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Radial Drilling Machine.

Every machinist employing the ordinary machines for drilling purposes must suffer from the inconveniences resulting from setting, resetting, and leveling his work, especially when it is of an un wieldy or cumbrous character, and a series of holes parallel with each other is required. Although it is essentially a simple operation to drill a hole, yet under these circumstances it is on e into which expense and annoyance enter very largely.

It is very difficult to meet a condition which brings the exact location of the proposed hole directly beneath the drill, and also has the position of the work correct in point of level; this is, in a greater degree, an embarrassing task when an irregular form of considerable weight is elevated on blocks, and has to be moved about on them; bars, rollers, blocks, and wedges are continually in requisition, and one or more laborers stand idly by surveying the performance preparatory to the next move.

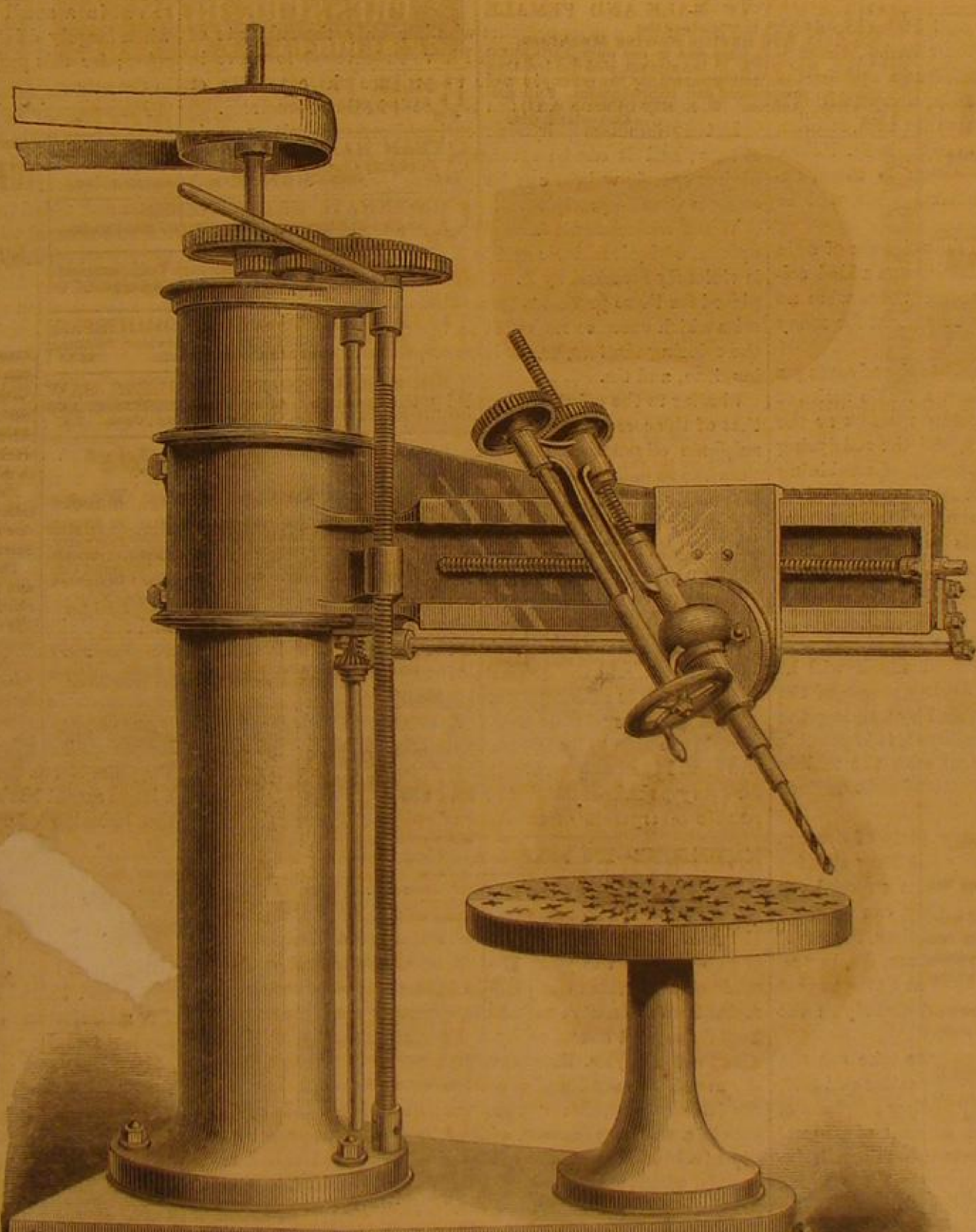
The tool represented in the annexed engraving overcomes the necessity of moving the work, as it is capable of drilling a hole at any angle and at any hight within its scope. It may be described as follows:

The whole machine swings around a stationary sleeve, bearing well up in the interior of the column; the nuts shown at the bottom are intended to secure it, but this provision is not needed in practice, as the fit is thorough and the bearing ample; the upright column is turned all over, and the arm is snugly fitted to it; the upright screw is employed for raising and lowering the arm by power, and is brought into action by the lever seen at the top of the column. As it is desirable that no belts should intervene to mar the complete revolving sweep of the machine, the driving is applied through the center direct, and transmitted to the upright shaft, whence the horizontal shaft carries it to the spindle by means of two pairs of miter gears. This arrangement also provides for the complete swiveling capacity of the drill spindle, so that it can be used horizontally, vertically, or at any angle with equal facility. The movement of the head, inward and outward on the arm, is accomplished by the horizonal screw. The table is for the convenience of the smaller class of work.

The countershaft supplies the requisite number of changes in speed.

We think it impossible to combine more excellent features with greater simplicity than is evidenced in this machine; an ordinary drill press is just as liable to get out of order, and one of the same dimensions would cost more money.

The Universal Radial Drilling Machine is designed and manufactured by the Niles Tool Works, of Cincinnati, Ohio, to whom all orders should be addressed.



IMPROVED UNIVERSAL RADIAL DRILLING MACHINE.

Human Degeneracy.

A marked degeneration has been observed to have taken place of late years in the *physique* of the inhabitants of Paris. The true Parisian is stunted in growth and of muddy complexion: his children are under-sized, emaciated, and pale. He chiefly dies of *ennui*—at least if we are to believe one of the Paris *savants*, Dr. Raoul le Roy, who has made this subject a special study for many years. According to M. le Roy, for instance, in spite of the solicitude manifested by government towards the hygienic welfare of all classes, in spite of the new plantations, the new boulevards and open squares, the amount of carbonic acid produced by the pulmonary emanations of two millions of human beings, each of whom daily exhales 219 grammes of oxide of carbon, is something frightful. To this noxious vapor must be added that produced by the gas manufactories, etc. Another cause for the impoverished blood is the enormous increase of the use of tobacco and alcohol. The consumption of the latter has exactly doubled since the year 1825. As to tobacco, in 1832 it produced a tax of 28,000,000f.; while in 1862 the consumption of tobacco brought into the government a sum of 180,000,000f. In 1852, 200,000,000 cigars were smoked in Paris, whereas, in 1867, the number increased to 761,625,000.

Man, or the Living Machine.

The Right Rev. Thomas M. Clark, Bishop of Rhode Island, recently delivered a very interesting lecture on man, at Trenors Hall in the Sixth Avenue—He began with alluding to the complicated machinery of an orrery, used in illustrating the motions of the heavenly bodies. The machinery of man was the same, but more complicated and more mysterious. There were in the room one hundred perfect machines, with all the bolts, screws, levers, and other appurtenances of machinery. There were also one hundred steam engines with valves, wheels revolving, and steam generating. There were also one hundred galvanic batteries with electrical currents in full operation. These machines were not over six feet long and often less, and, as it frequently happened, there was the largest power in the smaller machines; as for instance, in the first great Napoleon. A peculiarity about these machines was their regulating themselves as well as their power of reproduction. He referred to the use of the hand. Six thousand years ago it was used in collecting materials for clothing the human body, and in gathering sticks and rubbing them together to m[illegible]e to warm the body. This hand had had worked [illegible]ice. Speaking of man as one machine, it had subd[illegible]nd replenished the earth. This man had cut d[illegible] built cities; constructed ships, the steam en[illegible]graph. He compared man to the animal cr[illegible]e most perfect cells, beavers built bridges [illegible] showed a diversity of mechanical skill. [illegible]mals had improved. They were the [illegible]s of years ago; no one race of anim[illegible]ccessors. It was not so with man; he was constantly improving and would continue to improve. Next he spoke of the transmission of certain characteristics both in the brute and the human creation. The young of a shepherd's dog would, for instance, take to guarding sheep instead of worrying them, the natural instinct of dogs. With man influences of a generic character often showed themselves through generations. The mystery of man had never been solved—never would be. No perfect automaton had ever been made, and yet a man would stand in health without effort, and almost unconsciously. He alluded to the delicate formations of the eye and the ear. What, give sight to the eye? What, give hearing to the ear? Here was mystery, and the only solution was that the soul was the center of the senses. The body, he urged, was but a mass of sinews and gases, a mixture of solids and liquids. The soul was really the living man. A marvel transcending all others was the transmission of thought through the medium of speech. A thought possessed him; he gave motion to the complex machinery of his throat, opened his mouth, moved his tongue and lips, gave a vibratory motion to the air, and the thought, as a spoken utterance, reached the tympanum of another's ear, and the latter, by the same process, sent back his or her thought to him. From this topic he proceeded to speak of the effects of climate on man. No great man, he insisted, was ever born on the equator, and neither was the country of the Esquimaux favorable to the production of genius. The men of real power—the great leaders and shapers of the world's destiny, were born in the temperate zone. He urged in this connection that to the proper education of the soul through the body good air and good food were essential—a point that he forcibly illustrated at some length. Digressing from this point he gave his views upon the effect of spirituous liquors upon the body.

Liquor slammed all the doors of the soul and kicked up as much commotion as if so many evil spirits should commence playing upon all the organs in this city. After alluding next to the specific form of various anesthetic agents upon the human system, he spoke of the power of panics and cited several ludicrous instances bearing upon this point. He also referred to election excitements, speaking particularly of the Tippecanoe excitement in 1840, which, he said, caused the solid men of Boston to kick up antics in the street which they would whip their children for doing. His next topic was dreams, which he showed to be among the most inexplicable mysteries in connection with man. A most interesting digression was here indulged in on the subject of spiders. He instanced the sagacious capture of a snake by one, and also gave an experience of his own with one, that some years ago wove a web in his study. This spider he took under his charge and fed him, and the latter, as human beings are apt to do when helped, relied on him for his daily food. One day he threw a piece of sugar in the web. The spider made for it, thinking, doubtless it was food, but, discovering its nature, was intensely disgusted, and at once essayed its removal. He tugged on it awhile to loosen it from the web, but was unable to do this. Withdrawing for meditation, he soon returned, cut off one after another of the enveloping threads, and down fell the piece of sugar, and then repaired damages. Here he insisted, was thought, and he gave other equally curious and interesting illustrations, evincing in dumb creation the same capacity of thought. Reverting to man in conclusion he spoke of life here as a preparation for immortality, and the duties incumbent on man.

If it be true, as stated, that the metallic base of hydrogen is discovered, the field of chemical discovery is widened beyond the reach of conjecture.

SALT-CAKE IN DYEING.

Written for the Scientific American by DR. M. REIMANN.

In England, as well as in Germany, salt-cake, or sulphate of soda, has been employed for some considerable time already as an expedient in dyeing wool.

The practical dyer, when asked concerning the advantages of this substance, which seems to possess so little importance, for the dyeing process, can state no reasonable ground for its employment, only in rare cases you will perhaps hear that the bath dyes more equally when sulphate of soda is added to it. Even the chemist, on regarding the matter somewhat superficially, does not observe what purpose the sulphate of soda serves in the dyer's bath. He considers it one of the number of utterly useless substances employed by the dyers in accordance with the prescriptions of some hand-book.

Nevertheless, if we regard the matter carefully in the following discussion, we shall see that sulphate of soda can be of the very greatest value in dyeing processes, and that its employment is based on the most interesting chemical and physical principles. At the same time we shall be obliged to advance into the comparatively unknown region of the dyeing theory, the practical use of which we shall soon recognize.

The sulphate of soda, which is scarcely ever treated of in books on dyeing, because of its chemical indifference for coloring matters, elevates, as every soluble substance does, the specific weight, and thus also the boiling point of the solution. This property already, when taken into consideration, renders it important for many dyeing processes. It is possible, for instance, to change the shade of aniline violet into blue or red, according as the temperature of the solution is more or less elevated.

When the dyeing is performed in an acid bath (the dyers very frequently add sulphuric acid to their baths), the sulphate of soda combines with the free sulphuric acid in the bath, and forms with it bisulphate of soda, a crystallizable solid salt. In this manner the bath retains its acid reaction without the presence of free sulphuric acid in the bath. Hence, when half-woolen cloths are dyed, the cotton in them, extremely sensitive to the action of the mineral acids, will be very well preserved.

Dissolved in water in great quantities, the sulphate of soda diminishes the capacity of the bath to dissolve the added coloring matters in as great a degree as though there were no such salt present; this, too, is highly important for many dyeing processes.

Several practical examples will demonstrate the advantages of sulphate of soda more conclusively than a whole series of theoretical observations. The red coloring matters as the cudbear, and more especially the magenta, and the red dyeing woods, possess, as is well known, the property of combining only with the greatest difficulty with the fiber when dyed in an acid bath. Therefore, wherever the substances are employed in the acid bath—and often this is necessary—the greatest part of the coloring matter is wasted and lost if the common process is employed. The same applies also to the yellow wood.

If, however, the said coloring matters be dyed in an acid bath according to this new method, a twofold result will be attained. By adding sulphuric acid, the dyeing power of the said pigments can be put into activity, and by varying the quantity of sulphate of soda which is employed, it is possible to control the combination of the pigment with the texible fiber. Therefore, by means of the sulphate of soda various shades can be produced.

This fact is of great importance in many sorts of dyeing. There are some kinds of yarn, especially the long *slubbing* wool, which have the property of felting when exposed too frequently to a change of temperature; they can then no longer be worked into weft yarn. Nevertheless, the wool must be exposed to such a change of temperature, for, in preparing the shades, it is taken out of the bath at times, so that new coloring matter may be added to the part already in the bath.

In all these cases it would be unnecessary to take out the yarn if we were to add a little more coloring matter and acid, and shades could be produced by gradually adding sulphate of soda to the bath. By this process a great deal of manual labor may be spared, and the dyer enabled to work with far more security and comfort. Should at any time too much coloring matter have gone upon the fiber, the fault can readily be corrected by the addition of a little acid.

The truth of the above assertions is most easily perceptible in dyeing Magenta. As another example, let us regard the dying of shades, for which the wool must first be boiled in a solution of a chrome salt, in the most cases in bichromate of potash. This is often done for red, brown, and gray, which are produced by means of logwood, red and yellow wood. When the wood is boiled in a bath of bichromate of potash, and especially when to this, as is commonly the practice, sulphuric acid is added, the colors of the logwood and red wood attack the fiber very quickly, and therefore often spread unequally. Hence, dyers must begin to dye at low temperatures, and must increase the heat very slowly. If to such a dyeing bath but a small quantity of acid is added, the effect of the coloring matters in it is almost nothing, it is, therefore, possible to dye with the boiling bath without fear of an unequal spreading of the coloring matters. It is only necessary to add, while the coloring matter is fixing on the fiber, sulphate of soda in small quantities, the coloring matter will combine with the fiber, while the sulphate of soda absorbs the free acid. It is therefore possible to produce shades without removing the goods from the bath, if we take care that the quantity of coloring matter which is at first added to the bath is not too small.

A similar effect can be produced by adding the sulphate of soda at the beginning of the dyeing process. For sulphate of soda we may, in this case, employ even common salt. In this case the salts employed will, when dissolved in the fluid, precipitate the dissolved coloring matter, which is then contained in the bath, in a very fine state of division, or the salts will prevent the coloring matters from dissolving, according as these latter or the salts were first introduced into the bath.

For the process this is quite indifferent. The pigments fix on the fiber in the same measure as they are dissolved. Fresh coloring matter will only then be dissolved, when the portion already in dissolution is already consumed. The dyeing is more equal, if the coloring matters are not dissolved in the bath, but are contained in it in a state of minute division, as every dyer knows who has ever employed aniline blue, soluble in water. This pigment, because of its ready solubility in acids, often fixes too quickly if the dyeing is carried on in an acid bath, and therefore dyes at times unequally. It is therefore best to dye from a neutral or weak alkaline fluid, and then to produce the blue by adding an acid. The same pigment soluble only in alcohol is precipitated as soon as its solution is added to the bath, and therefore dyes more equally, though more slowly still. In many cases also it is advantageous to employ sulphate of soda where small quantities of indigo carmine are used to give somewhat more of blue to a shade. The affinity of this coloring matter for wool being very great, small quantities of it may often dye the woolen goods very unequally; to prevent this, and give uniformity to the color, it is necessary to continue the boiling operation for some time. The indigo carmine will dye more slowly and equally in the case of the free acid is carried off by sulphate of soda.

The question now remains whether only the sulphate of soda, the importance of which I have endeavored to prove in the preceding remarks, is able to produce these results, or whether any other agent, can replace it in these processes.

In the preceding I already mentioned common salt as a substitute; and it can be advantageously employed, if either a higher specific weight can be produced, or the dissolved coloring matter be precipitated.

When common salt is employed in an acid bath, the development of hydrochloric acid is highly disagreeable. Cotton is violently attacked by it. Common salt can in turn be replaced for these processes by sulphate of magnesia and other salts which exercise no effect on the chemical constituents of the coloring matters, as, for instance, the compounds of alumina, iron, and tin.

Similar to the effect produced by the sulphate of soda, is that of the corresponding combination with potash, viz.: the sulphate of potash. This salt, however, is more expensive than the soda-salt. The bisulphate of potash is now already frequently employed in dyeing. The bisulphate of soda, which is a residium in some chemical manufacturing processes, for instance, in the production of nitric acid can often be advantageously employed for sulphate of soda and free acid.

To compare the expense of the employment of these substances, we must therefore observe that the sulphate of potash crystallizes without water, while the sulphate of soda contains 55·9 per cent, and the sulphate of magnesia 51·22 per cent of water, which is of course devoid of any value.

Finally, we must state that 100 parts of crystallized sulphate of soda are able to fix 30½ parts of sulphuric acid (of 66° B. s. w.), and thus to form bisulphate of soda; or, in other words, for every pound of sulphuric acid added to the bath, three pounds of crystals of sulphate of soda must be employed.

MANGANESE—ITS USEFUL APPLICATIONS IN THE ARTS.

BY DR. L. FEUCHTWANGER.

This mineral substance was known in ancient times under the name of "glassmaker's soap" and was considered a species of iron ore. In the year 1740 it was ascertained to be an oxide of a separate metal, and in 1774, Gahn obtained the pure metal from the native carbonate, exposing the same to intense heat for several hours, or by subjecting chloride of manganese to electrolysis. Boerhaave does not appear to have known the metal. In my English edition of 1753 he speaks of it in the following words: "Take the frit and set it in melting pots in a working furnace, adding in each pot a proper quantity of a blackish stone not unlike loadstone, and called manganese, which serves to purge off that greenish cast natural to all glass and to make it clear." Scheele, Bergman, Chevreul, Berthier, and Berzelius, have in modern times investigated the physical and chemical characters of manganese. The ore is widely distributed over our globe; it accompanies many iron ores, particularly the hematites, also the franklinite of New Jersey. It has been detected as a constituent of meteoric iron in the ashes of most vegetable and many animal substances, is the coloring principle of many fossils in a dendirtic form in the chalcedony which is called the "mocha stone," and in the same form on sand pebbles of which I found plenty in Stanislaus River in California. It also occurs combined with sulphur, carbonic acid, silica, water, and with many atomic proportions of oxygen, such as protoxide, sesquioxide, binoxide, manganic acid, and permanganic acid becoming thereby sometimes a base and sometimes an acid. The principal varieties of manganese found in nature are of the following descriptions:

1st. Hausmannite has the form of a four-sided pyramidal crystal, with hardness 5, and a specific gr[illegible]y 4·7.

2d. Braunite is an anhydrous sesquiox[illegible]rystallizes in an octahedron, is much harder than the [illegible]d has a higher specific gravity.

3d. Psilomelane, generally called [illegible] gray oxide, occurs in botryoidal and stalactitic sh[illegible]

4th. Manganite is a hydrous sesqu[illegible]lizes in right rhombic prisms.

5th. Pyrolusite, the most useful and abundant ore of manganese, derives its name from two Greek words signifying "fire" and "to wash", in allusion to its property of discharging the brown and green tints of glass; it crystallizes in small rectangular prisms, or is fibrous, radiated, and divergent, of iron black color and grayish streak, has a specific gravity of 4·94, and is composed of 37 per cent oxygen and 63 per cent manganese. This ore is generally called binoxide, deutoxide, or peroxide, is a good conductor of electricity, and strongly electro-negative in the voltaic circuit. When heated to redness it readily parts with its excess of oxygen as it gives off one third of it. When heated with sulphuric acid one half of its oxygen escapes. Owing to this property it is more employed in the arts than any other oxide; it is called in trade the "black oxide of manganese." Its commercial value is dependant upon the proportion of oxygen which it contains in excess of that which is necessary to its existence as sesquioxide. A convenient method of estimating this excess of oxygen is founded upon the circumstance, that the black oxide of manganese is decomposed in the presence of oxalic acid, and from sulphuric acid proto-sulphate of manganese is formed, and all the excess of oxygen reacts upon the oxalic acid and converts it into carbonic acid which passes off with effervescence. If the mixture be weighed before the decomposition has been effected, and again after it has been completed, the loss will indicate the amount of carbonic acid; each equivalent of peroxide of manganese gives two equivalents or its own weight of carbonic acid.

Manganic acid is known under the name of chameleon mineral, is obtained artificially by fusing the peroxide of manganese with equal weights of caustic potash, which when dissolved in a small quantity of water has a green color, but when largely diluted becomes purple and ultimately claret color; for this property it has been employed for many years in the arts.

