor to himself and John Hewitt), Albany, N. Y.

106,187.—Saw.—Charles Mitzelfield (assignor to Mack Flanigan), Detroit, Mich.

106,188.—Machine for Bending and Punching Car Hooks.—D. G. Morris, Catasauqua, Pa.

106,189.—Water Elevator.—T. L. Morriss, Claypool, Ky.

106,190.—Process of Forging Carriage Shackles.—F. B. Morse, Plantsville, Conn.

106,191.—Base-burning Fireplace Heater. — Andrew Murdock, Brooklyn, E. D., N. Y.

106,192.—Attachment to Plows.—James W. Murfee, Havanna, Ala.

106,193.—Attaching the Point to the Shank of Subsoil Plows.—J. W. Murfee, Havanna, Ala.

106,194.—Horse-power. — James W. Murrel, Eldorado, Arkansas.

106,195.—Subsoil Pulverizer.—G. S. Newsom, Nashville, Tenn.

106,196.—Scrubbing Brush.—Jacob Odell, Petroleum Centre, Pa.

106,197.—Rock Drill.—Hermann Osterkamp, Eschweiler City, Prussia.

106,198.—Ink.—C. P. Panknin, Charleston, S. C.

106,199.—Vapor Burner.—Robert W. Park, Philadelphia, Pa.

106,200.—Vapor Burner.—Robert W. Park, Philadelphia, Pa.

106,201.—Steam Trap.—E. L. Perkins, J. H. Moulton, and C. E. Sawyer, Boston, Mass.

106,202.—Corn Planter.—George W. Pittman, Winona, Miss.

106,203.—Arching Bricks.—Watson F. Quinby, Wilmington, Del.

106,204.—Car Coupling.—Wm. A. Rex and J. M. Rex, Jr., Butler, Ind.

106,205.—Dryer.—J. E. Rice (assignor to himself and C. H. Remington), Moline, Ill.

106,206.—Air-heating Steam Condenser.—Peter J. Rice, Ashtabula, and David A. Scott, Cincinnati, Ohio.

106,207.—Mode of Treating Tobacco.—S. G. Rice, Albany, N. Y. Antedated Aug. 5, 1870.

106,208.—Cooking Stove.—Francis Ritchie, Troy, assignor to Jewett & Root, Buffalo, N. Y.

106,209.—Apparatus for Tanning.—John Robinson, S. F. Robinson, and C. C. Putnam, Skowhegan, Me.

106,210.—Broiler.—D. E. Roe, Elmira, N. Y.

106,211.—Curtain Fixture. — Franklin Root, Hartford, Conn.

106,212.—Apparatus for Cooling the Rollers used in the Manufacture of Isinglass.—Ebenezer Rowe, Rockport, Mass.

106,213.—Liquid for Raising Paste or Dough.—Arthur Sauer, Gustave Sauer, and L. Cachal, Paris, France.

106,214.—Cigar Machine.—Socrates Scholfield (assignor to himself and R. A. Bright, Jr.), Providence, R. I.

106,215.—Nut-tapping Machine.—Wm. Scully (assignor to the Michigan Bolt and Nut Co.), Detroit, Mich.

106,216.—Apparatus for Carrying Grain, Plaster, etc., for Sowing.—O. W. Smith, Flint, Mich.

106,217.—Steering Apparatus.—George Seymour, London, England.

106,218.—Mitering Machine.—Ephraim Shaw, Tarr Farm, Pa.

106,219.—Composition for Oiling Wool.—James Shaw (assignor to Conyers Button), Philadelphia, Pa.

106,220.—Washing Machine.—M. A. Shepard, Evansville, Ind.

106,221.—Box.—C. J. Siercks, Chicago, Ill.

106,222.—Steam Generator.—E. B. Sintzenich (assignor to himself and H. G. Hamilton), Rochester, N. Y.

106,223.—Flour Bolt.—John Skinner, Hadley, Mich.

106,224.—Lathe Dog.—J. S. Skinner, Lebanon, N. H.

106,225.—Die for Forging Carriage Shackle Blanks.—W. B. Smith, Plantsville, Conn.

106,226.—Pump.—P. M. Snell and Oscar Snell, Williamsburg, Ohio.

106,227.—Iron Frame for Pianos.—George Steck, New York city.

106,228.—Feeding Device and Presser Foot for Sewing Machines.—C. M. Stocker, Georgetown, Mass.

106,229.—Cotton and Hay Press.—C. W. Stoppel, Houston, Texas.

106,230.—Horse Hay Fork.—L. W. Stuart, Narrowsburg, N. Y.

106,231.—Water Closet.—W. G. Stuart (assignor to J. W. Trafton), Springfield, Mass.

106,232.—Photograph Album.—J. F. Tapley, Springfield, Mass.

106,233.—Refining Petroleum.—J. A. Tatro, Hartford, Conn.

106,234.—Book Binding.—J. C. Terry, Springfield, Conn.

106,235.—Cultivator.—J. B. Tibbits (assignor to himself and Joseph Stebbins), Portland, Mich.

106,236.—Automatic Table Fan or Brush.—R. E. Tolar and W. D. Orr, Newnan, Ga.

106,237.—Cock.—J. W. Trafton, Springfield, Mass.