Permanganic acid is artificially obtained by mixing intimately four parts of finely powdered peroxide of manganese with three and one half parts of chlorate of potash, while five parts of hydrate of potash are dissolved in a small quantity of water and added to the above mixture, the whole is evaporated and reduced to powder, then heated to dull redness for an hour in an earthen crucible and when cold the mass is treated with water and filtered through a funnel plugged with asbestos; the solution after being neutralized with sulphuric acid yields on evaporation beautiful red acicular crystals of permanganate of potash. This preparation of later years has become an important vehicle for disinfection. Among the other native oxides of manganese may be mentioned the *mineral wad* which is also very abundant but not valuable enough to produce gas. It is amorphous, soft, black, or brown and purple; when mixed with linseed oil it produces spontaneous combustion. It is supposed to be the coloring ingredient of the dendritic delineations upon many substances, such a steatite and others mentioned elsewhere. The localities of manganese are very prolific; pyrolusite has been mined very extensively in Europe; psilomelan in England, France, Belgium, and the United States; manganite in Bohemia, Saxony, and England. Much of the latter is consumed in the bleacheries of those countries. The United States and the Provinces have inexhaustible deposits of the oxides of manganese. From Vermont, the eastern limit, to Georgia, the southern limit, large supplies were formerly furnished, but in late years West Virginia, North Carolina, and California have supplied us to a large extent but not of a high grade of oxidation. While the binoxide of manganese suitable for the manufactures ought to yield from 80 to 90 per cent of oxygen gas, the product of the last mentioned States has not exceeded 50 to 70 per cent oxygen. The provinces of New Brunswick and Nova Scotia have produced within a few years very superior oxides of manganese, and the specimens I possess in my cabinet excel in richness and beauty those from Ilmuran in Thuringen and Ihlefeld in the Hartz mountains of days gone by. The manufacturers of bleaching powders in England have for the last twenty years been supplied by the little principality of Nassau to the amount of fifty thousand tuns per annum, while the United States with all its inexhaustible resources has not exported any, and it is hoped that before long the export of manganese may prove lucrative. The quality of the Nova Scotia manganese is, according to Howe, of high per centage, some from 82·4 to 89·8 of sesquioxide, and that from Tennycape as high as 97·04. The international manganese mine of New Brunswick contains from 80 to 85 per cent of sesquioxide. We find manganese in the State of Missouri containing much cobalt, while the Vermont manganese is associated with much iron. We also find in California, in the red hill of the bay facing the city of San Francisco, containing millions of tuns of psilomelane or compact manganese yielding from 40 to 50 per cent sesquioxide. We also know manganese to be abundant in Canada. A vein of 50 to 60 feet wide is said to exist at Bachawanning Bay on Lake Superior.

The geological position of manganese is not quite accurately known. In Germany it traverses porphyry and is associated with calcspar and baryta. In Vermont, in the United States, it is found among crystalline rocks; in Canada it is accompanied by dolomite, and in Nova Scotia it exists in a gray limestone, quartzite, and conglomerite, and it unquestionably belongs to the new red sandstone formation. My manganese mines at Pembroke are situated close to the gypsum deposits, which would range them with the upper silurian system.

I will now enumerate the many useful applications in the arts.

1st. Manganese is employed for producing oxygen gas in the chemical laboratory, the material of the compound blow pipe and drummond light, for the production of alkaline manganate in order to procure a good and cheap light in combination with coal gas.

2d. Manganese is most extensively used in the manufacture of chlorine so as to prepare a bleaching liquid or powder, the consumption of which by the paper and cotton manufacturers is unlimited.

3d. Next in importance is the manganese largely employed in the green flint glass works in precipitating the iron, and when added in excess to produce an amythyst color in flint glass.

4th. Steel manufacturers require manganese for producing a hard and tough product ; a half pound to fifty of iron will have the effect.

5th. Linseed oil is rendered more siccative by the addition of manganese, and is called a patent dryer for paints and varnishes.

6th. A permanent black on earthenware and pottery is obtained by exposure to heat.

7th. A black enamel used in ornaments by jewelers is likewise produced with manganese.

8th. The manufacture of permanganates, a powerful disinfectant, and the main material in the new oxygen light is obtained from the same.

9th. The quality of spirits, with or without distillation, is obtained by the use of maganese.

10th. The chameleon mineral used in sugar refining is prepared with manganese.

The consumption of manganese for the manufacture of the new gas light about to be introduced in this country, forms a new epoch in this direction. It is to be converted first into the alkaline manganate, which acting as a sponge alternately absorbing the oxygen of the air and again releasing it, must require if successful, not less than one hundred thousand tuns of manganese in order to produce a million of cubic feet of oxygen gas, and I gather the following particulars from the programme issued by the inventors, Messrs. Tessie de Motay and Marechal of Metz: " The manganates are decomposed at a temperature of 600 deg. Fah., by the action of a jet of ordinary steam which liberates the oxygen and leaves a residuum composed of sesquioxide of manganese and the alkaline base contained in the combination. The manganate is regenerated by submitting the above mentioned solid residue to the action of a current of air at the same temperature as used in the decomposition, and all these operations are conducted in a series of retorts placed in a furnace where the manganates, after being raised to a temperature of 600 deg. Fah., are alternately submitted to the action of a jet of steam and current of air which restores to the mass the oxygen has lost. The oxygen is disengaged by the steam from retorts; this steam is liquified by pressing into a condenser, and the pure oxide is collected into a gasometer. When applied for the production of light, oxygen in combination with common coal gas permits a reduction in the consumption of the latter, but at the same time giving an equal quantity of light in the proportion of 16 to 1.

The permanganate of potash or Condy's disinfectant is recommended as a powerful agent in obtaining pure drinking water and in epidemic diseases. But by far the largest amount of manganese is consumed by the manufacturer of bleaching powders. England alone consumes 80,000 tuns for that purpose per annum, and as soon as the United States becomes independent of the English imported chloride of lime for bleaching the cottons and the papers, not less than one half million tuns will be consumed for the desired object, for on examining the report of the director of the bureau of statistics, I find that 12,682 tuns of bleaching powder have been imported the first five months of the year at the value of $324,066.

NOTES ON THE VELOCIPEDE.

Our exchanges teem with items of all sorts concerning the velocipede. We are also in receipt of many letters of inquiry and suggestion with reference to the construction of the machine, some of them unpractical, others containing useful hints. One correspondent suggests the making of a vulcanized rubber rim to velocipede wheels, so that they could be run over Belgian pavements without shock to the rider, and the propeller wheel could also gain superior tractive power. Some very ingenious and peculiar devices are now on their way through the Patent Office, and will, if successful, make this little iron horse "a horse of another color," if we mistake not in our predictions.

A lady, writing from Georgia, wishes manufacturers to take into special consideration the wants of ladies. She says that the awkward position they are now forced to assume astride the front wheel, is a serious objection. She suggests a velocipede for two persons. It might have seats something like a side-saddle facing in opposite directions and be propelled by the combined power of the two riders, each on her own side of the wheel. This suggestion is worthy consideration, but, for our own part, we don't think it would work well with two female riders. There can be no doubt, however, that good sport could be had by a gentlemen and lady on a machine of such construction.

As is the case with almost every new invention, there are those who wish to make out that it is a discarded experiment of the past; but we do not believe the velocipede of the past could compare either in principle or nicety of construction with the two-wheeled machine of the present.

We have in our office a colored engraving of the velocipede of 1819, described in an English journal as follows:

This machine was of the most simple kind supported by two light wheels running on the same line; the front wheel turning on a pivot which, by means of a short lever, gave the direction in turning to one side or the other, the hind wheel always running in one direction. The rider mounted it and seated himself in a saddle conveniently fixed on the back of the horse (if allowed to be called so), and placed in the middle between the wheels; the feet were placed flat on the ground, so that in the first step to give the machine motion the heel should be the part of the foot to touch the ground, and so on with the other foot alternately, as if walking on the heels, observing always to begin the movement very gently. In the front before the rider was placed a cushion to rest the arms on while the hands held the lever which gave direction to the machine, as also to balance it if inclining to either side when the opposite arm was pressed on the cushion.

It will be seen at once that the "little difference", in the manner of propelling this machine and the modern one, completely changes the character of the vehicle. The ridicule which assailed this machine was not without foundation; the motion in propelling it was not graceful, and it was said to give rise to numerous cases of rupture.

Not so with the velocipede of the present, which glides along as though it were alive, and with a smooth grace alike exhilarating and beautiful to behold.

An English paper gives a description of a velocipede calculated to convey from six to a dozen people. It has four wheels for carrying and propulsion, and a fifth guide wheel, which acts upon a lever or pole, and cramps two of the wheels precisely as the fore wheels of carriages are now cramped in turning. Each pair of carrying wheels is provided with double cranks which are connected with each other by longitudinal treadle bars, so that all can aid in propelling the machine. This velocipede is provided with cross seats having backs like one of our Yankee market-wagons. It has not been tried yet, but it is stated that a club is being organized to manipulate it.

Performances with them are coming into fashion at the theaters. In the Parisian theatrical world considerable sensation has been caused by velocipede performances, and even some curious acrobatic exercises are gone through with them. A notice in the Paris journals recently stated that not more than twelve velocipedes should be allowed "at one time" on the stage. Chicago has followed suit, and the habitues of Crosby's Opera House have been treated to velocipede exhibitions between the other portions of the entertainment.

There also was a velocipede race at Pike's Music Hall in Cincinnati recently. A silver cup worth $100 was given to the fastest rider, and another, also worth $100 to the slowest rider

An exchange says, that a day or two since, a certain gentleman in Chicago, who has been practicing for some time on the side walks, at vespertinal hours, came out upon Indiana avenue, and throwing down the gauntlet of defiance, dared a street car driver to race with him to Thirty-first street, the terminus of the track. The challenge was gallantly accepted by the car driver, although the latter had several lady passengers on board. The race began auspiciously, the horses being driven at a furious pace. The velocipede soon gained upon its competitor and bade fair to distance it when an unlucky crack in the sidewalk received the fore wheel, leaving the other, in obedience to the law of its momentum, to turn a somersault, throwing the rider into the gutter. The car won the race on a "foul."

Rural districts are catching the mania. A velocipede school has, we learn, been established in Bridgeport, Ct., but it is said that the nearest approach to a velocipede that has been seen in Danbury was a bit of orange peel, on which a citizen went across a sidewalk and down a pair of stairs in just 1½ seconds—the quickest time on record.

Winslow Homer's last drawing for *Harper's Weekly* is very original in conception. He makes the New Year come in on a velocipede!

Mr. Dana, of the *Sun*, has become, it is said, one of the most expert velocipedists in the city. It is also asserted that he advocates a project to build an elevated railway from Harlem to the Battery, to be used only by the riders of velocipedes. By this means it would be possible to go from one end of Manhattan Island to the other in about an hour, making allowance for delays from stoppage and accidents. A good rider, with a clear track, would easily accomplish the distance in half an hour; but, with a well-filled road, progress would necessarily be slower. The proposed roadway ought to be at least thirty feet wide, upon an iron framework; with a flooring of hard pine. By all means let us have the "elevated roadway," and let the sidewalks be kept clear for pedestrians, who are otherwise likely to be endangered by the carelessness or awkwardness of velocipedists.

We regret to record that the Park Commissioners have prohibited velocipedes in the Park. The reason assigned is that the drives are narrow and horses are likely to become frightened. Then, why, Messrs. Commissioners, do you not widen the drives without delay? The Park was made for the public not the public for the Park. The drives are too narrow, anyway, especially on the east side of the Reservoir, and as we believe it is intended to widen them, we do not see good cause for postponing the work. As to frightening horses the following, from a correspondent of the *Herald*, is practical and suggestive:

The *Herald* is right. Velocipedes ought to be admitted to the Park. And why not? In the year 1855 I spent nearly four months in Paris, and occasionally saw velocipedes passing rapidly through the Champs Elysees and along the boulevards without exciting much attention either from man or beast. The horses did not appear to notice them at all. I was in Paris again last spring and found the velocipede mania raging with considerable force, and these vehicles were commonly to be seen upon the most frequented streets and public places of the city. The horses were not afraid of them. Yet, if you will allow me to say so, I am not quite sure that this state of things would hold good in our parks. It is noticed by all travelers that a runaway is a rare occurrence in Paris. Indeed, this remark holds good respecting all other cities in Europe. I have spent nearly two years of my life in Europe, and in all that time I never saw a horse run away. On my first visit to the Park after my return, in June last, I saw the fragments of no less than three light geared, heavy top buggies scattered along the roadway, and it is not uncommon, I am told, to have ten or fifteen injured persons brought in on a single day to St. Luke's Hospital, victims of smash-ups in the Park.

There is something radically wrong either in our driving or in our system of breaking horses. Probably both are faulty. And here, I suggest, is a subject for a searching inquiry.

Adulterations in Tea and Coffee.

The New York *World* has been applying its editorial nose to the tea chests and coffee bags, as well as the whisky barrels of New York, and finds much to offend. It says:

We heard, not long ago of one of the great tea houses buying in a cargo of damaged tea from a vessel which sunk in the harbor. It was properly doctored and fixed up, and put into the market afterwards. A common adulterant of genuine teas is exhausted tea leaves. A few years ago there were eight manufactories for the purpose of re-drying exhausted tea leaves in London, and several others in various parts of the country. The practice pursued was as follows: Persons were employed to buy up the exhausted leaves at hotels, coffee houses and other places at 2 1-2d. to 3d. per pound. These were taken to the factories, mixed with a solution of gum, and re-dried. After this the dried leaves, if for black tea, were mixed with rose pink and blacklead, to "face" them, as it is termed by the trade. The same practice is pursued in this country.

Perhaps the most general mode of adulterating the better grades of coffee in New York is by the admixture of inferior coffee. The Java is, of course, rich and comparatively expensive. The common South American coffee is cheap, has a flat aroma, and a bitter taste. When the berry is burnt it cannot be readily distinguished from the Java berry, and, of course, identification is lost after grinding takes place. We are informed that a new adulterant has been discovered in sweet potatoes, and that it is becoming quite popular with the sellers of ground coffee. It has the right color and taste, and it is not easily detected without the microscope. The common adulterant for coffee, however, is chicory. The use of chicory is openly acknowledged in some places, and even defended by grocers on the score of health and economy.

We have medical testimony that chicory is extremely injurious to health. Dr. Hassall says that taken constantly, prolonged and frequent use produces heartburn, cramp in the stomach, loss of appetite, acidity in the mouth, constipation with intermittent diarrhea, weakness in the limbs, trembling, sleeplessness, a drunken cloudiness of the senses, etc. Again, it is the opinion of an eminent oculist in Vienna, Professor Beer, that the continual use of chicory seriously affects the nervous system, and gives rise to blindness from *amaurosis*. Its use ought, therefore, to be discouraged, and grocers who sell it for coffee ought doubly to be put under the ban.

An Earthquake Convention.

A convention called by joint committee, on the Investigation of Earthquakes, has been held in San Francisco, with a view to the adoption of an improved system of building and other precautions against future disaster from earthquakes. The following report of its proceedings is from the *Bulletin*:

Mr. Gordon explained that the laboring oar in the investigation must fall on the two secretaries, and gentlemen had been selected having peculiar qualifications for the position, and who could give their entire time to the business in hand. Professor Rowlandson would bring the experience and critical knowledge of a man of science, and Mr. Bridge, a practical architect and builder, a vast fund of information in relation to investigations and experiments with mortars, cements, etc., gained while with General Gilmore, United States army.

The President called for reports from the sub-committee No. 1, on bricks, stone, and timber.

General Alexander, chairman, reported that the committee had made some preliminary investigations as to the qualities of brick, and had put on foot inquiries as to the properties of brick made mostly from sand, which had been highly spoken of in the Eastern States. He had no hesitation in saying that, as a rule, the brick used in the city were not good. Better brick can be made with the same material by using proper proportions and knowledge in burning, etc. He cited from his own experience a case in point, where a large kiln of brick had been condemned as defective, and from the same material, under his supervision, a very superior article had been made; the difference being in proportions and in burning.

Sub-committee No. 2. on Limes, Cements, Mortars, etc., Colonel Mendel, chairman, reported that they had the matter in progress, but were not prepared to make any extended report. Granted further time.

Sub-committee No. 3, on Structural Designs, General Alexander, chairman, reported progress from the committee, who were granted further time.

The President made some incidental remarks on the advisability of recommending some plan by which structures already erected can be strengthened by iron bracing, to resist any subsequent shocks, instancing the plan he was adopting in bracing the sugar refinery, etc. The matter was discussed by General Alexander, Colonel von Schmidt, Dr. Blake, and Judge Rix. On motion of Mr. Rix the matter was referred to the Committee on Structural Designs.

Sub-committee No. 4, on Scientific Inquiry, etc., Dr. James Blake, chairman, reported that the committee had met, and the investigations had been commenced. In this connection a letter was read by General Alexander from R. C. Hopkins, Custodian of the Spanish Archives in the Surveyor-General's office, stating that the archives were at the disposition of the committee in any investigation they might wish to make, and offering his services as translator, etc. The matter was referred to the same committee.

A discussion followed on the value of these old records on the subject under consideration. From remarks made by Prof. Rowlandson, it appeared that the old Mission records had been pretty well searched by Dr. Trask, Dr. Tuthill, and others. Mr. Hittell, of the *Alta*, stated that he had personally inspected these old manuscripts, with this very object in view, and found them very meager and unsatisfactory. On motion of Major Elliot, Colonel Williamson, United States Engineer, was placed on the Committee on Scientific Inquiry.

A letter was received from W. Frank Stewart of San Jose, accepting the invitation to serve on this committee. On motion, the gathering of facts connected with the earthquake in the vicinity of San Jose, was intrusted to Mr. Stewart.

FOOD REQUIRED TO SUSTAIN LIFE.—Judging from the minimum quantities of food upon which an ordinary individual is capable of existing without suffering in health, it would seem that about 4,100 grains of carbon and 190 grains of nitrogen are required in his daily diet. These proportions have been determined from a large number of observations, as by those of Dr. Lyon Playfair, in his inquiries into the dietaries of hospitals, prisons, and workhouses, and by those of Dr. Edward Smith, in his examination of the amounts of food upon which the Lancashire operatives were capable of living during the cotton famine, and also by his inquiries into the dietaries of indoor laborers.

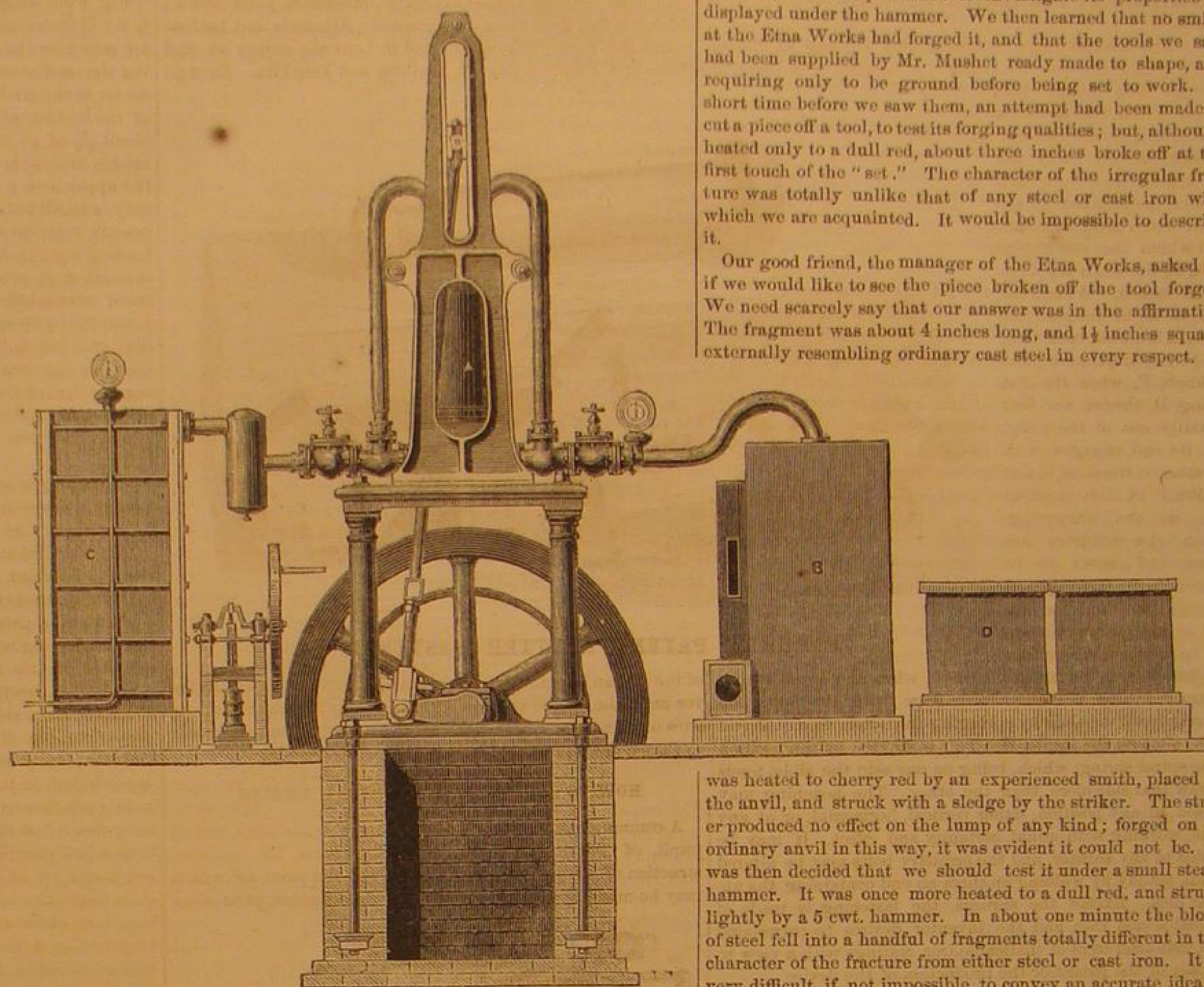
English Ice Making Machine.

We copy from the London *Engineering* the illustration of a device for producing ice, or for cooling liquids, by the evaporation of a volatile liquid under low pressue or in a vacuum.

We copy from *Engineering*: Referring to the engraving, A, is the double-acting air pump; B, the refrigerator; C, the condenser; and D, the ice troughs. The refrigerator, B, may be described as a kind of vertical multitubular boiler, the tubes of which are, when the machine is employed for ice making, traversed by a stream of strong brine, this brine being replaced, when the machine is used for cooling only, by the water which is to be cooled. The tubes are of thin copper, and are of small diameter, whilst by an arrangement of diaphragms the water or brine is made to traverse the length of the refrigerator several times. The liquid ether from the condenser is admitted to the lower end of the refrigerator, and, in consequence of the vacuum formed by the air pump, it there evaporates, absorbing heat from the brine or water. The vapor arising from the evaporation of the ether is drawn off by the air pump from the top of the refrigerator and transferred to the condenser, which consists merely of a coil of pipe inclosed in a wooden tank containing water. In the condenser the ether vapor, which has become heated by its compression, parts with its heat and becomes liquefied, the liquid ether thus obtained being, as we have said, transferred through a pipe back again to the refrigerator for re-evaporation.

The machine is used sometimes for ice making and sometimes for cooling the water used in ordinary refrigerators on the establishment, and it is for the latter purpose that it can be used most economically, as we shall show presently. The air pump of the machine is 20 in. in diameter with a stroke of 37 in., and it is driven by a 15-horse non-condensing horizontal engine at a speed of 40 double strokes per minute. The general arrangement of the air pump is, as will be seen by our engraving, similar to that of a table engine, the cylinder being placed in a vertical position on an entablature, beneath which the crank shaft, by which the machine is driven, is situated. The smallest practicable amount of clearance is allowed between the piston of the pump at the ends of the stroke and the cylinder covers, and every care is taken to arrange the valves so that the capacity of the waste space which the pump is unable to clear of vapor at each stroke is reduced to the smallest possible amount. So well has this been done, that the pump is capable of producing a vacuum of 29 in. of mercury; but the vacuum which ordinarily exists in the refrigerator, when the machine is in regular use for ice making, averages 26 in. of mercury, and that when the machine is cooling water only about 20 in. The difference between the two pressures last mentioned is due to the fact that, when the machine is employed for ice making, the ether vapor in the refrigerator falls to a much lower temperature than when the apparatus is used for cooling water only, and this being the case its tension is also less. Thus, when ice making is going on, the brine passing through the refrigerator is cooled down to from 10° to 18° Fahr., and is, in fact, returned to the refrigerator to be cooled when at a temperature of 32°; whilst, when water only is being cooled, the temperature does not fall below about 39° or 40° Fahr.

The pressure in the condenser varies from 2 lb. to 3 lb. per square inch, according to the supply and temperature of the water used for condensing purposes. With an abundant supply of water, the pressure in the condenser would, when the machine was ice making, be practically nothing; but the existence of a slight pressure in no way interferes with the working of the machine, but merely throws a little extra work on the pump. It may be noticed here, as a distinctive feature of Messrs. Siebe's machine as compared with the refrigerating machines acting by the expansion of compressed air, or by alternate production and liquefaction of ammoniacal gas, that no parts of the apparatus are subjected to severe pressure. The 2 lb. or 3 lb. pressure per square inch in the condenser may be considered to be practically nothing, whilst the refrigerator is subjected to a collapsing pressure only, and that, of course, cannot exceed, however nearly it may approach, the pressure of the atmosphere. With such low pressures as these, there is, of course, no difficulty, by the aid of good workmanship, in making all joints perfectly tight, and thus guarding against loss of ether. As the heat generated by the compression of the ether vapor is considerable, the stuffing box through which the piston rod passes is kept cool by jets of water, and similar means are employed to cool the delivery valves.



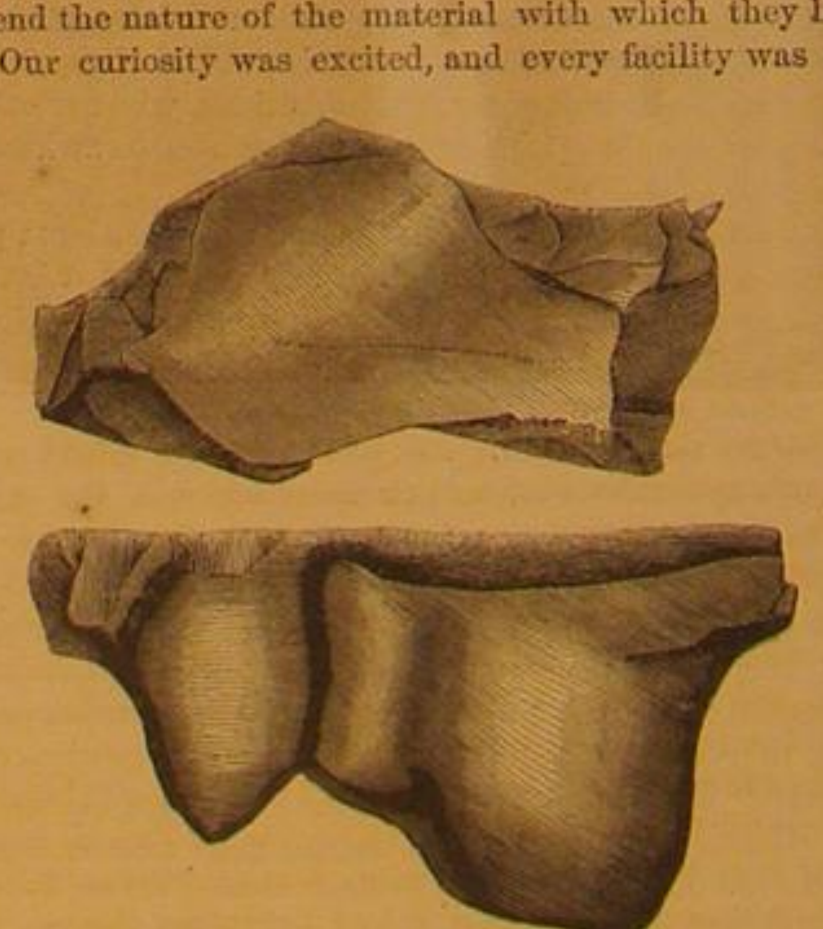
SEIBE BROTHERS' REFRIGERATING MACHINE.

SOMETHING NEW IN STEEL.

It has long been a disputed point where steel leaves off and wrought iron begins; but it is generally received that the difference between steel and cast iron is so great that no doubt can exist as to which is which. Within the week we have proved to our own satisfaction that it is just as difficult to distinguish between cast iron and steel, as it is to define those characteristics in which steel differs from wrought iron. There is, indeed, at this moment, a so-called steel in the market, which possesses such extraordinary attributes, that the metallurgist may well feel in doubt under what head it should be classed. To all intents and purposes it is a new material, and as such it claims the attention of our readers.

For some time past Mr. Mushet has advertised a "special tool steel" warranted to last—we are afraid to say how much longer than any other steel, worked in the same way and in the same shape. Our readers may have seen these advertisements, and passed them over as legitimate trade puffs. In this they were wrong. The material—be it steel, cast iron, or some alloy—is, in reality, one of the most singular substances we have ever met with, and it possesses qualities which deserve the attention, not only of engineers, but of analytical metallurgists. We propose to put our readers in possession of all that we know about it, leaving them to draw their own conclusions, and trusting that Mr. Mushet will supply more information to the scientific public than he has hitherto thought proper to furnish to purchasers.

A few days since we visited what we shall term the Etna Works. Chatting with the manager about things in general and engineering in particular, the subject of tool steel turned up, and we then learned that a couple of tire turning tools, made of Mr. Mushet's tool steel, were in use at the moment, which we were assured possessed such qualilies, that managers, foreman, smiths, and turners were alike at a loss to comprehend the nature of the material with which they had to do. Our curiosity was excited, and every facility was court-



eously afforded us for testing the steel. Mr. Mushet issues with each bar printed instructions as to the system to be adopted in working it. In the first place we are told that, after forging or otherwise working the tool steel, it is to be suffered to cool slowly, and under no circumstances to be quenched and tempered. Now, it is well known that the hardest ordinary cast steel may be softened so much by heating it to a bright red and suffering it to cool slowly, that it will not retain a sharp edge for two minutes. In other words, its temper may be drawn. We proved, on the other hand, that the temper of Mr. Mushet's "special tool steel" cannot be drawn. After being heated red hot and suffered to cool slowly, it still remained harder than any ordinary cast steel tempered at straw color. The proof of this lies in the fact that a tool of the best ordinary cast steel required to be ground three times in planing a given area of hard cast iron, whereas a tool of Mr. Mushet's steel not only planed a similar area without regrinding, but remained to all intents and purposes nearly as sharp as when it began. It is rather more brittle than ordinary steel, in so far that a different angle, slightly more obtuse than that commonly employed, must be given to turning tools, but it certainly is not objectionably brittle. In the shape of chisels, we have no experience of its qualities whatever.

Having satisfied ourselves of its good qualities in the shape of a tool, we next proceeded to investigate its properties as displayed under the hammer. We then learned that no smith at the Etna Works had forged it, and that the tools we saw had been supplied by Mr. Mushet ready made to shape, and requiring only to be ground before being set to work. A short time before we saw them, an attempt had been made to cut a piece off a tool, to test its forging qualities; but, although heated only to a dull red, about three inches broke off at the first touch of the "set." The character of the irregular fracture was totally unlike that of any steel or cast iron with which we are acquainted. It would be impossible to describe it.

Our good friend, the manager of the Etna Works, asked us if we would like to see the piece broken off the tool forged. We need scarcely say that our answer was in the affirmative. The fragment was about 4 inches long, and 1¼ inches square, externally resembling ordinary cast steel in every respect. It was heated to cherry red by an experienced smith, placed on the anvil, and struck with a sledge by the striker. The striker produced no effect on the lump of any kind; forged on an ordinary anvil in this way, it was evident it could not be. It was then decided that we should test it under a small steam hammer. It was once more heated to a dull red, and struck lightly by a 5 cwt. hammer. In about one minute the block of steel fell into a handful of fragments totally different in the character of the fracture from either steel or cast iron. It is very difficult, if not impossible, to convey an accurate idea of the appearance of the fragments. The foregoing engraving of two fragments, natural size, will suffice, at least, to show that they in no way resemble fragments of ordinary cast steel broken up in the same way. The real pieces lie before us, and resemble nothing in the world so much as bits of vitreous slag from a blast furnace. They are not like any metal in the slightest degree, but on filing them the surface assumes the character of polished steel. All the pieces manifested the same conchoidal fracture. In a second experiment with another piece a far higher temperature was imparted to the metal, and it was then drawn with little difficulty to about a quarter of an inch square. It was hardened in the usual way, and did not fly, so that it is possible that in small masses it will bear hardening. The little piece is so intensely hard that no file will touch it. A lump of the same steel an inch and a quarter square cracked in all directions when heated and quenched.

What is this material? Is it steel or cast iron? Under the hammer it behaves more like cast iron than anything else; as a tool it behaves as neither cast iron or steel ever behaved before. To all intents and purposes it is a new metal. Mr. Mushet has not patented its mode of production, which he reserves as a secret. That it contains an enormous quantity of carbon is, in a sense, proved by its hardness. Why does not this carbon render it as brittle as cast iron? Is the carbon combined or graphitic? Is the "steel" simply an alloy of iron with some other metal? What is the proper method of forging it in ordinary smith's fires? These and some other questions present themselves for solution. The only conclusion we can arrive at, and we confess we do not believe it to be the correct solution of an interesting problem, is that Mr. Mushet first forges his tools or bars from a hard cast steel of the ordinary kind, and then, by some process such as recementation, imparts an additional hardness to them, which, although it makes the tool as such invaluable, renders the bar from which tools should be made, as such, useless in the hands of all but first rate smiths.—*The Engineer*.

Dyeing and Coloring.—We invite attention to the article on another page written for the Scientific American, by the well known Dr. M. Reimann, of Berlin, author of a valuable work on "Aniline and Aniline Colors." We hope during the year to publish several articles from his pen.

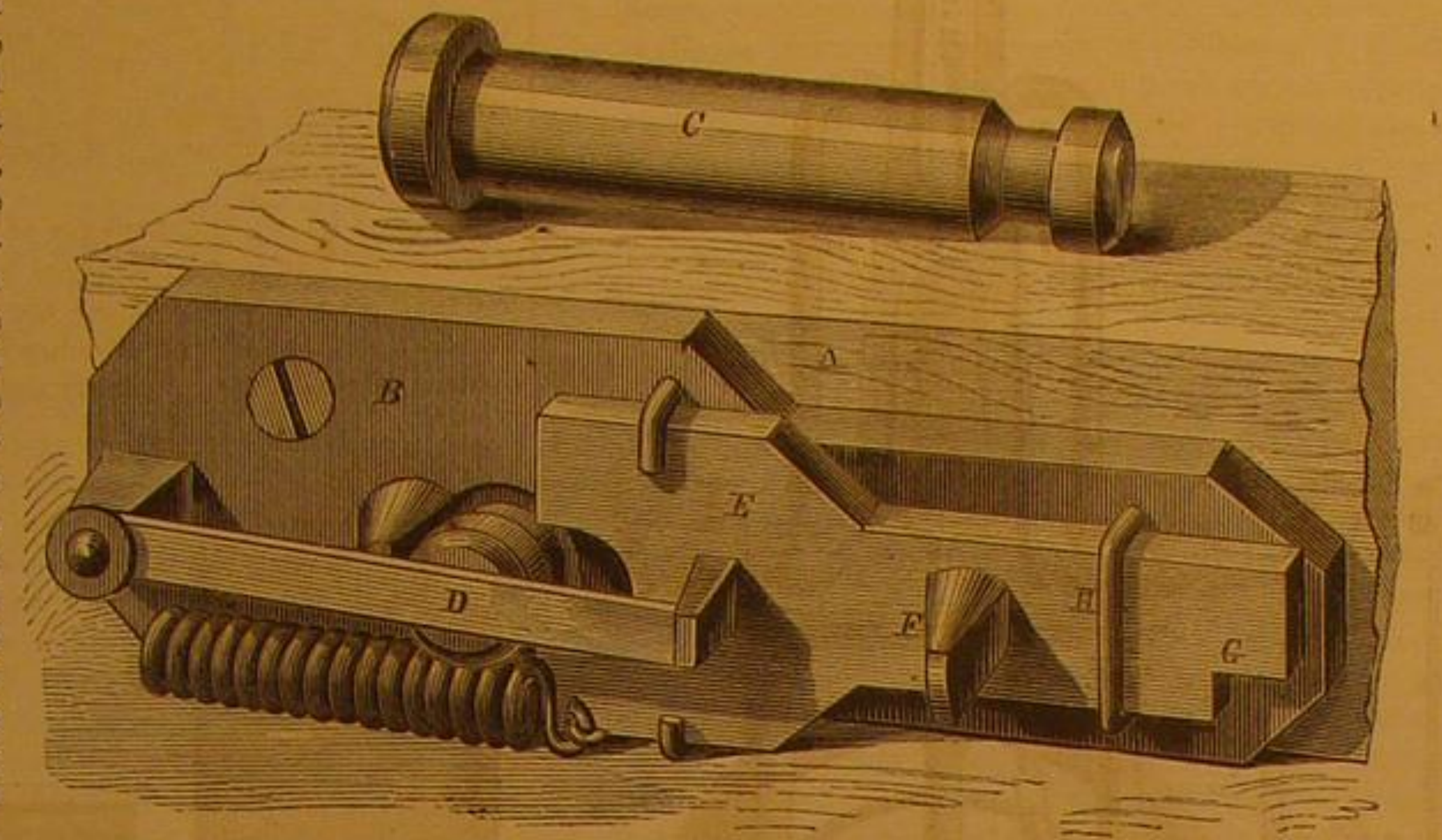
It is said that the largest distillery in the United States has just been finished near Lexington, Ky. It will be able to make 2,400 gallons of whisky per day. Thirty other distilleries in the same district will begin operations January 1st, and their aggregate daily product is estimated at 25,000 gallons.

Improved Bolt for Securing Window Shutters.

The ordinary method of locking the shutters of buildings is to pass the bolt through from the outside and then secure it on the inside by means of a strap or split key passed through a hole in the bolt near the end. Beside the annoyance of being compelled to pass into the building to lock the bolt, it is an unsafe contrivance, as sometimes by turning the bolt from the outside the key will drop out, and in any case the key is too slender to resist any considerable strain upon it from the outside before breaking. The device, however, shown in the accompanying illustration has none of these objections, and is in all respects a most admirable contrivance for the purpose intended.

A represents the wall or casement of a building, on the inside of which the lock is secured. It consists of a plate, B, through which the bolt passes. The bolt is shown detached at C, and the end is seen directly under the flat spring at D. As will be seen the bolt has an annular score near the end, into which the end of the slide, E, fits when the shutter is locked. When the bolt is to be released the slide, E, is moved back from the bolt by the thumb piece or knob, F, when the flat spring, D, throws the bolt partially out of the plate, and its end engages with the snug on the slide, E, and retains it in the position seen in the engraving. When the shutters are closed and ready to be locked, the bolt is passed through from from the outside in the ordinary manner, its end pressing against the flat spring, releasing the slide, when the spiral spring instantly brings the slide to engage with the bolt, and securely locks the slide by springing the notch, G, on the end of the slide on the staple, H. This is effected by the position of the spiral spring, which, being on one side the slide, tends to draw that side more than the other. The fastening may be used in any position, either vertical, horizontal, or at any angle, working with equal certainty and effect. It may be applied to any shutter, and the ordinary bolts may be altered to suit, simply by welding on them an end containing the annular nick. Except the springs, the fastening is made of malleable cast iron, and the inventor desires to correspond with manufacturers of malleable iron castings with a view to the sale of the patent or the production of the device.

Patented through the Scientific American Patent Agency, December 8, 1868, by W. B. Farrar, who may be addressed at Greensborough, N. C.



FARRAR'S PATENT SHUTTER FASTENER.

Vienna White Bread.

Prof. Horsford gives the following recipe for making the celebrated Vienna white bread: In the first place, great care is taken in the preparation of the flour. Scrupulous neatness and cleanliness are observed in all the processes of preparing the yeast and dough. The dough is placed in an oven somewhat of the type of the aerotherme, that is surrounded by currents of heated air, maintaining a uniform temperature of about 380°. By an arrangement of steam pipes, jets of steam are introduced into the oven to maintain an atmosphere saturated with moisture, and so retard the evaporation of water from the loaf during all the early part of the baking. When the loaf has attained its fullest distension and is penetrated by myriads of minute pores, the steam is shut off, and a side door, communicating with a separate fire from that which heats the oven, is opened. From this the heat of an intense blaze is flashed into the oven to be reflected from the low, glazed, tile roof, and give that requisite delicate red tint to the surface, which at the same time charges a thin crust with an aroma which is the product of roasting—an essential oil—most grateful to the palate. This part of the operation is brief, and is watched through a glass door. When complete the loaves are taken from the tins and immediately varnished with warm milk or water, with which a little good melted butter has been incorporated. The water of the milk quickly evaporates, and leaves a fine glazed surface.

We can testify from considerable personal experience that the Vienna bread and beer are the best to be found anywhere.

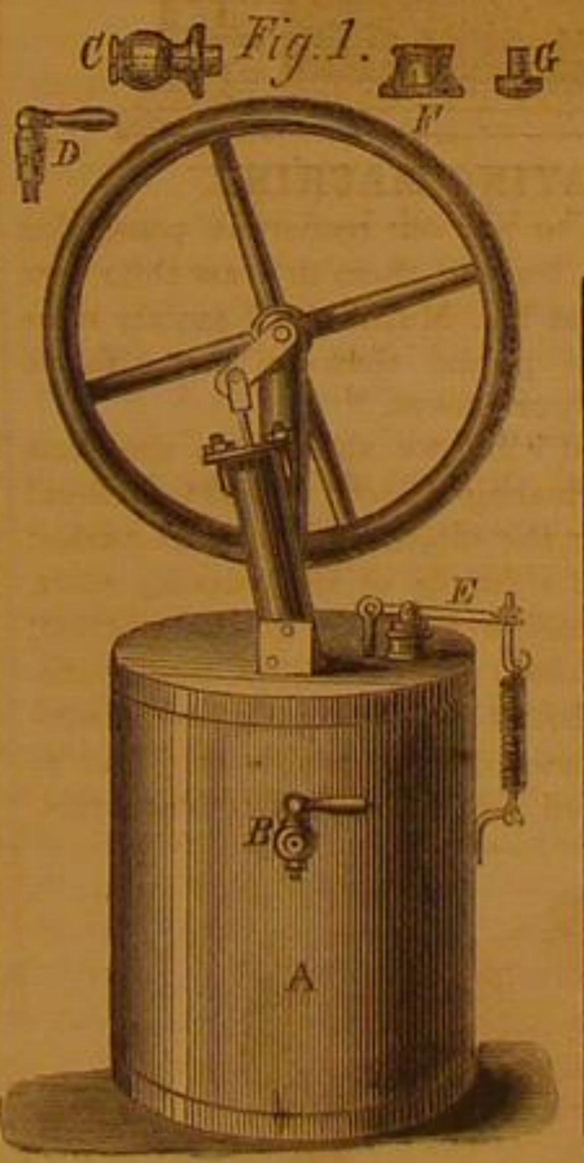
The Growth and Prosperity of Michigan.

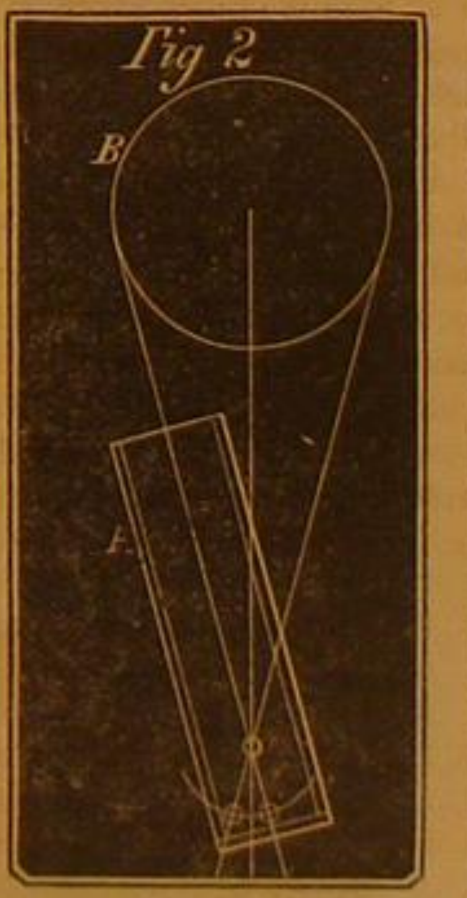
Many of our readers can remember when Michigan was in the far West, only to be reached by tedious journeyings through wide regions of unsettled country. But to-day Michigan has a population of more than a million; six incorporated colleges, one of them a University, with law, medical, literary, and scientific departments, and with more than twelve hundred students; an Asylum for the Blind and the Deaf; two Asylums for the Insane; a Normal School; high schools in every considerable town, and a system of public instruction as thorough, as wisely adjusted, and as efficient as in any State of the Union, so good indeed, that private schools are hardly known. Pupils come from all the States of the West, not only to the University, but to the Union Schools of Michigan. The finest and largest buildings, the most beautiful for situation, and most convenient in their appliances, are those which are set apart for public instruction. No interest is so jealously guarded as this. Every city and every county has its superintendent of schools. There is the same zeal for education in the newer as in the older settlements, in Saginaw and Muskegon, as in Monroe and Detroit. The market for school books in these forest cities is not less sure and regular than the market for boards and shingles.

Classic and foreign learning flourishes on what were but yesterday Indian hunting grounds; and the youths and maidens know more of Goethe and Virgil and Xenophon than of the legends of the red men. This strange mingling of ancient lore with the traditions of savage life is presented to us in the names of Michigan towns and cities. Pontiac borders upon Troy; just beyond Owasso is Ovid; Metamora joins Attica; Adrian is the next town to Tecumseh; Athens is but half an hour's ride from Wakeshma; and in Lenawee county we find Rome and Palmyra close to Madison and Franklin. Enough of the Indian appellations are retained to preserve a native flavor amid the classic and romantic names by which the famous sites of Europe and Asia, ancient and modern, from Caledonia to China, are represented in this favored Peninsula.