106,238.—Stump Puller.—Grey Utley, Charlotte, N. C. (assignor to himself and Glenn & Wright), Atlanta, Ga.

106,239.—Medical Compound or Pill.—J. P. Waddell, Brookhaven, Miss.

106,240.—Show Case.—Edward Watson and R. H. Norris, Paterson, N. J.

106,241.—Wire for Attaching Soles to Boots and Shoes.—William Wickersham, Boston, Mass.

106,242.—Sewing Machine Table.—C. H. Wilcox (assignor to Wilcox & Gibbs Sewing Machine Company), New York city.

106,243.—Cast Iron Car Wheel.—William Wilmington, Toledo, Ohio.

106,244.—Earth Closet.—Joel Wood, Martinsville, Ohio.

106,245.—Tweer.—Edmund Youngs, New York city.

106,246.—Magazine Gun.—N. H. Ambler, East Cleveland, Ohio.

106,247.—Mica Chimney for Lamps.—John Baird and Warren Fisher, Hamilton, Ohio.

106,248.—Shade Cord Retainer.—W. H. Bechtel, Philadelphia, Pa.

106,249.—Sewing Machine.—Joseph Bennor (assignor to himself and Abraham Rex), Philadelphia, Pa.

106,250.—Sausage Stuffer and Lard Press.—Abner Bishop, Smithville, Ohio. Antedated August 3, 1870.

106,251.—Process of Forming Vacuum in Freezing Apparatus.—E. S. Boynton (assignor to himself and Charles Parker), Meriden, Conn.

106,252.—Hop Press.—Jeremiah Brockway, Richland Center, Wis.

106,253.—Pruning Shears.—Ransom Bullard and G. E. Mills, Litchfield, Mich.

106,254.—Handle for Knives, etc.,—Matthew Chapman, Greenfield, Mass.

106,255.—Seal Lock.—Everett Clemons, Catawissa, Pa.

106,256.—Railway Rail Fastening.—John Cochrane, Farmingdale, N. J.

106,257.—Machine for Soldering Metallic Vessels.—E. T. Covell, Brooklyn, N. Y.

106,258.—Safety Shoe for Railway Car Truck.—J. S. Crary, Salem, N. Y.

106,259.—Switch Stand.—C. C. Dodge, Marshall, Mich.

106,260.—Machine for Manufacturing Hoops.—J. B. Dougherty (assignor to himself, R. E. Sherlock, J. C. Schanck, A. G. Wheeler, and P. H. Lawler), Rochester, N. Y.

106,261.—Lubricator.—Isidore Dreyfus, New York city.

106,262.—Toy.—J. G. Fine, Cincinnati, Ohio.

106,263.—Manufacture of Artificial Marble.—G. A. Frear, Chicago, Ill.

106,264.—Molding Machine.—Thomas Glover (assignor to Morris, Tasker & Co.), Philadelphia, Pa.

106,265.—Core for Casting Axle Boxes.—W. H. Hawley, Utica, N. Y.

106,266.—Railway Switch.—J. P. Herron, Atlanta, Ga.

106,267.—Belt Shifting Mechanism for Looms.—L. J. Knowles, Warren, Mass.

106,268.—Device for Operating Windows.—J. S. Lester, Knoxville, Tenn.

106,269.—Stove Pipe.—W. P. Lewis and S. L. Vera, Pittsburg, Pa.

106,270.—Apparatus for Evaporating.—N. R. Martin, Canandaigua, N. Y.

106,271.—Grinding Mill.—Gove Mitchell, Philadelphia, Pa.

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106,301.—Washing Machine.—J. B. Wilson, Philadelphia, Pa., assignor, by mesne assignments, to himself, P. W. Lawrence, and Walter Reckless.

REISSUES.

4,092.—Planting Machine.—S. L. Allen, Cinnaminson, N. J.—Patent No. 81,247, dated November 24, 1868.

4,093.—Bridge.—Albert Fink, Louisville, Ky.—Patent No. 63,914, dated April 9, 1867.

4,094.—Spindle for Spinning.— A. H. Gilman, Boston, Mass.—Patent No. 66,017, dated June 25, 1867.

4,095.—Composition for Covering Steam Boilers and for other Purposes.—Ferdinand Leroy, administrator, and P. A. Victor Le Lubez, assignee of Ferdinand Leroy, deceased, London, Eng.—Patent No. 87,781, dated December 14, 1869.

4,096.—Saw.—E. P. Wheeler, E. M. Madden, and William Clemson, Middletown, N. Y., assignees of Joseph H. Tuttle.—Patent No. 9,807, dated June 21, 1853, extended seven years.

4,097.—Extension Wash Bench.—Samuel Wiswall, Hyde Park, Vt., assignor to A. H. Spencer, Providence, R. I.—Patent No. 30,371, dated October 9, 1860.

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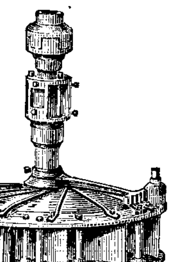

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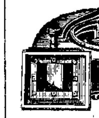

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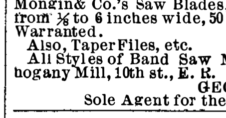

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