HOW TO CONSTRUCT A TOY STEAM ENGINE.

A communication from T. D. Quincy, Jr., a high school pupil, of Dorchester, Mass., gives directions for the construction of a toy steam engine, most of the parts of which may be made by any boy of ordinary intelligence, possessing





a slight knowledge of the use of tools, at a very slight cost. It is a single acting, oscillating engine of which A, Fig. 1, is the boiler, which consists of a fruit can about 4 inches in diameter by 4½ inches in hight, with a new end soldered on where it was opened. B, C, D, represents the gage cock, which is made by turning a piece of brass to the form indicated at C, and drilling a hole through it in the globular part, which is then reamed out tapering. The plug, D, of the cock is turned to fit the hole in C, and seated by grinding it in with grindstone grit and oil at first, and afterward with oil alone. A piece of wire will do for the handle. Cut a thread on D, and fit a nut on it to hold the plug D in C; then put the two together and drill a hole longitudinally through C and across D. The cock is then complete. It may be cheaper to purchase the cocks already made at any gas fixture or hardware establishment, but these directions are intended for those who cannot readily avail themselves of this accommodation. E is the safety valve with its parts. F shows the form of the seat of the valve which has a hole drilled through it, as seen by the dotted lines, and beveled at the top to receive the piece marked G. Place these together and seat them by grinding, as in the case of the gage cock. Make a score in the small portion of G to receive the edge of the safety valve lever. This lever is merely a light bar with a hole in each end, one end to be attached to a stud, or fulcrum secured to the top of the boiler by soldering, and the other to a light spring on the side of the boiler with an adjusting nut at the top, or it supports a hook on which weights may be suspended. These described, two of the most important points relating to the boiler may be understood—the gage for ascertaining the hight of the water; and the safety valve, the means of regulating the steam pressure.

The cylinder of the engine is a piece of brass tubing, 2¼ inches long and ½-inch internal diameter, ground out true. The piston is a disk of brass, ¼ inch thick, with a wire soldered to its center as the piston rod. On opposite sides of the cylinder, near the top, are soldered two screwed pieces of wire designed to hold the cylinder end and stuffing box combined, in place.

Fig. 2 is a diagram of the cylinder, and its connections, A, is the cylinder, and B the path of the crank pin. Three holes are seen near the bottom of the cylinder, with an arc describing the oscillation of the cylinder, the upper hole being the center of the circle of which the arc is a segment. On the side of the bottom of the cylinder is soldered a piece of brass, about $\frac{1}{16}$ of an inch thick and $\frac{5}{8}$ by $\frac{9}{16}$ in area. The lower hole is drilled through a plate into a cylinder near its bottom; the upper hole $\frac{3}{8}$ of an inch above it and through the plate only, a small hole slightly indenting the cylinder being made exactly opposite without piercing the shell. Another piece of brass, $\frac{1}{8}$ inch thick, $\frac{5}{8}$ wide, and $\frac{3}{4}$ long, has a hole drilled through it $\frac{9}{16}$ of an inch from the bottom, and that receives a bit of wire soldered in and projecting $\frac{1}{16}$ of an inch. On a $\frac{3}{8}$-inch radius from this point, $\frac{3}{32}$ of an inch from the center line, drill two holes, that on the right hand entirely through the piece and that on the left about half way through, meeting one drilled from the bottom. The inner faces of this plate and that on the cylinder must be fitted smoothly together. These constitute the valve faces, or valve and seat of the engine.

The pillars or supports of the wheel, shaft, and crank, are rods of brass or iron, 3½ inches high, with holes near the top for the shaft. At the hight of $\frac{9}{16}$ of an inch from the bottom a hole is drilled and tapped, through which a pointed screw is passed, the point of which enters the hole in the side of the cylinder opposite that on which the plate is soldered. The thicker and separate plate is soldered to the top of the boiler, the side having both holes being placed inward or next the cylinder, and the left hand hole meeting that through the bottom being directly over one through the top of the boiler. Place the faced side of the cylinder against the fixed plate, the projecting pin of which enters the hole in the cylinder plate and the pointed screw through the pillar engaging with the opposite hole in the side of the cylinder. The pillar is soldered in this position to the top of the boiler, and the other is similarly secured at the distance of about one inch. The cylinder bottom is a thin plate of brass soldered on. When the crank and piston are at their lowest points, the latter should not quite reach the lower hole in the cylinder. The wheel may be of iron, about 4½ inches diameter, to be obtained at any iron foundery, or be cast of lead, or lead and tin. The gage cock may be attached 3½ inches from the bottom, and if filled to this hight the boiler will furnish steam for half an hour's safe running. The boiler may be filled by the safety valve. To start the engine set the boiler on a stove or range, or place it over a lamp. The first is the preferable mode as being more cleanly.

An engine of this fashion need not cost much, and its construction would afford useful employment to boys in town or country, and be a source of pleasant and profitable amusement during winter evenings.

Correspondence.

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

Connecting Shafts by Pitmans.

MESSRS. EDITORS:—John Allen's plan for connecting shafts by pitmans, a diagram of which is given on page 20, Vol. XIX, and which "Aberdeen," on page 69, same volume, says won't work, will not work. With a trifling alteration it will work finely.

D. H. McCormick's diagram, on page 21, Vol. XX, will not work unless there is something on the shaft not shown in his diagram to throw it over the dead center. Will Mr. McCormick please explain his diagram.

I append a diagram showing a modification of John Allen's device that will work. A is the main or driving crank; B is

the fulcrum which is made permanent in the center of the connecting bar and slides in its bearing, B, slotted for the purpose. The crank, D, is slotted at the end to allow the crank-pin to slide to and from the center. The crank pin will describe a curve shown by the dotted line E. In this way the movement will be perfectly free and smooth, though with slightly varying velocity in the revolution of the crank D.

C. H. PALMER.

Periodic Oscillations of the Earth.

MESSRS. EDITORS:—An article in your paper indicates a theory of earthquakes and volcanoes originating from gaseous explosions as opposed to the general belief in a molten sea beneath the earth's crust, and basing the improbability of such liquefaction on the universal ruin resulting from its eruption. This theory would be more probable did the explosive force crush through "thirty miles of the earth's crust," but why the necessity of such supposition, when conduits such as volcanoes and fissures penetrating through the crust of lesser thickness relieve the pressure?

The theory of an igneous sea is probable from the increase of heat proportioned to the earth's penetration, and also from the simultaneousness of earthquakes in regions far distant. There is also the periodicity remarked in geysers, volcanoes, and earthquakes, as regular in some instances as the ebb and flow of the tidal wave. This periodic law was noticed by Professor Palmieri, of Naples, who, from large investigation, attributes the eruptions of Mount Vesuvius to lunar influences. "The periods of its greatest force are every day half an hour later, coinciding with the movements of the moon, showing that the interior of the earth is like the ocean subject to tides."

There is reason to believe that internal oscillations of the earth are as periodic as external phenomena. In deep mining, from the hours of twelve at night until eight in the morning, water falls where none is seen during the day. The volume in the wheel is perceptibly increased; the atmosphere is charged with gases which prevent lights burning, and small particles of earth and rock, as in the Chicago tunnel, are observed to fall from the tops of the drives. Similar to this is the disturbance of the Atlantic Telegraph, whose electric pulse beats slowly or rapidly in certain recurring hours.

Humboldt remarks that "the great earthquakes which interrupt the long series of slight shocks appear to have no regular period at Cumana; while on the coasts of Peru, as at Lima, a certain regularity has marked the destruction of the city. The belief of the inhabitants in that uniformity has a happy influence on public tranquility and the encouragement of industry." GEO. A. LEAKIN.

Baltimore, Md.

[The article referred to, published on page 377, Vol. XIX, SCIENTIFIC AMERICAN, propounds no unknown theory. Hutton, Mayer, and even Lyell suggest a similar theory, the latter, although giving attention and consideration to La Place's idea of the agglomeration and solidification of liquid nebulous matter, proving the growth and present formation of what are called the primitive rocks, thus striking a heavy blow at a theory which he evidently only partly accepted for want of a better. If an igneous sea existed and, as our correspondent states, "volcanoes and fissures penetrating through the crust of lesser thickness are conduits to relieve the pressure," how does he account for the total extinction of these outlets, many instances of which are patent. If the cause continues to exist why not its results be continually shown?

Our correspondent's second paragraph in regard to the simultaneousness of earthquakes could hardly be attributed to "lunar influences." Periodicity of eruptions, as geysers and volcanoes, boiling springs, etc., is no proof of the existence of a molten interior, but rather an evidence of the existence of a more superficial cause. He must have heard of, if not seen, the natural phenomenon of intermittent springs, which, are never attributed to an internal globe of liquid fire whether its perturbations are caused by lunar influence or the unequal pressure of gases evolved, but to natural syphons existing in the earth and connected with the surface at different points. That the whole earth, land as well as sea, is subject to lunar influence will not be disputed, but if this influence reaches a molten interior, there is no reason why Vesuvius and other volcanoes should not have their eruptions every thirty days, and the tremor of the earthquake follow continually the course of the moon.

The facts in the statements made in the last two paragraphs of Mr. Leakin's communication can be accounted for, as he will see, without the theory of a molten interior of the globe we live upon. What he means by the heading of his communication, "Periodic Oscillations of the Earth," we do not understand.—EDS.

Does Resistance Increase as the Square or Cube of Velocity?

MESSRS. EDITORS:—Whether the resistance of ships increases as the square or as the cube of their velocity, is a point much disputed; some maintaining the former, some the latter, and there is still another class who maintain that, while the resistance only increases as the square, the power required increases as the cube of the velocity.

The importance of a correct decision of this vexed question arises from the fact that this decision forms the only mathematical basis to any calculation required to determine the amount of power required to overcome the resistance of any vessel at any proposed increase of velocity.

The writer is of opinion, that resistance only increases as the square, and power to overcome increased resistance only increases in exact proportion to resistance, and in support of his views submits the following argument:

It is easy to prove that the resistance and the power required do not increase as the cube of the velocity by a single test. A 5,000 tun steamer uses at present 6,000 actual horse power of steam when making a speed of 15 miles per hour, hence, if resistance increases as the cube of velocity, to go one-tenth the speed would only require one-thousandth part of the power, which is equal to saying that 6-horse power would be sufficient to propel 5,000 tuns at 1½ miles per hour, which is simply impossible by any present known appliances, therefore neither resistance or power can increase as the cube of velocity; and I trust you will agree with me as to the fallacy of such an opinion. That resistance increases as the square of the velocity is the prevailing opinion of the most eminent engineers, and this view certainly seems most in accordance with the universality of Divine law; for by doubling the dimensions of any superficies or solid, we obtain four times, and not eight times the area or quantity.

The only question now left to consider is—Does the power required increase in exact ratio or a more rapid ratio than the resistance?

That it can only increase in the same ratio seems to me mathematically certain. The only means we have of measuring resistance at all is by the amount of power required to overcome it, hence it follows that the equivalent of the power is the exact measure of the resistance, and *vice versa*; therefore if it requires a power of 10 units to overcome any resistance at any given velocity, the measure of the resistance is 10 units; and by the same law if resistance is quadrupled by doubling the velocity, the measure would be 40 units, and the power required, being always the equivalent of resistance, would be also 40 units—the distance traveled being in both cases the same.

To deny this is, logically and mathematically speaking, to deny the possibility of measuring resistance at all, which is simply absurd; and I trust it will be conceded that I have demonstrated the fact, that whether the square of the velocity is or is not the exact measure of increased resistance, that the power can only increase in exact ratio to resistance, and therefore, that if resistance increases as the square of the velocity, so also does the power. Please throw some further light on this subject. MATHEMATICIAN.

New York city.

[Without assuming to decide on a point on which doctors (engineers) disagree, we will quote from a text-book that has withstood the test of criticism, and is generally acknowledged as authority on the subject of the laws governing matter. Silliman, in his "Principles of Physics," ¶ 143, pp. 105 and 106, says: "The resistance which a moving body meets in air and water, is an effect of the transfer of motion from the solid to the particles of fluid. For the moving body must constantly displace a part of the fluid equal to its own bulk, and the motion thus communicated is so much loss of the motive power. When other circumstances are the same, the denser the medium the greater will be the resistance which it offers. Newton demonstrated that if a spherical body moves in a medium at rest, and whose density is the same as its own, it will lose half of its motion before it has described a space equal to twice its diameter. The resistance encountered by a body moving in water is 800 times greater than if it were moving with the same velocity in air; for water, being 800 times more dense than air, the body must displace and communicate its own motion to 800 times as much matter in the same time." . . . . "The resistance increases as the square of the velocity; for, if the velocity is doubled, the loss of motion must be quadrupled, because there is twice as much fluid to be moved in the rame time, and it has also to be moved twice as fast. Again, let the velocity be trebled, then the body will meet three times as many particles of the fluid in the same time, and communicate three times the velocity; therefore the resistance is $3 \times 3 = 9 = 3^2$."

It would seem from the above that resistance increases as the square of the velocity, and that the power necessary to overcome that resistance increases in the same ratio. This is the opinion of mechanicians generally, we believe. The example given by "Mathematician" would seem to be conclusive; at least his argument is plausible, and if it has not been found true in practice, it must be one of those cases where exact mathematical calculations do not agree with our means of applying natural laws.—EDS.

Liebig on Unfermented Bread---A Correction.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of December 2, there is a recipe, copied from the *Chemical News*, for making unfermented bread. Liebig recommends the ingredients in that recipe because they make more economical and wholesome bread than that made by fermentation with yeast. Instead of using, as is generally done for lightening unfermented bread, a combination of carbonate of soda, with either tartaric acid or cream of tartar, which makes a purgative salt, Liebig recommends the using of muriatic (hydrochloric) acid with carbonate of soda, the combination of which makes common salt, a desirable ingredient in bread. But there must be some error in the proportion of the ingredients given in that recipe, which I am surprised that some of your readers have not corrected ere now. Reducing the French measures in that recipe to English measures, the proportions there given are: 1 pound flour, 70 grains carbonate of soda, 300 grains muriatic acid, 300 grains common salt, ⅘ pint of water. The proportions of soda and acid in this recipe are, for the end in view, incorrect, being about 1 to 4; while the proportion to make common salt will be about equal parts of each; much excess of either beyond that which makes common salt being detrimental to the bread. Then, the amount stated of common salt is greatly in excess, because the amount, including that which the acid and soda make, will be nearly one ounce to one pound of flour.

It is remarkable what different opinions celebrated chemists give of this kind of bread. In 1846, a London physician gave the following recipe: 1 pound of flour, 40 grains carbonate of soda, 50 grains or drops of muriatic acid, 1 teaspoonful of powdered sugar, ½ pint of water, or as much as may be necessary. Bake in two loaves. He says that bread thus made is more digestible than biscuit from its lightness and porosity; that it saves time and trouble in the preparation compared with bread fermented with yeast; and that it is not liable to be vitiated by bad yeast or by fermentation. But a writer in the supplement to "Ure's Dictionary of Arts and Science" (Dr. Normanby, I think), says that bread prepared in this way is with difficulty permeated with fluids; that it will not absorb water, hence its heavy and clammy feel; nor saliva, hence its indigestibility; nor milk, nor butter; and that it will not make soup, or toast, or poultice. This may be true if the ingredients used are proportioned as above; but if the proportion used be those given below, I claim for the bread all the good qualities that Liebig claims, and all the qualities that Normanby denies that it possesses. 1 pound flour, 100 grains of carbonate of soda, 60 grains of common salt, 1 teaspoonful of powdered sugar, 120 grains of muriatic acid, more or less, according to its strength; 1 wine pint of water, inferior flour will require less. Intimately mix the flour, soda, salt, and sugar in an earthenware vessel, then add the acid mixed with the water, and stir with a wooden spoon. Bake in one loaf for about one hour. The color of the loaf should be a light brown. The bread may be baked in an iron or tin pan, but, in mixing, the use of metallic vessels or spoons must be avoided. J. C.

New Harmony, Ind.

Expressional Dentistry.

MESSRS. EDITORS:—I was glad to see an article in your valuable paper on the above subject, in respect to which a want has been felt by the profession.

Why are we not proficients in artistic or expressional dentistry? It is because we have had imperfect materials with which to do our work as artists. We have been cramped and hampered by many rude instruments and articles, though so much has been accomplished toward the true and the beautiful.

The materials upon which artificial teeth are commonly mounted are gold and silver plate, and vulcanized rubber; with these bases the dentist is compelled to employ porcelain teeth, with gums attached; and when rubber is used, the teeth are made in blocks of two or three. These are made at the extensive teeth manufactories, and are infinitely better than the old bone walrus tooth, or ivory carved teeth, and they have assisted greatly our reputation abroad, for our tooth carvers and tooth molders, are acknowledged the best in the world; but from the very nature of their molded forms and arrangement, the artistic dentist is hampered and restricted in placing them just where he desires to suit the mouth and face and expression of the unfortunate patient requiring artificial teeth. Dentists have all felt this restraint in special cases, and many have spent months and years, and have burnt the midnight oil till health and strength succumbed, to improve this part of our art. Dr. John Allen's continuous gum work is beautiful, and perhaps accomplishes all that the most fastidious artist can desire in affording opportunity for expressional dentistry, but the labor and skill required, and the high price necessary for this work, deprive the masses, who have often as just an appreciation of artistic dentistry as the rich, from the benefits. Much credit is due Dr. Allen and others for their labors in this direction. The most popular material used by the profession for six or eight years past has been vulcanite. It has been popular on account of its cheapness, and the ease with which it can be manipulated; and yet the result of the use of rubber has been to retard rather than advance the artistic part of dentistry. Art has suffered sorely from this cheap and easily made work, and Nature smiles at our attempts to imitate her work with rubber and porcelain teeth in rows like soldiers in a ten cent lithograph. To be convinced of this, we have only to notice in crowds, on steamboats, on the railroad car, on the streets, everywhere, the many, many sets of glistening, regular artificial teeth worn; and when we can discern the artificial, the thing is proved, for expressional dentistry would so hide the art dame Nature herself would not suspect another's work.

Within the past year another long step has been taken toward our ideal by the invention and introduction of consolidated collodion as a new base for artificial teeth. This has been noticed in your paper before, though not in this light; and is well known as the invention of Dr. J. A. McClelland of our city. With it (Rose Pearl is the name it bears) the advantages of the continuous work can be secured. Single teeth are used, and the dentist who may be an artist can arrange them as irregularly and as naturally—as artistically as he may desire, after a study of the features and expressions of the face. This work is easily made, and cheaply enough to satisfy the patient of moderate means. It is lighter in weight than any other material now used for dental plates, and its strength is so great that plates can be made much thinner than rubber or porcelain. The color, too, are those of the natural gums, or mucus membranes of the mouth—it is susceptible of a variety of shades, according to the taste of the operator. With Rose Pearl we can have artistic dentistry, and the profession will appreciate the severe labors of the inventor as much as the people will an artistic set of teeth for a moderate price. C. M. WRIGHT.

Louisville, Ky.

Steel for Axes.

MESSRS. EDITORS:—An article on page 22, current volume of the SCIENTIFIC AMERICAN, headed, "Low Steel—The Requirements of Ax Manufacturers," is calculated to create the impression that the requisite temper for this purpose has not been, and cannot be, manufactured in the country. The minds of the people who peruse your columns for information and instruction, should be at once disabused of any such an idea, and by your permission I will state a few facts, which your East Douglass correspondent, and others interested, will be glad to hear.

The steel manufacturers of both England and America can, and do make ax steel of both mild and high temper, according to the requirements or demands of their customers, who, it is presumed, know better what they want in this respect than the steel maker, who obeys orders strictly, as his great effort and desire is to please his customer, and thereby retain his trade. Collinsville, East Douglass (the home of your correspondent), and other Eastern ax makers, have, for years past, and up to within a short time, always demanded a high temper steel, claiming that it made a much keener edge than a mild or low temper, and was preferable on this account. At the same time the ax would not stand near the abuse in the chopper's hands, it being more easily broken than if made of a mild temper.

The Western ax manufacturers have for years past invariably used nothing but the mild temper, principally manufactured in this city, and of a quality unsurpassed by any made abroad. A high temper steel, while it is claimed it will give a finer edge in a cutting tool, has so many drawbacks attending its use, that the one redeeming feature—the superior cutting edge, is a very expensive and questionable luxury. It is much easier burnt in the process of welding, and easier broken in practical use, especially in frosty weather; and the writer has always been surprised that Eastern manufacturers of edge tools, and of axes especially, would discard a mild tempered steel that is not easily burnt in the process of welding, is tough and strong, and in every way preferable to the other. The difference in the cutting edge is so very fine that the practical chopper cannot appreciate it; for if he did, the Western ax makers, who produce nearly one half of the axes manufactured in the United States, would have had their attention called to this point before this. So that for the benefit of those engaged in manufacturing edge tools, you will be pleased to learn that both mild and high tempered steel for tools has been manufactured in the city of Pittsburgh for years past, of unexceptional quality, and especially the temper which your correspondent is so anxious to obtain, viz.: a low or mild steel, the requirements of ax makers.

Pittsburgh, Pa. AN AX MAKER.

Bean Sheller Wanted.

MESSRS. EDITORS:—Farmers badly want a machine to thresh beans of all kinds. It should be made like the corn shellers with a balance wheel with pulley attached so as to be used either by hand or power, and should be so contrived as to shell beans of different sizes. Such a machine, to cost not more than thirty to forty dollars, would meet large sales both North and South and be a boon to the farmers beside.

Prospect Hill Farm, Va. C. R. M.

A Valued Testimonial.

MESSRS. MUNN & CO.:—Enclosed please find the "wherewith" to renew my subscription to the SCIENTIFIC AMERICAN. My old friends, I would willingly send you subscribers could I do so; but the illness of almost four years, confining me to my house, renders me unable to do so; yet I can send out your circular. Your books will show I have been a subscriber ever since the SCIENTIFIC had a being. My age and illness admonishes me that my name must disappear from your books ere long forever—but I trust for a world without affliction, pain, or sorrow, and where there is no parting.

But, be life longer or shorter, I must have the paper to the end, and shall leave for it my best wishes; and I say most sincerely that I consider it the most valuable paper printed, of any kind. I have only one child, a son, who, if he survives, will be a subscriber in my place.

Please tell your subscribers if you think proper, to follow my example: "Always be subscribers to the SCIENTIFIC AMERICAN; and when a paper comes, stitch it with a fine thread, cut it open, leaving it in book form, convenient for reading, which do carefully and thoroughly; keep it clean; and at the close of the volume, if not ready to get the numbers bound, put them together in proper form for binding, put a board or 'straight edge' on each side, near the back, and then press strongly in a vice; punch holes through them and tie up tightly with a strong cord, and thus have a book."

Schenevus, N. Y. A. HOTCHKIN.

WATER POWER OF THE CONNECTICUT—THE HOLYOKE DAM.

About ten years ago, Mr. Alfred Smith, a citizen of Hartford, Conn., purchased about eleven hundred acres of land on the site of the present flourishing manufacturing town of Holyoke, Mass., now containing over 1,100 permanent residents. It has now in operation fourteen paper mills, two large thread mills, four cotton mills, and other manufacturing concerns, One of the paper mills, that of the Holyoke Paper Company, makes six tuns of paper per day.

The dam, which here controls the whole power of the Connecticut, is one of the most remarkable instances of engineering skill in the country. The Hartford *Times* says: "The only question of the assured and certain success of the company, and the growth of Holyoke to a great manufacturing center, being merely one of the durability of the great dam, Mr. Bartholomew and the company have wisely gone to work to make the dam absolutely indestructible. The work of improvement here is one of far greater magnitude than we had supposed; and its impressiveness as a triumph of engineering skill and a proof of what men's labor can effect over the rude forces of nature can be properly appreciated only by being seen.

"In the flood of last spring the front timbers of the dam were slightly loosened by the concussion of a huge and heavy bridge, which came crashing down on the flood from some point a hundred miles above. An examination of the front foundations, while it disclosed no very serious injury to the great dam, revealed another fact of some interest. The river bed at this place is for a considerable distance composed of rock—but a rock full of seams; and the steady, continuous fall of the great sheet had by hydrostatic pressure lifted out the rock in masses, and scattered boulders of a tun to twenty tuns weight for a considerable distance down stream—making, at last, a great hole in front of the dam, from twenty-six to thirty feet deep! or as deep as the deepest places in New London harbor.

"It was found necessary to check this destructive work; and accordingly the dam, which has for so many years presented a sheer fall from its edge, will now be made with a sloping front as well as rear; so that it would, if the river were dry, present an outline similar to that of the peaked roof of a house. This front extension is fifty feet in diameter at the base, presenting a uniform slope to the top, that will so graduate the fall, for its entire width of over a thousand feet, as to make it look more like a great rapid than the old familiar Holyoke dam.

"This work is done by sections; the first, which was begun in September and is now nearly finished, being 269 feet wide in the middle of the dam.

"It is made of solid timbers, fastened in layers crosswise, in the way known to builders as 'crib-work,' and filled in with an enormous ballasting of stone. These solid masses of timber, bolted and riveted together for such an extent and hight, present, to one unaccustomed to it, a very impressive sight. Unlike the old dam, the new front will be solid; no openwork timbers. The timber 'cribs' are sunk, and the rock ballast filled solidly in beneath them in the higher part, with a good deal of engineering skill. The engineer is Mr. S. S. Chase, whose uncle, we believe, built the original dam. He floats down a good deal of his timber from Vermont. It consists largely of hemlock, a timber which resists decay and the action of water beyond most others. Chopping into the wood of the old dam, shows that twenty years have failed to damage it a particle; it is as sound as ever.

"They have put down in this section about one million feet of timber. That fact tells the story of the literal solidity of the new dam.

"It is found that the weight or force of the stream, exerted against the dam at all times, is nearly four thousand tuns. The weight of this new structure above the water is 13,000 tuns.

"Looking at it from the shore, this section of 269 feet seems but a little part of the whole breadth of the fall; but to a person standing on it, at its lower or its upper edge, it seems in itself a 'big thing.'

"The construction of the fish-way, for salmon and shad, had to be delayed on account of this improvement on the dam. It will be made, at the east end of the dam, as soon as the latter is finished.

"One of the rocks lifted out from its natural bed by the hydrostatic pressure in front of the old dam, weighed, before Mr. Chase blasted it, twelve tuns; and yet it had been taken out and moved a hundred feet down stream by water power."

There are between twenty and thirty mills and factories in active and profitable operation at Holyoke, all the power required being taken from the great dam. It is distributed at present by three canals at different levels, and affords an immense power. The water power of the Connecticut at Holyoke is estimated by competent engineers as equal to that of Lowell, Mass., and Manchester, N. H., combined. It subjects to the service of man the whole volume of the Connecticut river, which here pours over a steady flood, reliable at all seasons, of 1,017 feet in breadth, at a fall of between 25 and 30 feet, but less than one-fifth of the power is yet utilized.

Successful Trial of the Shelbourne Submarine Drill.

Considering that it is an entirely new invention, and has never yet been thoroughly tested, Mr. Shelbourne's experience with his machine for drilling sunken rocks during the last three days in the swift currents of Hell Gate must be considered as eminently encouraging. As was intimated in our previous article, the pipe used to convey the exhaust steam from the engine inclosed and sunk with the "mushroom" was found too flexible and too small. A larger and firmer one had to be procured from Boston, causing a delay which prevented any trials of the drill from being made on Tuesday. Yesterday the new pipe was severely tested in a very swift current, and found to work satisfactorily. Assuming the machinery of the drill to be in working order, the first problem is to keep the floating derrick stationary while the holes are being bored. The *Wallace*, the boat which has been chartered by Mr. Shelbourne, is about sixty feet long, and quite shallow, yet on Monday it was found impossible to hold her with several large granite boulders, weighing four tuns each. These were intended for use only as temporary moorings, while four holes six feet deep, should be made by the drill for the insertion of ring bolts. To these, which are marked out like the bases on a base-ball ground with reference to the pitcher, cables will be extended from the *Wallace*, which will then be firmly fixed as though tied to a wharf. Yesterday the first hole was drilled and the first ring-bolt inserted. While the tide was still running strongly, and contrary to the advice of her experienced commodore, the *Wallace* steamed out over the Frying Pan and dropped one of her boulders overboard. At first the current slowly carried the vessel along, the huge stone dragging on the bottom, but at length the anchor caught in the rocks below, and the *Wallace* was brought to. So far so good; but work must be done before the turning of the tide. The ponderous "mushroom" is swung out over the boiling waters, while the diver incases himself in his horrid habiliments. Both speedily find their way to the bottom. The diver sees that the drill is in proper position, and everything being reported right, at last Mr. Shelbourne gives the word to turn on the steam. It works to perfection. Standing by the anaconda-like steam pipe, you can hear distinctly the machinery in operation below. An hour passes, and the tinkling of a little bell gives the longed-for information that a hole six feet deep has been sunk in the Frying Pan Rock. The ringing of this little bell is one of the most beautiful ideas embodied in the invention. It is done by electricity, and is, in fact, the Atlantic Cable on a small scale. Mr. Shelbourne pulls a cord, which reverses the motion of the machinery, and presently another tinkle of the bell informs him that the drill is withdrawn from the rock, and that the "mushroom" is ready too root itself in another spot. And now the diver, with a ring-bolt six feet long, a sledge-hammer, and other implements, descends again, and in an amazing short space of time is drawn up to announce that "he has stuck a pin." There not being time to shift the position of the *Wallace*, anchor again, drill another hole, and get off this tide, the "mushroom" is hoisted on board, and we start back for Jersey City. To-day another and perhaps two ring-bolts will be put in. When all are down, and the *Wallace* permanently moored, Mr. Shelbourne will be ready to work night and day, and soon Hell Gate will be shaken by the discharge of nitro-glycerin, and the diabolical Frying Pan and Pot be shattered.—*New York Tribune of Jan. 14th.*

Clock making in Bristol, Conn.—Ingenious Inventions.

Bristol, Conn., is noted for the manufacture of clocks. The business is divided and subdivided into several distinct branches, so that there are only five firms in the town that manufacture complete clocks, while twenty firms are engaged in making the different parts of the same. The New Britain *Record* gives the names of these firms as follows:

"The Bristol Brass and Clock Company, where the brass is rolled into plates; the brass founderies of Lester Goodenough, where ratchets and sockets are cast; the works of the Bristol Foundery Company, where the weights and alarm bells are cast; the works of L. F. and W. W. Carter, where movements and cases are put together and the finished clock with Lewis' patent calendar attachment is produced. Clock springs and springs for toy movements are made by E. B. Dunbar and Wallace Barnes. S. E. Root makes sash and paper dials patented by himself. W. H. Nettleton makes lock works and pillars, and straightens and cuts wire. A. Warner and Mr. Taylor make verges, pendulum rods, and wire bells. N. Pomeroy, L. Hubbell, and S. E. Root manufacture movements. E. N. Welch Manufacturing Company, Atkins Clock Company, E. Ingraham & Co., and Mr. Partridge are large manufacturers of both movements and cases. Geo. W. Brown & Co. have also a large factory for the manufacture of clockwork toys.

"The clocks are produced in great variety, and range in price from one to eighty dollars each. Some are so constructed that by one winding they will run respectively, thirty hours, eight days, thirty days, and one year. A self-winding attachment is also made at Bristol, which is placed in the draft of the chimney, and the clock no sooner runs down than the draft, operating a fan, winds it up again. This little invention is a source of great income to its author. A perpetual calendar attachment, which will correctly indicate the day of the week and month, is also made, the patentee of which receives as royalty for the right to manufacture an income of $3,000 per year. An important improvement on the original invention has recently been made and secured by letters patent.

"Most of the workmen employed in clockmaking are 'specialists' who have labored many years at some particular part, and though they have become experts at their business, their wages are lower than those of most other mechanics, ranging from $1·75 to $2·25 per day. Much of the work is 'put out' to be done by women and girls.

"At present the clockmakers are busy making movements for a walking doll, a New York firm employing five hundred girls in making the dolls to which they are to be attached. Many other mechanical movements for various purposes are also made, among which are movements for lamplighters and fans, cradle rockers and baby swings (in which the baby is the pendulum ball), coffee roasters, works to ignite torpedoes, and works for a variety of animated toys. The first clockwork toy ever made was a toy engine, invented at Bristol, but the inventor never took out a patent, and probably escaped the miseries of a large fortune."

An Opportunity for Enterprise.

Not seldom we are addressed by inventors soliciting aid in the disposition of the improvements they have perfected, their object, generally, being to dispose of the whole or a portion of their patent right in return for present pecuniary assistance. As we invariably decline doing a commission business of this character, we can take no action upon such appeals, unless occasionally to draw attention to the matter by a notice in our columns.

A case now before us, however, we cordially commend to the attention of those who are seeking a desirable investment for a moderate sum. It is an improved weighing scale, the subject of a patent just obtained by S. S. Hamilton, who may be addressed at Taylor's Falls, Chisago Co., Minn. Very favorable terms for the patent may be obtained by addressing the inventor as above, as he is in ill health, which precludes him from personal attention to the necessary business of manufacture and introduction. We think the opportunity is a good one to obtain an interest in a valuable invention, and at the same time assist a very worthy invalid to go to a warmer climate, which his health demands.

FUSEL oil, tannin, acetate of lead, oil of vitriol, strychnine, creasote, Prussian blue, mountain dew. The *World* has done the community good service in exposing the villainous compounds which are daily sold to our citizens under the name of rum, gin, brandy, and whisky. What will the *World* say to the enactment by the Legislature of a law prohibiting the sale of such poisonous compositions, unless prescribed by a competent physician? The inquiry strikes us as a pertinent one, in view of the exposure which has just been made. We hope that our able cotemporary will give the public the benefit of its views upon this question.

Improvement in Railway Car and Locomotive Wheels.

Much of the necessary expense of working railway lines is to be charged to the deterioration of the rolling stock, subjected, as it is, to the constant percussion of one rigid body, the wheel, on another unyielding surface, the rail. The slightest degree of elasticity in either would partially remedy this evil, and reduce the cost of repairs to track and rolling stock; but if this elasticity is confined wholly to the track, the power necessary to propel a train is enhanced, although the attention of railway managers, both in this country and Europe, has been for several years directed to methods intended to secure a permanent way. The elasticity sought, on the other hand, for the rolling stock, is wholly confined to springs interposed between the axle and the body or weight of the carriage or engine. It is well known, however, that this does not relieve the excessive wear and rapid deterioration of the rolling or running parts—the wheels and axles—which are subjected to perpetual hammerings. The objects of the improvement, illustrated in the accompanying engravings, are to provide a wheel which while always presenting a rigid face to the surface of the rail shall pass without jar over inequalities in the road, preventing concussions on the axle, relieving the shock of lateral motion, and the jar on the carriage, and furnishing a wheel immensely stronger and longer lived than any rigid wheel now in use. These objects attained, not only are the life and efficiency of railway rolling stock extended and increased and the expense of running trains consequently reduced, but the comfort of passengers and the safety of freight greatly enhanced.

Fig. 1

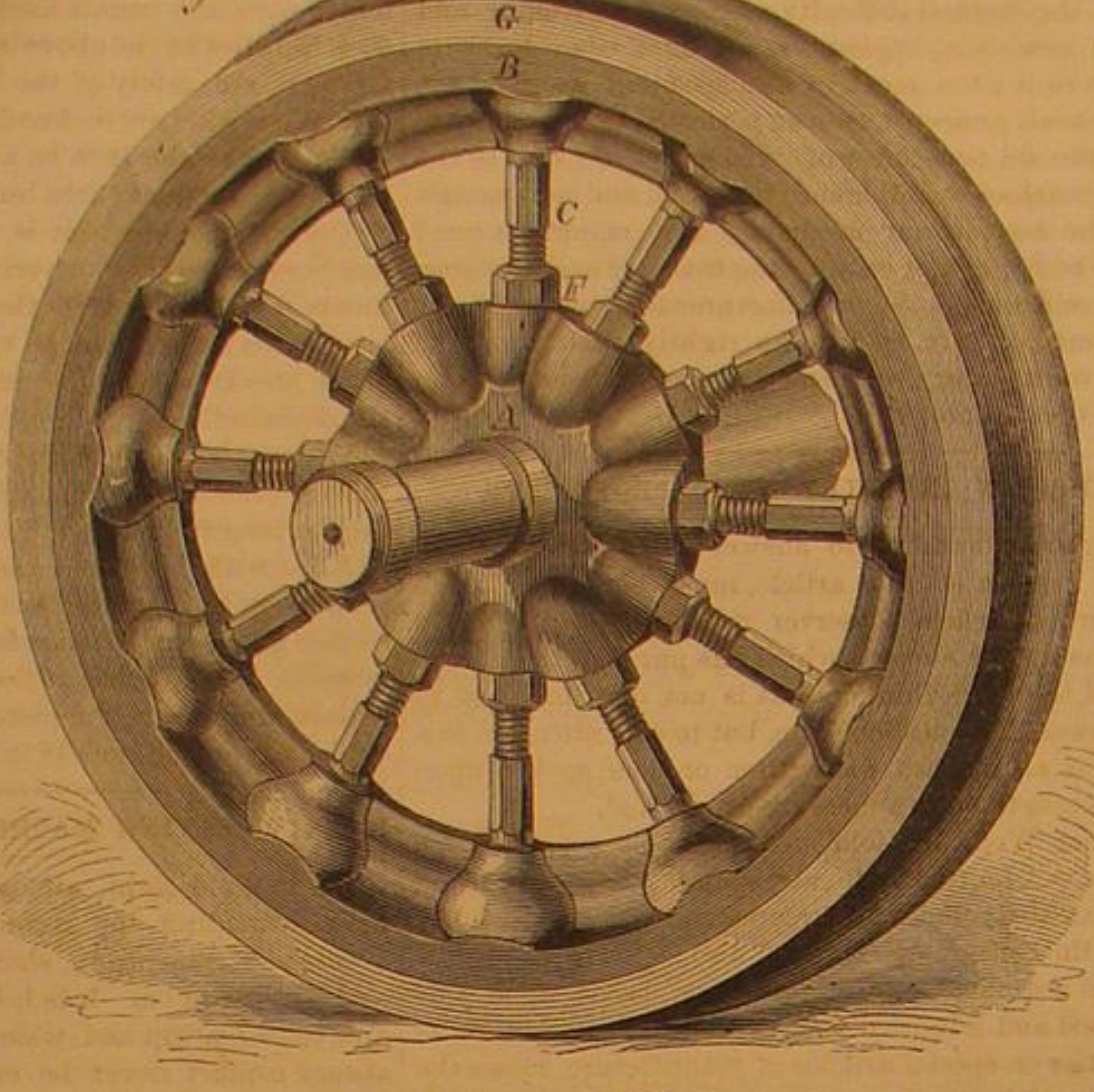
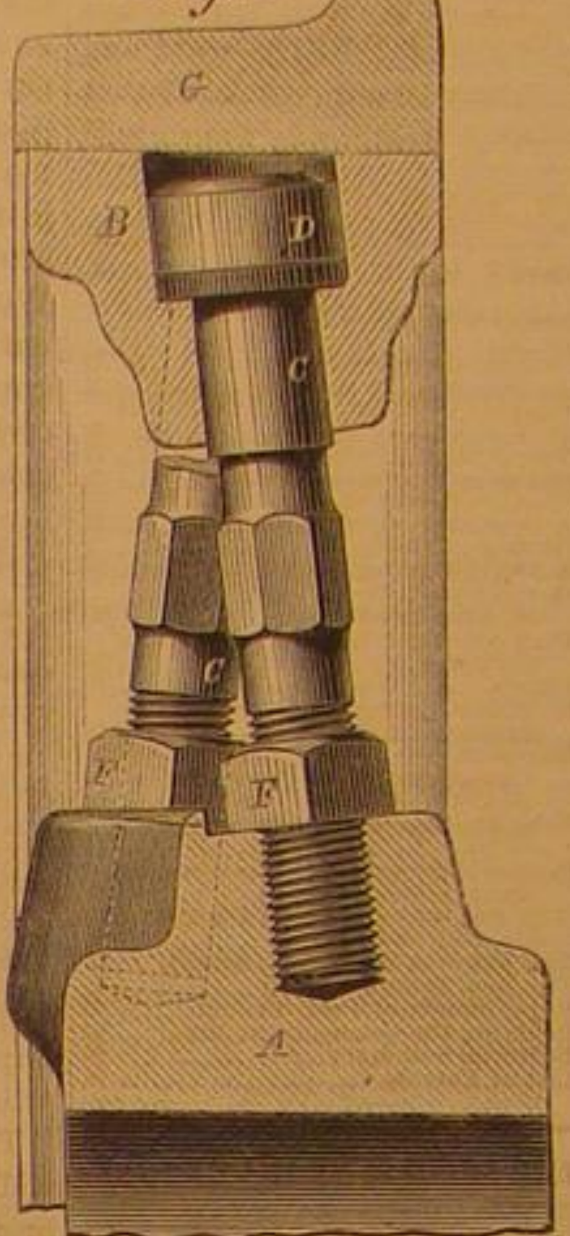


Fig. 2



AYER'S PATENT CAR WHEEL.

Fig. 1 is a perspective view of Ayer's Car Wheel, and Fig. 2 a vertical section from the axle to the tread. The hub, A, and rim, B, are of cast iron, the best stock being used. These are united by wrought iron spokes, C, each alternate spoke leaning at an angle from opposite sides of the central circumference of the hub to the central line of the rim. This is to receive and relieve the lateral shock in running caused by inequalities in the rails or the rounding of curves. The hub is tapped to receive each spoke, which is screwed into it, passing through holes in the rim. Each spoke has a head, D, seated in a recess, and between the under side of the head and the bottom of the recess is interposed a cushion, E, of rubber, between which and the head is a washer of iron or steel. The wheel is trued and the pressure on the elastic cushion adjusted by the nut, F, bearing on the hub; a portion of the spoke being squared, as seen, for the reception of a wrench. The spokes are passed through the rim, screwed into the hub, and the wheel is finished by a tire, G, made of Krupp's best steel, rolled without a weld from a solid ingot.

The weight acting on the hub is suspended from the rim by the wrought iron arms, or spokes, and rests at all times on an elastic cushion. A wheel made on this plan has been found by long trial, under the most exacting circumstances, to wear perfectly round, to withstand uninjured the severest shocks, and to wonderfully increase the comfort of passengers, in the reduction of noise, the absence of jar and jolt, and the additional security from accident afforded.

It is the subject of two patents by Charles C. Ayer, of Lynn, Mass., assignor to himself and Henry A. Breed, of the same place. Manufactured by the New York Steam Engine Company at their works, Worcester, Mass. All orders should be addressed to the Ayer Patent Wheel Company, 126 and 128 Chambers St., New York, where specimens may be examined

Transmitting Steam Power.

At the shops of the Portland and Kennebec Railway a large steam boiler has been put in the wood shop of the company, and from this boiler a three-inch iron pipe leads under ground to the machine shop, a distance of four hundred and fifty feet, conveying steam power for driving two engines of twenty-five and fifteen horse-power, carrying all the lathes and other machinery of an extensive establishment. The pipe is four feet under ground, is inclosed in three-quarter inch hair felting, and encased in a seven-inch box filled with calcine plaster. It has three slip joints to prevent breakage by expansion. When there is a pressure of 80 pounds of steam at the boiler, the same pressure is maintained at the other end of the pipe. The new arrangement is found to work admirably, and will be a great saving in machinery, labor and fuel.—*American Railway Times.*

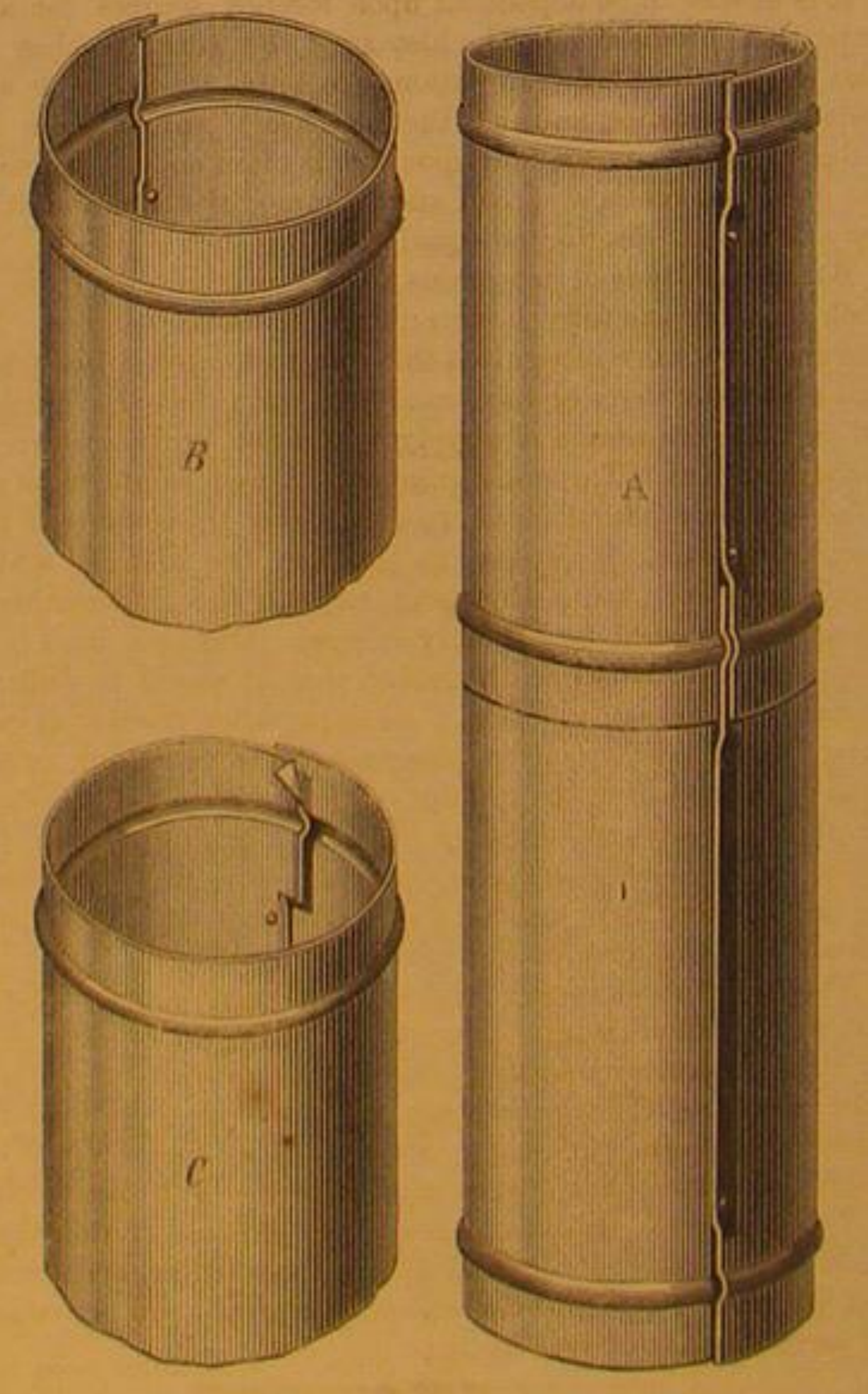
Cheap and Good Smoke-House.

A Western New York farmer publishes his plan of a small, cheap, and good smoke-house, which, as it may contain some practical hints for our readers, we append:

"No farmer should be without a good smoke-house, and such a one as will be fire-proof and tolerably secure from theives. Fifty hams can be smoked at one time in a smoke-house seven by eight feet square. Mine is six by seven, and is large enough for most farmers. I first dug all the ground out below where the frost would reach, and filled it up to the surface with small stones. On this I laid my brick floor, in lime-mortar. The walls are brick, eight inches thick, and seven feet high, with a door on one side two feet wide. The door should be made of wood and lined with sheet-iron. For the top I put on joists, two by four, set up edgewise, and eight and a half inches from center to center, covered with brick, and put on a heavy coat of mortar. I built a small chimney on the top in the center, arching it over and covering it with a single roof in the usual way. An arch should be built on the outside with a small iron door to shut it up, similar to a stove door, with a hole from the arch through the wall of the smoke-house, and an iron grate over it. The arch is much more convenient and better to put the fire in, than to build a fire inside the smoke house, and the chimney causes a draft through into the smoke-house. Good corn-cobs or hickory wood are the best materials to make a smoke for hams. The cost of such a smoke-house as I describe, is about $20."

FAINT'S PATENT STOVEPIPE JOINT.

Most of our readers know something of the annoyance of putting up stovepipes, the difficulty of entering the joints, the liability of their separation while the work is being done, and



the unavoidable smut, arm ache, and temptation to profanity. The plan shown in the accompanying engravings makes the joining of stovepipes as "easy as rolling off a log." By this method the pipes can be joined when the connecting ends are of the same size; the sections are securely fastened and cannot fall apart, and the operation either of joining or taking apart is performed instantly; the joint, when made, is as closely fitting as where one end slides into another; when rusted they may be separated as readily as when clean, and when put together the joint has as neat an appearance as those made in the ordinary way.

A, in the engravings, represents the two sections of the pipe joined. B is one section showing the unconnected or unriveted portion of the seam between the bead and the end, and C is a similar section also open at the seam and having the corner of the inner edge bent to form a stop for the inner edge of B. The difference between a true circle and the opening of the lap at the seam is only sufficient to admit easily the passage of the sheet iron.

In use the two ends are brought together, one edge entered into the opening between the lap of the other, and turned about one-third of a revolution, with a slight endwise pressure, when the parts are securely locked by this simple rotary or spiral motion. With this method there is no necessity for suspending the pipe, unless of very great length between the points of support, as the joints are so stiff that no appreciable sagging takes place.

Patented Dec. 8, 1868 by John Faint. For further information address or call upon John and G. B. Faint, Tremont House, 665 Broadway, New York

A New Alloy for Coin.

The authorities of the mint in France have been experimenting upon zinc for replacing copper, either partially or entirely as an alloy for the silver coinage of the country, and articles of silverware generally. The advantages are said to be that the metal is more homogeneous, has at least as fine a white luster, and possesses a clear ring and considerable elasticity. When toughened by continued or repeated rolling, it is restored by simple heating, and is less liable to be blackened by exposure to the sulphureted hydrogen of the atmosphere, while there is no green coating formed with acid liquids. A mixture of 835 parts of silver, 93 of copper, and 72 of zinc is recommended.

OBITUARY---DEATH OF A NATURALIST.

John Cassin, a distinguished naturalist, died in Philadelphia on Sunday morning last, the 10th inst. Mr. Cassin was born near Philadelphia, September 6, 1813. In 1834 he became a resident of that city, and was, for a few years, engaged in mercantile pursuits. From early youth, however, his favorite study was ornithology, and in his later years occupied his whole attention. He contributed description of new species of birds and synoptical reviews of various families to the Philadelphia Academy of Natural Science. His more elaborate publications are "Birds of California and Texas," a handsome octavo volume, containing descriptions and colored engravings of fifty species not given by Audubon; a "Synopsis of the Birds of North America;" "Ornithology of the United States Exploring Expedition;" "Ornithology of the Japan Expedition;" "Ornithology of Gillis' Astronomical Expedition to Chili;" and the chapters on rapacious and wading birds in the "Ornithology of the Pacific Railroad Explorations and Surveys." His works are the result of careful research, and are especially valuable for their descriptions and classification of many birds not given in the previous works of Wilson and Audubon. Mr. Cassin was of a Quaker family, several members of which have distinguished themselves in naval and military service.

A Novel Method of Catching Mice.

A correspondent of the "Journal of Pharmacy" says: "Having on several occasions noticed mice in our seed barrels, I bethought me of some method how I might trap the little intruders; they having gained entrance by eating through the chime. To kill them with a stick was impracticable, as the little fellows would invariably escape as soon as the lid was raised to any hight. I then thought of saturating a piece of cotton with chloroform and throwing it in, then closing the lid. On raising it again in a few minutes, I would find that life had almost or quite departed. Having on one occasion left the piece of cotton in the barrel, on again returning, found three mice with their heads in close contact with it, and dead. In the evening I saturated another piece, and placed it in the barrel, and on opening it the next morning, to my surprise I found *nine dead mice.*" We recommend our Chicago friends to try chloroform on their rats, and see what effect it will have.

RICE is a valuable crop in Louisiana, a rich planter in St. James Parish, determined to sow rice for the use of his family and his farm hands on about one hundred acres, which he had to spare after planting his sugar cane. His rice crop filled 1,400 barrels, the greater number of which he disposed of on the plantation at $21 a barrel; the entire cost of plowing, sowing, and preparing the grain for market was $4,000. If he had sold all the barrels, which he could easily have done, at $21, his clear profit would have been $25,400.

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Contents:

(Illustrated articles are marked with an asterisk.)

OBSTACLES IN THE WAY OF THE SUCCESS OF INVENTORS.

The difficulties which want of means and influence places in the way of inventors, the compulsory exactions of poverty and the discouragements of those who should stand ready to aid with their influence any attempt to relieve the *onus* of labor and increase the return of capital employed, seem to be enough to dishearten those who hope by their improvements to benefit themselves while adding greatly to the advantage of their fellows. But these difficulties overcome, there are others still greater in the path to pecuniary success, which must be removed before the benefit intended can be realized by the mass. We allude more particularly to the jealousy with which any improvement, deserving the name, is viewed by those whom it will most directly and certainly benefit.

Possessors of capital, whether it is invested in mechanical enterprises or not, view with more than a critical eye any device which proposes to aid them in the increase of their capital or its advantageous investment. To them the inventor appears as a harmless visionary, annoying and verbose, impractical and troublesome, well got rid of by a few words of milk-and-water encouragement, or perhaps by a bluff notice that their time is too valuable to waste on him. In consequence of these rebuffs, perhaps often repeated, the disappointed and disheartened inventor ceases effort, sees afterward his invention reproduced by another, made one of the grand inventions of the age, and spends the remainder of his life in legal squabbles, out of which he will consider himself fortunate to secure the crumbs of the feast at which the capitalist and the plagiarist fare sumptuously.

Singularly enough it is that those whose experience has driven them through a similar course, and who by a lucky stroke have achieved pecuniary independence are among the last to recognize the value of an invention or the claims of the inventor. And those whose fame, if not fortune, has been attained by their persistence seem ashamed to make their virtue of perseverance glorious by encouraging followers in the same path. It is almost as difficult for an inventor to procure even an interview with the men whose inventions and discoveries have made their names famous as to achieve a presentation to Queen Victoria or the Emperor Louis Napoleon. But these notable men are not ignorant or forgetful of the means that gave them fame; for at dinners given in their honor and in sketches or biographies of their lives they are not ashamed to rehearse the circumstances of annoyance, the obstacles, the difficulties that faced them and troubled them before success was assured. But they seem to suppose that their inventions and their value to the world absolve them from any further concern about the welfare of the race or the well-doing of individuals. The old British doctrine, "Once a subject always a subject," is entirely applicable to the realm of invention. No man who has worried through the annoyance, and trouble, and travail, and agony of discovery, and come out successful against great odds, has any right to repudiate his allegiance to the great republic of improvers and refuse his aid to those who strive to reach his eminence.

But these are not the worst obstacles in the way of the inventor. His patent secured, the favorable opinion of experts and influential persons obtained, and even a fair trial having proved the superiority of his device over others used for a similar purpose, he must meet the unreasonable objections of unreasoning or captious men. He may have considered his path easy after having demonstrated by fair experiment the absolute value of his invention, but the road is still rough. Introducing his device and procuring the assent of the party to whom he wishes to dispose of a machine, or right, he is not certain that he has made a success, even in a single instance. Although no direct objection can be urged against the facts adduced or the demonstration shown by experiment, not unfrequently the purchaser and user will bring forward some objection not really tenable, and without logical argument to support it, but which, to him, is all-sufficient. It is difficult to manage such cases. It is hard to combat prejudice. Attachment to old forms of tools, to machinery perfectly understood, to familiar methods, is hard to overcome. With all their faults the mechanic loves his own tools and own methods the best. Only the all-powerful influence of interest can avail to overcome this sentiment.

This conservatism—vulgarly called old-fogyism—among mechanics, is the hardest difficulty met by the inventor and introducer of new tools, appliances, and methods. Is there not too much of it; too much of a disposition to give the cold shoulder to all projected, or even perfected improvements; too much of the old time sneer of "visionary" directed to the inventor, too much of an adherence to the old and not enough attention to the new, by our mechanics and manufacturers? Would it not be better, not only for the inventor or discoverer, but for the mechanic and the manufacturer to look fairly, try impartially, test honestly, and judge rightly, than to allow prejudice to work injury to themselves and produce disappointment to the inventor?

DOES AMERICAN INDUSTRY NEED PROTECTION?

The man who undertakes to answer the question which stands as the caption of this article, must be one of broad views. A mere superficial observer must necessarily err in his conclusions upon a subject, which has puzzled the minds of careful and thorough thinkers. It is not our intention to definitely answer this question here, but to call attention to a point, which, in all that we see written or hear spoken upon the subject, seems to be in a measure overlooked.

Commissioner Wells has told us in his able report, that a tariff is a tax.—Admitted. He also asserts that a tariff on imports is a tax that, under all circumstances, is paid wholly or in part by the consumer. Granted also.

The general argument against protection based upon this well understood and admitted fact, is that the imposition of protective duties on special articles of manufacture raises the price of these articles to the entire mass of consumers, while a few are enriched by their production. The general answer to this argument which is as old as the idea of protection itself, is, that the advantages which accrue to the commonwealth from the protection of special industries, by the wise imposition of duties, compensate for the increased price of the taxed products. We believe this position is sound, but without rehearsing the arguments usually put forth in its support, we will at once state our proposition. The political health of any commonwealth demands a diversity of industries. The cheap lands and the high rates of labor prevalent in the United States, as compared with Europe, naturally tend to unduly develop agriculture, at the expense of many industries of vital importance to the general good. These latter, fostered by a judicious legislation, can be sustained without detriment to the agricultural interest.

It is unwise to be dependent upon foreign sources for any important production. The history of the world teaches us that the relations between nations are liable to frequent and serious disturbance, and that the increase of values upon articles of import consequent upon war is often enough to make the domestic manufacture of such commodities remunerative for a decade, if distributed equally during such a period.

But especially is it dangerous to fail in the protection of such industries as furnish material for national defence. All governments have recognized this fact, and have either taken full control of them or have made it certain that the cutting off of a foreign source of supply would not prove a source of embarrassment. The same principle can and ought to be applied to such productions as are essential to the comfort of the people at large. It is easy to imagine the distress which would be felt in some European states if the importation of breadstuffs should be suddenly stopped. Our own land is so wide and its products so diversified that it would be difficult to name a commodity which, if its importation should at once cease, would now seriously embarrass the Government, or materially detract from the comfort of the people; but it is easy, we think, to see how improper legislation might so dwarf the home production of—say iron for example, and so stimulate its importation, as to render such a contingency as we have named not only possible but probable.

There is another reason why national prosperity is dependent, among other things upon diversified occupations. It is by this means only that the full mental power of the population can be developed. All are not adapted to pursue the same calling, and different pursuits are as necessary to the health of a nation as different articles of diet to bodily health.

The danger of enriching a few at the expense of the many, is, in this country, limited by a free competition; and we are not in sympathy with those who view a proper protective tariff as the parent of monopolies.

CENTRAL LAKE NAVIGATION.

The grand chain of lakes occupying the center of the North American Continent together affords navigation almost oceanic in its proportions. The improvement and development of these great waters have, with the increased settlement of the fruitful regions surrounding them, become a matter of necessity, and the public will be interested to know something of what is now being done in this direction.

General T. J. Cram, of the United States Corps of Engineers, is now directing the improvement of what is known as St. Clair Flats. The improvement consists in the construction of a canal, one and one-half miles in length and three hundred feet wide, and of sufficient depth to permit the passage of vessels drawing thirteen feet at low water, and is built with a view of increasing its depth to eighteen feet in future if required. The bank is flanked by dykes of timber to be filled by the excavated earth. The timbers are to be saturated with creasote to retard decay. Few unacquainted with the subject will realize the great increase of facilities for navigation which this canal will afford. An examination of a map of the lakes will however show at once the importance of the work.

At Chicago, other improvements worthy of notice are progressing under the direction of the Chicago Dock and Canal Improvement Company. These improvements consist of a system of piers and canals having for their object the increase of dock facilities at the above named city and a huge breakwater for increased safety of the harbor. The canals are to extend into the town, twelve hundred feet from the shore line.

The breakwater is to be a very extensive structure. It is to be built in sections three hundred feet in length, to be sunk to to the water line; and it is contemplated to build thereon an immense storehouse covering the entire length, if experiments shall demonstrate the safety of such a structure. The entire area the storehouse will cover, from which also the size of the breakwater can be estimated, is one hundred and fifty-six thousand feet.

The canals are to be divided by cribwork consisting of two rows of piles driven as closely together as they can be set, and capped longitudinally with timbers. The space between is to be filled with stone, and planked. The docks are to connect with every railroad in the city by special tracks and switches, so that goods can be transferred directly from the cars to the vessels. The expense of the work is estimated at two million dollars, and when completed will be as complete and convenient as any system of inland dockage in the world.

IS LABOR-SAVING MACHINERY THE ENEMY OF LABOR?

The old, old fight, almost interminable, and persisted in notwithstanding the recorded verdict of history—and the events now transpiring, shortly to become a portion of history—is still going on. It is between ignorance and enterprise, dull conservatism and wide awake improvement. Will this absurd conflict never be ended? Will our would-be social theorists ever be willing to accept facts as better than their theories? Will ever the Malthus philosophy cease to affect social relations and the opinions of those philosophers whose thoughts intend to "shake mankind" and mold the ideas of the active ones who strive to make these thoughts a reality? Is the advance of the race by means of new scientific discoveries and new mechanical improvements to be checked by the bugbear of a plus of laborers over the work to be done? Have we reached the point where we must either stay the progress of labor-saving, and time-saving, and brain-saving, to allow the muscle as wielded by the puny arm of man to exploiter us and prevent all progress by brain muscle, or allow the serfdom and feudal lordliness of the past ages to return? Must all our boasted improvements in the arts and the sciences be considered only as toys for the intellect, unaffecting the well-being of the race? Shall we return to the laws of Lycurgus, and immolate our progeny upon the altar of national advantage, as understood by the fearful disciples of Malthus?

Such would seem to be the idea of some theorists. A gentleman of culture—æsthetic and literary—called upon us a few days ago to make inquiries relative to the subject of supply and demand as concerning the progress of the race. He seemed to be devoted to the idea that the supply of labor exceeded the demand, and that labor-saving contrivances were only laborer-slaying devices. The information we might give him in relation to this subject as shown by the record of patents, and their aggregate or proportionate usefulness, he supposed might be available to sustain what was his plainly preconceived view, that the laborers were many and the harvest small. He alluded to the destruction of labor (life) in our late war as something like a "providential dispensation," to weed out and lessen the choking growth of laborers in our social garden. We could not give him encouragement.

That some of the centers of manufacture and commerce are overcrowded proves nothing in favor of the idea that the laborers are too many. It proves only that this labor is misdirected, either by its possessors or others. Commerce, or rather the mercantile branch of business has grown to be a fungus on our industries. It was once used and is now calculated to be a support and aid to productive industry, but that it has proved to be either a parasite or a fungus, garroting the growth and sapping the life of industry, alluring by its temporary or periodical luxuriance, does not prove that labor is less in demand, only that other means of living than that of direct labor make seemingly fairer offers. If the cities are crowded, the country is open; if it is hard to procure even indifferent shelter and precarious living in crowded cities, both are easily obtained outside. Take the State of New York, for instance, and go through the nearest one hundred miles from the metropolis, what acres upon acres, miles upon miles of fertile soil which one passes on the line of a railroad, may be seen from the window of the swiftly gliding car, that seemingly have never felt the magnetic and magical touch of the laborer's hand! This State alone has unoccupied and unused land enough to give good homes and profitable or comfortable incomes to all the possessors of muscle and brain, however uneducated, that come to our shores from foreign lands in a twelvemonth.

Do the improvements made by researches in science or experiments in art add to the difficulties of labor in seeking its reward? We cannot see it. On the contrary, every advance, even if it includes the production of labor-saving devices, opens and clears the way for the pioneer, the laborer, the *avant guard* of civilization. Has the sewing machine been a benefit to the women who before lived by sewing? Let the demands for female seamstresses daily published in our journals answer. Has the introduction of railway trains driven by steam diminished the production or the price of horses? Let the plain facts of to-day reply. Has the adaptation of steam to river and ocean navigation diminished the amount of freight and the number of passengers conveyed, or even the number of men heretofore employed? The condition of this business as compared with itself fifty years ago is a sufficient demonstration of the value of labor-saving machinery in this department.

The proudest days of the Roman empire saw a state the wealthiest members of which knew less of the luxuries of life than the ordinary American mechanic of to-day, and the workers were simply slaves whose liberties and lives were held in fee simple by their masters. While their masters shivered in the cold of their unheated marble palaces and gorged themselves on food, barbarously cooked, their slaves courted any sunshiny corner for warmth and greedily devoured the leavings we now think fit only for dogs. Then, the only relief from this state of vassalage was the army. Here, even, the soldier was not always sure of his regular food, but like the savage dogs in Eastern cities in our own time, or the wild beasts of the wilderness, he must fight for, or thieve for, or murder for it, before he could get it. Even the commonalty (*Cives Romani*) were only hired hinds, the tools of warlike generals, the victims of licentious civilians, or the protegés of a wolfish government, that raised her cubs to imitate the fabulous dam of the empire's founder. There were laborers enough then, but their labor was enforced and their pay stripes, imprisonment, or death. They had brains as we, but they did not invent; they had necessities but they could not supply them. Would they have been worse, would the empire have been poorer, if a patent office had existed and an invention could have been protected? The remedy, then, for too great a population was that of Malthus propounded in later times, and his admirers in our day.

Now, it is hardly necessary that we should allude to times nearer our own, but it may be well to direct our readers—those at least who delve into the musty soil of history—to the condition of our mechanics less than one hundred years ago. These readers will see the wonderful difference between the condition pecuniarily and the position socially of the mechanics of that time and those of the present.

In 1769 a carpet on the floor was unknown, except in the houses of the magnates of the church or state, and at that time they were one. In the Plymouth Colony, in that year, one of the deacons (then like our present ministers, ordained to baptize and conduct religious services) was brought before a committee of his church in a town in Eastern Massachusetts and roundly reprimanded by his pastor for "presenting before ye congregation of ye w^ch he was an honoured officer ylch an yxample of luxury as best befitts yee times of ye ungodly of England" and was suspended for his daring, although the carpet, which was the head and front of his offending, was the handiwork of his dame and daughter.

Have we progressed since that? And is the progression, if made, to be attributed more to religious tolerance than to mechanical invention? Here is a nut for our Malthusian philosophers to crack. The world of eighteen hundred years ago contained all the means for man's comforts it does now—possibly more. We have found out not only what the earth contains, but we have found out the means of getting at it and using it. We with our Briarean arms of labor-saving utilities can afford to sneer at the Roman patrician of eighteen hundred years ago, and offer to his despairing slave not only freedom from his bonds of iron and steel that bound his limbs or prevented his freedom, but an equal right with his patron, or master, in the present possibilities, and in the magnificent future, for himself and his. And why? Because science and mechanical skill has made the impossible possible; because labor-saving machinery has not only opened new fields for the exercise of his faculties, but has provided with its iron fingers what he never could hope to provide for himself.

KEROSENE OIL.--REPORT OF PROF. CHANDLER TO THE METROPOLITAN BOARD OF HEALTH.

We reproduce the salient points of a report lately made by Prof. C. F. Chandler to the Metropolitan Board of Health, of New York, not particularly because it presents any new facts or suggestions, but because it deals with a subject to which we have repeatedly called attention in these columns, and recognizes the importance of a matter to which we have devoted much thought and given much space in our paper, as we deemed it of great and general importance. Prof. Chandler says:

The burning fluid sold so extensively throughout the United States under the name of kerosene oil, is refined petroleum from the oil wells of Pennsylvania, Ohio, Virginia, Kentucky, and Canada. As it comes from the wells petroleum is generally of a dark yellowish or greenish brown color, and possesses an odor more or less offensive. To render it salable it is subjected to a process of refining by which it is rendered almost colorless and freed as much as possible from its disagreeable odor. One of the most important objects of the purification is, however, the separation of the more volatile constituents, the benzine, keroseline gasoline, or naphtha, as they are variously called. These liquids, being very volatile, and, at the same time, very combustible, are the substances which give rise to the explosions which render the use of kerosene so dangerous. Benzine being the cheaper article, the cupidity of the refiner leads him to leave as much benzine in the kerosene as possible, regardless of the frightful consequences. Native patroleum is a mixture of a great number of hydrocarbons, compounds of hydrogen and carbon. These differ from each other in volatility. Some are so volatile as to evaporate rapidly at ordinary temperatures, making it dangerous to approach an open tank of petroleum with a flame. Others are much less volatile, some requiring a temperature of 700 to 800 degrees Fah. to vaporize them. The volatility of these component hydrocarbons is intimately related to their specific gravity or weight, the lightest oils being the most volatile, while the heavier oils possess the high boiling points. The inflammability of the oils is also intimately connected with their volatility and specific gravity. The light volatile oils ignite on the approach of a burning match, no matter how cold they may be; while the heavy, less volatile oils can only be ignited when they are heated above the ordinary temperature of the air.

The crude petroleum as it comes from the wells is subjected to distillation, when the most volatile constituents pass off first in the form of vapor, and are condensed by passing through a coil of iron pipe surrounded by cold water, and collected as benzine; subsequently the burning oil or kerosene makes its appearance; this is followed by a heavier oil which may be used for lubricating machinery; and there is finally a small residue of tar or coke left in the still. That portion of the product which is designed for illuminating oil is then subjected to the action of sulphuric acid to remove the odor and color, and destroy a little tar which it still contains. It is then subjected by the more careful refiners to a somewhat elevated temperature to expel a small percentage of benzine which it still contains. Thus purified it constitutes the kerosene oil as it is sold in the market.

The conscientious refiner runs all the dangerous oil into the benzine tank, and only when the oil is sufficiently heavy to be safe does he allow it to pass into the kerosene receiver. But as the benzine must be sold at a lower price than burning oil, the refiners are many of them led to collect as little benzine and as much kerosene as possible. It must not be supposed, however, that the specific gravity of the oil can be considered a safe index to its quality. On the contrary, the specific gravity gives very little idea of the quality; for while benzine and naphtha render the kerosene lighter, the gravity of good kerosene is preserved by the presence of heavier oils. So a poor, dangerous oil may be much heavier than a safe oil.

As the products of petroleum are dangerous in proportion to their inflammability, a fire test has long been in use, by which the temperature is determined at which the oil evolves an inflammable vapor—the "vaporizing point"—and the temperature at which the oil itself may be handled with a burning match—the "burning point." The vaporizing point of good kerosene oil should not be much below 100 degs. Fah., and the burning point should not be below 110 deg. Fah. Unfortunately the results of this investigation show but little of the oil sold in New York comes up to this standard.

Processes have been patented, and venders have sold rights throughout the country for patented and secret processes for rendering benzine, gasoline, and naphtha non-explosive. Thus treated, it is sold under such names as "liquid gas," "aurora oil," etc. These patents and secret processes are not only ridiculous, but their sale to ignorant persons is a crime only equaled by murder.

The fire test gives the only sure indication. Apply a lighted match to a little of the oil contained in a cup or saucer, and if it can be made to take fire, it should at once be considered unsafe, even though the experiment be made in one of the hottest days of summer.

Seventy-eight samples of kerosene oil have been procured from the same number of kerosene dealers in different parts of the city, and these have been carefully subjected to the fire test to determine the vaporizing and burning points. Several of the samples have also been subjected to fractional distillation to determine the proportions of benzine and naphtha which they contain. The result was that not one of the seventy-eight samples, selected at random throughout the city, which are all that were tested, is of a good quality, which may be called safe. The only single specimen of safe oil in the entire list is manufactured in Boston.

It is a little singular that Prof. Chandler should have been so unfortunate in the samples of kerosene he obtained. If he is correct, the surprise is not that occasional explosions, and consequent injuries, occur, but that such are not reported almost daily. Several months ago we made repeated trials and tests of kerosene obtained from our family grocer in Brooklyn, and in no case did we find the kerosene below the legal and practically safe test. We could mention the names of refiners of petroleum who would scorn to attempt such a murderous imposition on the public, or such a fatal stroke at their business name as to send out an improperly distilled or refined product. The test is so easily made and the law is so explicit that either manufacturer or dealer should find his attempt to impose on the public a spurious, dangerous, or inferior article a sad and serious failure.

No one possessed of common sense, a thermometer, a saucer, and a match, need ask anybody's opinion as to the explosive or dangerous quality of the kerosene he uses. The facts in regard to the character and tests of the fluid have been repeatedly published in the SCIENTIFIC AMERICAN, and it adds nothing to the importance of the subject that professional chemists should write, and daily papers print, a rehash of facts long ago sufficiently plainly stated.

Foreign Contracts for American Guns.

The gun-making ingenuity of Americans seems to be appreciated in Europe almost as much as that of the Prussian or French, if foreign orders for American fire-arms are any indication. The *Sun* says the Remington Company has recently delivered to the Danish government, 40,000 of their guns, and to the Swedish government 30,000, and the Greek government has contracted for 15,000 which have not yet been delivered. The Remington pattern is a single cartridge breech-loader of superior make and efficiency, of which from 200 to 300 are turned out daily by the Company. The Cuban government has bought upwards of 20 000 of Remington and Peabody rifles, the latter an arm manufactured in Providence. The Cuban revolutionists also have been buying up a large quantity of small arms, but of a poorer class, chiefly muzzle-loaders, being unable to pay for better ones. They hope to achieve their independence with the odds of breech-loaders against them. The Russian government has a contract with the Colt Fire-arms Company at Hartford, for 30,000 rifles, an improvement on the Prussian needle gun.

Besides the above contracts, shipment of guns to other governments have been made by American firms. The standard arm of the United States Government, is the Springfield musket, converted into a breech-loader, upon what is known as the Robert plan. It is a beautiful and very effective piece, and is admired by the ordnance departments of foreign governments. The regular army is now supplied with them. The great quantity of muskets which our Government had on hand at the close of the war is being disposed of at auction and private sale.

The only repeating rifles now made in this country are the Winchester at Bridgeport and the Spencer at Boston. The former is an improvement on the celebrated Henry rifle, carrying eighteen shots, and can be fired with great rapidity. The latter is a seven-shooter, and in Sherman's campaign through Georgia six men on a picket post armed with the Spencer carbine kept at bay for some time a whole battalion of the enemy by the rapidity of their firing. These repeating rifles are used for hunting on the Plains, and meet with much favor in foreign countries. American gun makers regard the famous Prussian needle gun as inferior in every respect to our best patterns.

PRIMEVAL CHEMISTRY---LECTURE BY PROFESSOR J. STERRY HUNT.

Reported for the Scientific American.

Professor Hunt, of Montreal, delivered the eighth lecture of the scientific course before the American Institute, on the evening of the 14th instant. Subject, Primeval Chemistry. Whatever may have been the opinions of his hearers in regard to the peculiar views of Professor Hunt, all will concede the singular ability with which he maintains them. The lecture, although from its subject, a dry and abstruse discussion might have been anticipated, proved, on the contrary, one of great popular interest, both on account of the order in which the points were arranged and the happy method of illustration employed by the speaker. We have only room for an abstract of the lecture, but we shall, as far as we can, give its leading features.

Upon his introduction to the audience by Judge Daly, Professor Hunt said:

MR. PRESIDENT, AND LADIES AND GENTLEMEN: You have already been informed that the subject of this evening's lecture is Primeval Chemistry—the chemistry of the earlier condition of the world's history—chemistry before there were chemists, before there was any eye, except the eye of the great All-seeing One, to investigate or to study His marvelous phenomena. As this has reference more especially to the history of this earth, it may be well spoken of as chemical geology, a term which has been very frequently applied. We speak of geology as if it were a science, but in reality under that name we include a whole group of sciences. In the first place, to the astronomer this world is one of a system revolving around our sun—the so-called solar system—and that so-called solar system is but one of many more such great systems, thus occupying a very insignificant position in the great cosmos. Thus our world appears to the astronomer. To the physicist, again, who studies it in relation to the laws of gravitation, with regard to the laws of light, it appears altogether in another light. Then comes the chemist, who examines the relations of its rocks, its waters, and its atmosphere. He has also his history of the globe. Then comes one who studies the changes in its crust, the movements which give rise to mountains, which cause all the geographical diversities of the earth's surface. This has been discussed before you by my distinguished predecessor, Professor Hall. Later, comes a period in the history of the planet, in which life appears upon the surface, animal and vegetable. Already Dr. Dawson has explained to you the laws which govern the evolution of vegetable life, how during successive periods, successive creatures, flora after flora, each more beautiful and more perfect than its predecessor, appeared upon the surface of the planet. Then again comes the zoologist, who investigates the various forms of animal life. All these studies, beautiful and important as they are, are mere branches of that great complex study which we call geology. Professor Hunt said he would merely discuss the chemical relations of our globe, but he must to a certain extent go outside of our globe, because he must look at it from the astronomer's point of view. The chemist had to look to the rocks, the waters, and the air; but behind all these came in another question, whence was the origin of rocks, of water, and of air? There must have been a time when these were not, and the first question of the student was as to the origin of these things. It was the rare privilege of the scientific eye to look backward, to solve this problem, and to learn, as it were, the history of these pre-historic times. From the astronomer, who recognizes the fact that our globe is but one of many worlds, there comes in a strange and unexpected light to aid us, and physical science here contributes most curious stores of knowledge Speculating upon the origin of our earth, and seeing the curious harmony which existed between its motions and those of its satellites, and of the other planets that moved around the sun, the great Kant was induced to ascribe a unity of origin to all. Later, the idea was developed by La Place, who supposed that from a great nebulous cloud existing in space there was formed, in accordance with certain physical laws, successive planets, successive satellites, the sun finally remaining in the center; the result of the condensation of one immense cloud of vapor, for whose origin, still further back, we must only look to the great Author of existence, who created it, and imposed upon it the laws which, in after ages, regulated its development. This great nebulous cloud rested in this condition until Sir William Herschel, in studying the skies, examined certain masses of light which had before been known as certain cloudy, milky masses of white light. He viewed them with his great telescope, and was unable to resolve them. Here he said, "I have the origin of this cosmic matter; here I really see the stuff of which worlds are made," and he described them as so many nebulæ. Later astronomers looked at the masses with more powerful glasses and were able to resolve many of them into groups of stars. For instance the great milky-way which we observe so plainly in a clear, cold winter's night was found on close examination to be made almost entirely of little stars which came out under our brightest telescopes. Still there were certain masses of light which Herschel could not resolve, but which other observers discovered to be made up of suns or of stars, and hence the nebulous hypothesis fell into doubt. It was said as some of the supposed nebulæ have already been shown to be composed of stars, still more powerful instruments will enable us to show that these nebulous masses are made up of stars. Just at this point came in a very unexpected aid in the spectroscope. With this instrument, in the examination of light in the first place from terrestrial sources, it has been found that you can discriminate between the light that comes from a solid body and the light which comes from a vaporous, or gaseous body—that you can pierce distance and resolve problems, for the investigation of which the most powerful telescope was impotent. We have now discovered that in the sun and in the fixed stars we have present the very same elements as those of our earth, and we may hence conclude that the same chemical laws which hold good in our planet hold good in the bodies of the solar system. We might, therefore, conclude not only the unity of our system, but the unity of all systems, and all worlds, and we are enabled by comparison between these and our own planet to show that all these nebulæ, suns, and planets, are worlds in so many successive stages of development, of which our own is perhaps one of the latest and most complete. Having determined this great luminous or nebulous mass, the natural inquiry is what are the laws which regulated its condensation; how should it ever become reduced to the condition of a solid globe? By the simple process of cooling. The sun, the great center of our system, was and is a cooling body. It is a body constantly giving off light and heat, and therefore slowly but surely undergoing a cooling process. When we investigate the laws of cooling bodies, and still more when we investigate the chemical changes in bodies at a greatly increased temperature, we learn another curious lesson, which is, that at intense temperatures (such heat as must exist in the sun and in the nebulæ), almost all bodies are in a state of chemical indifference. To make himself plainly understood, he would refer to the composition of water. This was known to be produced by the combination of oxygen and hydrogen gases. These combine with an evolution of heat to produce water, but if you exposed water to a very much higher heat than that by which it is formed, it will break up again into oxygen and hydrogen. So we find that almost all compound bodies known in nature, when intensely heated, are decomposed. It seems as though the chemical affinities, which brought them together and tended to make them a unit in combination, are completely suspended at these higher temperatures, so that one may well suppose that on the sun, and still more in these nebulous bodies, all the elements are in a state of chemical indifference. The spectroscope told us that, because we recognized the spectra of the simple elements, and not of the compound bodies. The process of condensation going on in the sun, and which surrounds that body with an envelope of luminous mist, is going on in all the planets. Our earth was once a luminous mass of vapor, passing through a stage in which it was self-illuminating like the sun, until it finally became cool to such a point that it liquefied and became at last solid. Many suppose that this great liquid earth was surrounded first by a solid crust; but there is no evidence to prove that the cooling began at the center, and proceeded outward to the outer surface. This question is interesting to us from more than one point of view; it has an important bearing upon many facts connected with the changes of the earth's crust; the question as to whether this solid surface upon which we walk rests upon a liquid molten rock, or whether we have a solid mass through to the center. This subject has been extensively investigated by physicists, and has given rise to many differences of opinion. We must either regard the earth as solid to the center, or, if not solid, the crust must be many hundred miles in thickness, as the laws spoken of have operated from the beginning; and the vast masses of solid matter would arrange themselves at the center of the globe, while the surface would be covered by a thin layer of liquid matter, and this acted on by the internal heat would naturally assume the uneven character of the surface of our primeval globe. So far as the chemistry of our planet is concerned, we have only to deal with the outer crust. In this we find granite, quartz, limestone, gypsum, coal, and the various metals, and the waters of the ocean, and all these surrounded by the still lighter atmosphere. We must understand that these elements must have been formed from the materials which were near the surface and in the air. There, of course, could have been at one time no water. The high temperature of the mass rendered its existence impossible. Then there was no ocean. We must, therefore, restrict the primitive crust to the solid rocks, and the atmosphere with its gaseous contents. Thus we may form a just idea of what that early crust consisted, if we suppose the atmosphere and the ocean to be brought together at the intensely high temperature which then existed.

Suppose the earth to be now melted with fervent heat. Every chemist can readily see that by bringing together the limestone and the waters of the ocean under such conditions, sulphur also being present, the sulphur, the chlorine, and the carbon would be transformed into gases; the alkalies, lime, alumina, and magnesia, would unite with the acid gases to form sulphates, carbonates, and chlorides, while the metals, with silica and alumina, would combine in the crust to form a substance similar in composition to what are now known as slags, and over and above this an atmosphere, charged with acid vapors—sulphur and carbon in the form of gases, and water in the form of steam, mixed with the elements of the atmosphere, nitrogen and oxygen, and carbonic acid, or the elements of carbonic acid in the free state. Under these conditions the atmospheric pressure would be immense, and the barometer would stand three or four times as high as it now does. Under the pressure of such an atmosphere, water and the less volatile materials would be precipitated upon the rocks. This water would, of course, be strongly charged with acids—hydrochloric and sulphuric—and being fluid, would fill the cavities and spaces in the solid earth. The result would be, at this high temperature, to give rise to the immediate decomposition of the silicates and carbonates, and set free the whole of the silica, while the acids would combine with the lime, magnesia, soda, and many of the metals; chlorides and sulphates would be formed, while the silica, separating, would form quartz. The salts of lime, magnesia, and soda would dissolve in the water, and form sea water. The activity of the combinations would gradually become less violent, as the affinities would be rapidly satisfied. The acids would combine with the rocks until they got their full equivalent, and then would commence a new process. A process of slow decomposition by air and water would now set in. Carbonic acid and water would attack the silicates, and take the lime from them; clay, bicarbonates of soda, etc., would be formed, which, dissolving, would find their way to the sea, where chloride of sodium or common salt would also be formed. This action is still going on upon the felspatic rocks, decomposing the strongest quartz and making clay, though much less rapidly then formerly on account of the diminished quantity of carbonic acid in the atmosphere. Every lump of clay then upon the earth's surface represents granite decomposed, limestone formed, and salt added to the sea.

Until the acids were in a great measure removed from the atmosphere, animal and vegetable life was impossible. Professor Dawson has told you that vegetation was one of the most powerful agents in removing carbonic acid from the atmosphere; but I believe that a very large quantity of it must have been first removed before vegetation could have taken place.

Another curious question solved, if these views are correct, is the fact that in the polar regions, where there is now little or no vegetation whatever, there existed in former ages plants now confined to the tropics. Many hypotheses have been framed to account for this change of climate; but the true solution is undoubtedly to be found in the composition of the atmosphere at this period—the mixed gases heretofore described. These gases imprisoned, so to speak, the sun's heat, so that the earth might be compared to an immense greenhouse. The high temperature at the poles was then the consequence of impeded radiation.

Beside the chemical forces already named, there succeeded of course mechanical forces, described in a previous lecture by Professor Hall, until finally the whole surface of the earth became nearly covered with sedimentary deposits. I deny that at this period the interior of the earth was in a fused condition; but I admit that its temperature was very high—as hot as it could be and remain solid.

The surface of the earth receives but little heat from the interior at present, not enough to change its temperature more than one degree, but as we descend into mines we find an increase of temperature. The loss of heat from the earth's interior diminishes daily, and the increase which would have been felt in descending was formerly ten times as great as now. The result of this high temperature was crystallization and new combinations. Hence the origin of the metamorphic rocks, which are sediments changed in character by crystallization. If I had time, I think I could show you that the White Mountains of New Hampshire were originally of the same age and composition as the Catskills of New York. The mountains of New England have had their rock masses changed by the action of heat.

Granite has been supposed to be the primitive rock. This is a fine theory, but we really know as little of the primary nucleus of the earth, as we do of the other planets. Granite is a rock, derived from quartz. Quartz cannot be formed by heat, it is only formed by water. Quartz when heated ceases to be quartz, so it will be seen that what were supposed to be primitive granites, are not primitive, but derivative rocks.

This can be determined by the microscope, which not only shows the origin of the rock, but the very temperature at which it was formed. The crystals are found to contain cells inclosing water, when this water is heated to a temperature at which it exactly fills these cells, that temperature must be the precise temperature at which these rocks were formed. This temperature has been determined to be below that of melting lead.

The question now arises, how these rocks were softened. To answer the inquiry it will be necessary to consider the relations of pressure to the melting point of bodies. It has been found by Tyndall and others, that ice melts more easily under pressure, than otherwise. But ice is in this particular, as in some others, an exception to solid bodies in general. Most bodies expand in liquefaction, so that pressure raises the melting point of bodies. Thus pressure tends to solidify the center of the globe. Solution resembles in many points, the fusion of solid bodies, but every solution is denser than its ingredients. Hence pressure favors solution, while, with the exception of ice, it retards fusion. It will be seen then how water penetrating deeply into the crevices of the earth's crust, and there acting under enormous pressure would soften obdurate sediments, and—a point made for the first time here to-night—aided by the contraction by cooling of the deply buried sediments, which, tending to open crevices of great depth, gives rise to the yielding bed upon which the earth's crust now rests, and so also the oscillations and other phenomena of volcanic action. Did time permit, I would like to show how the precious metals remained suspended until finally they were deposited in veins and gangues, as now found, but I forbear. I think I have said enough to show that the proper commencement of geological science is chemistry.

Why Boilers Sometimes Explode.

The last number of the *Locomotive*, published by the Hartford Steam Boiler Inspection Company, gives the following somewhat startling summary of inspections made by its inspectors during the month of December: One hundred and eighty-two visits of inspection were made, three hundred and forty-one boilers examined externally, seventy internally, thirty-four tested by hydraulic pressure. In these boilers one hundred and sixty-eight defects were discovered, thirty-two being sources of special danger. Among them we enumerate the following: Six furnaces out of shape, thirteen fractures—three dangerous, six burned plates, twenty-four blistered, seven dangerous, thirty-one cases noticeable incrustation, twenty seven boilers corroded externally, five dangerous, seven boilers grooved internally, five safety valves overloaded—three dangerous, five blow-out apparatus out of order—three dangerous, thirteen water gages out of order, twenty-two pressure gages out of order—three dangerous, two boilers without gages, six cases of deficiency of water, three boilers had stopcocks between safety valve and boiler—a dangerous apparatus, one boiler had no safety-valve, one had no feed pipe, three were cracked entirely around the shell. One was blistered so that the Inspector pushed his finger through the shell, after cutting off the blister. One was corroded through from accumulation of ashes, combined with small leak. One gage-pipe was completely stopped up. One boiler was so badly burnt, blistered, cracked, etc., as to give out entirely under pressure. These boilers were all in actual use.

Voice From the South.

Perhaps in the whole range of exchanges that come to our table, there is none more welcome -while there is certainly none more useful—than the SCIENTIFIC AMERICAN. Devoted to explanation and discussion of all the most novel improvements in science, mechanics, and arts, which are rendered plain and easily understood by admirable cuts, this paper has a high mission which it fulfills with exceptional ability. It has that novel quality, too, of minding the business for which it set out, and eschews politics most carefully. It is perhaps this fact, as much as its very great ability, that has for years given this paper the high standing it has among the business, manufacturing, and scientific men of the country.

Munn & Co. who own the paper, are everywhere known as thoroughly experienced and successful Patent Agents. They are prompt and reliable; and we can state of our own personal knowledge, that any such business entrusted to them will be perfectly certain to give entire satisfaction.—*Mobile Daily Register*.

The Value of Small Inventions.

The great value of some of the smallest inventions is strikingly illustrated in the success of the Bag Fastener, recently patented by Charles M. Nye, of Elizabethport, N. J. It is only three months since the issue of the patent, and he has already received cash orders for over $60,000 of the Fasteners, and several offers of $10,000 for the patent, which he declines. He has established a factory capable of turning out 15,000 of the article per diem. The Fastener consists merely of a couple of small leather straps, united by a central buckle. One customer in Philadelphia orders them by the ten thousand, and says that they save him $50 a day in cash. A man can securely fasten a dozen bags of grain in the time that it ordinarily takes to tie a single bag. The millers like the improvement, and it is coming into extensive use. Patented through the SCIENTIFIC AMERICAN office.

The New Breech-Loader.

The work of preparing tools for the fabrication of the new breech-loader, which is to be made at the Springfield (Mass.) armory, is being rapidly forwarded, the machinists, at the request of the commandant, working ten hours a day for that purpose. When everything is ready the making of the new model will begin at once, and a larger force than the present one will necessarily be employed, in order to furnish the army with the improved breech-loaders as rapidly as they are called for. In anticipation of this demand for labor many of the former workmen at the armory are returning and entering their names and addresses on a book kept for that purpose, so that the authorities can send for them when they are wanted.

Experiments by Professor Tyndall.

At a recent meeting of the Photographic Section of the American Institute, Professor Joy read the following extract from a private letter which he had received from Professor John Tyndall:

My daylight hours have been recently occupied with the question of the chemical action of light upon vapors, and also with the blue color and polarization of the sky. These questions, which have been so long the great enigmas of meteorology, have, I hope, at length been brought within the grasp of experiment, and have been, to a great extent, satisfactorily solved. The condensed summary of my results is at the present moment in the hands of Sir John Herschell, who has manifested great interest in the inquiry. As soon as he sends it back to me I shall hasten its publication, and it will give me great pleasure to send you a copy of it. J. TYNDALL.

ARCHITECTURE AND BUILDING.—We intend to devote considerable attention during the year to the subjects of architecture and building, and shall endeavor to furnish information that will be useful and interesting to all our readers.

Bridging the Connecticut River.

The subject of bridging rivers for railways purposes is still agitated. It is proposed to bridge the Connecticut River at Lyme and at Middletown, and the Connecticut Legislature has authorized the construction of the bridges. The matter has been carried before Congress for confirmation. It is claimed that by bridging the river at Middletown the distance by rail from New York to Boston will be shorter twenty-six miles.

Connecticut interests oppose the interference of Congress and the building of the bridges, for the reason, among others, that they will obstruct the navigation of the river. There is apparently a big "lobby" on both sides. We predict that in the end the bridges will be built.

Editorial Summary.

Mr. George W. Blunt has issued a notice cautioning masters of vessels passing Hell Gate of the danger of collision with the vessel at work removing the obstructions at that point. He says: "It is a settled fact that masters and owners of vessels colliding with the contractor's tug and machinery at work over Frying Pan must make full indemnity for the damage done. It is also important, for public reasons of humanity, that collisions should be avoided, as large quantities of nitro-glycerin must be kept constantly on the spot, and liable to be exploded by the shock of percussion, which would be highly destructive to human life in case of collision." Mr. Shelbourne, the contractor, particularly requests the pilots of the Sound steamers to slow their engines in passing the point of his operations. Regular work on Frying Pan commenced on Monday, January 11.

Social Science Association.—The annual meeting of the American Social Science Association will be held in Albany in February, under the direction of the District Committee, among whom are General John Meredith Read, Jr., Chairman; Thos. W. Olcott, Treasurer; Charles E. Smith, Secretary; John V. L. Pruyn, William Cassidy, Jas. Hall, Erastus Corning, Hon. Ira Harris, S. B. Woodworth, John H. Reynolds, the Hon. Amasa J. Parker, J. H. Armsby, Benjamin Nott, Dr. S. O. Vanderpoel, William A. Rice, Dr. James McNaughton, R. L. Banks, Orlando Meads, John H. Van Antwerp, Geo. Dawson, Hamilton Harris, John F. Rathbone, and William H. De Witt. Papers will be read by General Garfield, John Stanton Gould, Professor Goldwin Smith, President Samuel Eliot, and other distinguished gentlemen.

The New York "Journal of Medicine" says that Dr. N. Hickman, Demonstrator of Anatomy in the University of Pennsylvannia, has met with a case of complete transposition of the internal organs in the dissecting room of the university. The apex of the heart is on the right side; in fact every organ occupies exactly the opposite side from what is natural. This may be cited as a good case of total (physical) depravity.

Melting Snow with Salt.—Persons are in the habit of sprinkling salt upon snow before their doors. They could not do a more silly or injudicious thing. The result is to change dry snow or ice at the temperature of 20° to brine at 0. The injurious effect of damp upon the feet at this excessive degree of cold is likely to be extreme. The practice is prohibited in this city.

Oranges were frozen solid on the trees, at Augustine, Fla. on Christmas day. The weather was the coldest known in that locality since 1865. The thermometer at daylight stood at 20° above zero. It afterward touched 17°. In a climate where even white frosts are unusual, this was very severe. Last year, at the same time, the Florida ladies were dressed in lawns.

It is said that the Sutro Tunnel has been considered by the Committee on Mines and Mining since the opening of the session, and a favorable report is expected. The plan has been somewhat modified. It now contemplates the guarantee of bonds by the Government to the amount $5,000,000, and the raising upon this basis $12,000,000 in Europe.

Polished Plate Glass.—A correspondent writes to know why polished plate glass is not manufactured in the United States.

Ans. Want of good material, cheap skilled labor, and capitalists to invest in a business involving a good deal of risk.

The recent thaws have broken up the ice, and produced a disastrous freshet at Albany. Large quantities of grain have been lost, and the piers along the river front so undermined, that the buildings resting on them are insecure. Some have already fallen.

A convention has been held at Peoria, Ill., to consider the improvement on the Illinois river. It is proposed to seek aid from the State in addition to the appropriations made by the general Government to carry on the work.

A Boston paper asserts that a Portland mechanic has made a fine cambric needle which can be unscrewed, and contains in a hollow within another smaller one. This is a delicate piece of work, but by no means without precedent.

Siemens' Furnace.—We are having inquiries about the above furnace which we are unable to answer. Parties interested will do well to advertise in our paper.

The new suspension bridge at Niagara has been opened to public traffic. It is said to have the longest span of any bridge on the Continent.

Recent American and Foreign Patents.

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

Gage for Sewing Machines.—Mrs. Anna P. Rogers, Quincy, Ill.—This invention consists of an adjustable gage plate having a recess in its front edge, in which a presser pad, having inclined serrated grooves on its lower face, is arranged and connected to the said gage plate by an adjustable spring which governs the pressure of the pad upon the cloth.

Railroad Car Oil Box.—John C. Creed, Omaha, Neb.—This invention consists of an improved form in which the box and its cover are cast, whereby when the one is hinged to the other by a single pivot, a close-fitting joint is obtained without the expense of other finishing.

Water Elevator for Stock.—D. J. Keller, Kane, Ill.—The nature of this invention relates to the elevation of water for the purpose of supplying stock. The general features of the invention consist of a hinged platform upon which the animal steps to approach the trough, and the weight of the former causes the platform, through the interposition of proper mechanism, to compress a water bellows which forces the water into the said trough.

Extension Table.—G. S. Manning, Danville, Ill.—This invention relates to a new and useful improvement in extension tables, whereby the table is rendered much more convenient and useful than extension tables of ordinary construction. The invention further consists in so forming the table that the parts may be separated and a number of separate tables formed thereby.

Oven.—Charles H. Finn, Syracuse, N. Y.—The object of this invention is to provide means for determining at all times the temperature of baking ovens, cooking stoves, and ovens in other situations; and it consists in attaching to the doors of such ovens a thermometer, in such a manner that the bulb of the thermometer shall be inside the oven, while the scale and tube shall be on the outside of the door or visible to the eye.

Cotton Gin.—A. A. Porter, Griffin, Ga., has just patented a new and improved cotton gin, which is said to be an important improvement. The invention consists in an improved arrangement of means for causing the cotton being fed into the gin to have a to-and-fro movement in a lateral direction, for bringing it more perfectly into contact with the saws, thereby more thoroughly separating the seed, and, at the same time, working the fiber evenly. Mr. Porter is desirous that planters should investigate and test the merits of his machine confident that his invention will be a benefit to them.

Smoking Pipe Mouthpiece Attachment.—J. P. Courtney and William H. Kelagher, Brooklyn, N. Y.—This invention relates to improvements in smoking pipes whereby the salvia or liquid from the mouth of the smoker is prevented from entering the stem or tube of the pipe.

Cartridge Box.—John I. Pittman, New York city.—This invention relates to a new and improved cartridge box, designed more especially for holding metallic cartridges. The object of the invention is to obtain a simple and economical means whereby the cartridges may be firmly retained in proper position in the box, readily withdrawn from the latter as required for use, and the proper or usual number allowed to put into the box.

Joints or Connections for Railway Rails.—Charles H. Crosby, Boston. Mass.—This invention relates to a new and useful improvement in that class of joints and connections for railway rails, in which screw bolts pass transversely through plates placed at both sides of the rails and also through the rails.

Stalk Cutter.—R. B. Parks and J. R. Parks, Neponset, Ill.—This invention relates to a new and improved machine for cutting the standing stalks of Indian corn or maize into short lengths, so that they may be left upon the ground and plowed under, and cause no difficulty or trouble in the cultivation of succeeding crops.

Fence.—J. J. Reicherts, Delaware, Ohio.—This invention relates to a new and useful improvement in fences for door yards and for all other purposes to which the same may be applicable.

Gate Latch.—J. A. Martin, Strasburg, Pa.—The object of this invention is to provide a simple and effective gate latch which is not liable to get out of repair, and which supports part of the weight of the gate.

Blind Fastener.—Simon F. Stanton, Manchester, N. H.—This invention relates to an improvement in fastening window blinds (either closed or open), and it consists in attaching a semi-circular notched bar permanently to the window frame, and a spring bolt to the blind, whereby the blind is securely held entirely closed, or in any desired position when open.

Press.—J. Berkeley, Washington, Texas.-The filling and pressing chamber is divided into two parts, one of which is fixed to the wagon frame near the front end in a permanent manner, the other part to which the material is supplied to be passed, and which is provided with the follower, is arranged upon trunnions near the rear end of the wagon and is turned on the same with the rear end down to be filled; when filled it is restored to the level of the frame, and communicates with the fixed portion into which the material is forced by the follower, which is operated by a windlass and cords working over pulleys properly arranged. The sides of the fixed portion are arranged to open to discharge the bale.

Derrick.—Angus Campbell, Downieville, Cal.—This invention relates to various improvements on derricks, whereby the operation of loading and unloading articles from and into ships, and other receptacles, can be greatly facilitated. It also consists in the use of a truck which slides on the boom, also in the application of an endless rope for bracing the boom without interfering with the motion of the truck, and without overstraining the topping lift.

Composition for the Cure of Hog Cholera.—W. B. Robuck, Oxford, Miss.—The object of this invention is to provide for public use a cheap specific for hog cholera.

Goblet.—Thomas Leach, Taunton, Mass.—In this invention the bowl of the goblet is of glass and the standard of silver, or other metal, the two parts being connected by a screw joint, so that they can readily be taken apart, in order that, if the bowl should get broken, another may be inserted in its place, and thus a new goblet be produced at a comparatively slight expense.

Gang Plow.—Wm. Mason, Independence, Oregon.—The object of this invention is to construct a simple and strong gang plow which can be more easily and conveniently operated than those now in use.

Hay and Cotton Press.—Elias Evans, Montgomery, Ala.—This invention relates to that class of hay and cotton presses in which the bale is formed at the top of the press box, and consists in an improved apparatus by which the cover of the box can be swung out of or into place with greater convenience and dispatch than heretofore.

Evaporating Apparatus.—Elijah Chitister, Chatham, Iowa.—This invention consists of a furnace arranged in three or more sections and provided with ways for sliding the pans transversely over the furnace, and provided also with suitable pans, which, after being charged with the liquid to be evaporated, are placed on the furnace and transferred from one section to another, where fires of varying intensity are maintained, in the order calculated to produce the best results.

Process for Bleaching Ivory, Bone, and other Similar Articles.—D. K. Tuttle, New York city.—This invention relates to improvements in the process of bleaching ivory, bone, and other similar articles, and has for its object to cheapen the cost and improve the quality of the articles bleached, and it consists in exposing the said articles to the action of light in a bath of spirits of turpentine.

Harness Cock Eye.—S. D. Bingham, Maumee City, Ohio.—This invention has for its object to furnish an improved harness cock eye, simple in construction, durable, easily adjusted, and which will diminish the cost of the construction of the harness very materially.

Seed Planter.—John S. Robb and Samuel P. Allison, New Cumberland W. Va.—This invention has for its object to furnish an improved machine, designed especially for planting potatoes, but which shall be equally applicable for planting all other seed requiring to be planted in hills or drills, and which shall be simple in construction and accurate in operation.

Burglar Alarm.—M. Pierson and M. D. Manville, Adams, N. Y.—This invention has for its object to furnish an improved alarm for attachment to doors, windows, drawers, etc., which shall be so constructed and arranged that it shall be impossible to open the door, window, or drawer to which it is attached without a continuous ringing of the alarm.

Plow.—Samuel Prentiss and George Flint, De Soto, Mo.—This invention has for its object to furnish an improved plow, simple and durable, which may be used with equal facility for breaking up new ground, for plowing old or cultivated ground, or for subsoiling, and which can be run at a greater depth, with less draft than is possible with the ordinary plows.

Land Rollers.—Neal S. McLay, Olathe, Kansas.—This invention has for its object to furnish an improved land roller, which shall be so constructed and arranged that the rollers may adapt themselves to rough or uneven ground, so that the entire surface of said ground may be suitably rolled.

Cultivators.—John G. B. Gill, Chester Court House, S. C.—This invention has for its object to improve the construction of the cultivator known as the "Buckeye Sulky Cultivator," so as to make it more durable and more convenient.

Iron Frame Gate.—W. F. Whitney, Milwaukee, Wis.—This invention has for its object to furnish an improved gate, which shall be light, strong, durable, simple in construction, and adapted to any situation.

Weighing Scale.—S. S. Hamilton, Taylor's Falls, Minn.—The object of this invention is to provide a weighing scale which is simple, durable, compact, and not liable to get out of repair, and which will indicate with delicacy and accuracy the weight of the article weighed.

Hydrants.—Louis W. Werner, St. Louis, Mo.—The object of this invention is to provide a hydrant which is simple, effective its operation, and easily taken up to repair or clean out when occasion requires.

Threshing Knife.—Henry Spaulding, Fletcher, Vt.—The nature of this invention relates to the form of the threshing knife usually affixed in the concave of threshing machines. It consists in forming the said knives with two cutting edges, and affixing the same to the concave in such a manner that the knives may be reversed to present a new edge when the other has become dulled from use, thereby enabling the machine to be run twice as long as when knives with only one edge are employed.

Ore Concentration by Centrifugal Force.—S. F. Pearce, 32 Dey street, New York city.—The concentration of ores by a mechanical process, without the use of water or currents of air, has been successfully accomplished by the application of centrifugal force, acting on the ore (previously crushed dry by any method), and by which it is caused to fly off from a central point and fall freely into a series of annular receivers, by which means it is separated according to its gravity, the heavier particles falling further from, and the lighter nearer to the center. A sketch of the apparatus, with a description, will be given in a future number of this paper. Patent dated August 11, 1868.

Furnace for Roasting and Calcining Ores.—Ernst Westman, of Stockholm, Sweden.—This invention relates to a new furnace for roasting and calcining ores by means of gases that are produced by the combustion of suitable fuel; and the invention consists in such an arrangement of parts, that ore of suitable quality can be perfectly freed from impurities, and that the process can be quickly and conveniently carried on.

Safety Attachment to Carriages.—Claude Ducreux, New York city.—This invention consists in so connecting the operating lever with the brake and detaching apparatus, that either the brake alone, or both the brake and the detaching apparatus can, by one move of the lever, be operated. The object is to allow the same lever to apply the brakes of the carriage or wagon moves down hill or is drawn too quick, without necessitating at the same time the detaching of the horses.

Sectional Bureau.—Elias Gill, New York city.—This invention relates to a new bureau, which is so constructed that it can be readily packed together into a small compass when to be transported from one place to another. The invention consists in constructing the bureau of a series of sections or boxes, of which the upper ones are made smaller than the lower, so that each box or section can be packed into that immediately below. Each box has sliding or other doors in front or side, to allow access to its contents. The lower section is provided with a removable back or cover to allow the insertion of the upper boxes, while each of the upper ones may be entirely open at the bottom.

Method of Tempering Steel.—G. Davis, Elizabethport, N. J.—This invention relates to a new manner of tempering already completed steel or other tools and articles, and consists of a mixture of sand or other neutral substance, and water, which mixture is placed into a barrel or other suitable receptacle. The sand and water are mixed in such proportions that the required temper may be produced. The tool is heated to a red heat, and is then immersed in the mixture.

Water Elevator.—G. M. Atherton, Friendsville, Ill.—This invention relates to a new water elevator, which is so arranged that the crank handle can be turned continually in one direction, and will still operate to alternately hoist up one bucket and to lower the other; and which is further more so arranged that the little water remaining in a bucket cannot freeze the valve to its seat, and so that the buckets will be kept separated, and will be emptied in a certain desired place, and in one certain position.

Kiln for Burning Fire-Brick Tiles and other Analogous Article of Manufacture.—Jas. Green, St. Louis, Mo.—The object of this invention is to provide a permanent kiln for burning fire brick tiles and the like with economy and facility, and consists in the arrangement of flues, fire passages, draft passages, stacks with other parts perfecting the whole.

Sewing Machine Attachment.—Mrs. Anna Rogers, Quincy, Ill.—This invention consists of an improved method of actuating an adjustable vibrating tuck creasing device and in the combination therewith in one attachment of an improved tucking gage.

Compound Levers.—John Simpson, Marietta, Ga.—This invention has for its object to furnish an improved device for converting rectilinear into circular motion which shall be convenient and effective, and less liable to become set upon the dead point than the ordinary means for this purpose.

Hydrocarbon Burner.—Louis Verstraet, Paris, France.—This invention refers to an apparatus for the direct combustion of any petroleum and other mineral oils, for the purpose of heating steam-boilers and other industrial and domestic fireplaces, and is intended to provide a special apparatus for burning the oils in a single jet by spreading them in a sheet on a furnace.

For descriptive circular of the best grate bar in use, address Hutchinson & Laurence, No. 8 Dey st., New York.

Rights for sale of a valuable patent, just out, easily manufactured and in season, in limits to suit purchasers. Address, for information, Rob't T. Burnett, 212 Madison st., New York.

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Manufacturers and machinists look out for orders. See manufacturing of the United States in Boston Bulletin, which will post you where to solicit them. Commercial Bulletin, Boston, $4 a year. Advertisements 17 cents a line each insertion.

Pocket repeating light, with improved inflammable tape. Send for circular to Repeating Light Company, Springfield, Mass.

An experienced engineer, who for years has been engaged as superintendent and mechanical draftsman in a machine shop, wishes a similar position in some establishment. Good references given. Address Engineer, Postoffice Box 3483, Boston, Mass.

American Needle Company, general needle manufacturers, and dealers in sewing-machine materials. Hackle, gill, comb, card pins, etc., for flax, hemp, carpet, and other machinery. J. W. Bartlett, Depot 569 Broadway, New York.

See A. S. & J. Gear & Co.'s advertisement elsewhere.

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

For steam pumps and boiler feeders address Cope & Co., No. 118 East 2d st., Cincinnati, Ohio.

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Iron.—W. D. McGowan, iron broker, 73 Water st., Pittsburgh, Pa.

For sale—100-horse beam engine. Also, milling and edging machines. E. Whitney, New Haven, Conn.

Millstone-dressing machine, simple, durable, and effective. Also, Glazier's diamonds, and a large assortment of "Carbon" of all sizes and shapes, for all mechanical purposes, always on hand. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

Get a fire extinguisher for your building. It may save it from destruction. Send to U. S. Fire Extinguisher Company, 8 Dey st., New York, for descriptive circular.

Water-power, with grist & saw mill, 90 miles from N.Y., for sale, good location for paper mill or manufactory. H. Stewart, Stroudsburg, Pa.

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

N. C. Stiles' pat. punching and drop presses, Middletown, Ct.

Prang's American chromos for sale at all respectable art stores. Catalogues mailed free by L. Prang & Co., Boston.

Winans' boiler powder, N. Y., removes and prevents incrustations without injury or foaming; 12 years in use. Beware of imitations.

The paper that meets the eye of all the leading manufacturers throughout the United States—The Boston Bulletin. $4 a year.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JANUARY 19., 1868.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On filing each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filling application for Design (seven years)	$15
On filling application for design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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85,721.—Corn Planter.—F. J. Ashburn, West Union, W. Va.
85,722.—Harvester.—John Barnes, Rockford, Ill.
85,723.—Harvester Rake.—John Barnes, Rockford, Ill.
85,724.—Water Wheel.—Robert Bing, May's Landing, N. J.
85,725.—Flax Boll Brake.—B. S. Burgan, Congress, Ohio.
85,726.—Mill for Grinding Sumac.—Remington G. Chase, Alexandria, Va.
85,727.—Toy Hoop.—Samuel E. Cleveland, Buffalo, N. Y.
85,728.—Butt Hinge.—Calvin Cole, Ithaca, N. Y.
85,729.—Door Tightener and Fastener.—Dennis Conlon, Portland, Me.
85,730.—Torpedo for Oil Wells.—Frederick Crocker, Titusville, Pa.
85,731.—Revolving Bench for Tinners.—William Culveyhouse, Ligonier, Ind.
85,732.—Device for Turning Street Cars.—Benjamin I. Day, Vanderburg county, Ind.
85,733.—Horse Hay Fork.—W. E. Derrick, Jordan, N. Y.
85,734.—Grapples for Suspending Horse Hay Forks.—William E. Derrick, Jordan, N. Y.
85,735.—Stone and Stump-raising Machine.—Harvey Fleming, Vienna, N. J.
85,736.—Cultivator.—Isaiah B. Gilbert, Lewisville, Ind.
85,737.—Machine for Trimming and Dressing Millstones.—James T. Gilmore, Painesville, Ohio.
85,738.—Picture Hook.—Wilmer D. Gridley, New Britain, Conn.
85,739.—Horse Hay Fork.—Levi Haverstick (assignor to himself and Abraham W. Shuman), Manor township, Pa. Antedated December 26, 1868.
85,740.—Gage for Circular Saws.—Oliver A. Horn and William P. Horn, Addison, N. Y. Antedated January 2, 1869.
85,741.—Earth-boring Instrument.—W. T. Huntington, Washington, D. C.
85,742.—Method of Uniting Sheet Metal Plates.—Joseph Le Comte, Brooklyn, N. Y.
85,743.—Manufacture of Yeast Cakes.—Benjamin F. Lee, Sandusky City, Ohio.
85,744.—Vaginal Injection Pipe for Syringes.—Thomas Lewis, Malden, Mass.
85,745.—Cast Iron Car Wheel.—George G. Lobdell, Wilmington, Del.
85,746.—Plow.—David A. Manuel, Napa City, Cal.
85,747.—Horse Collar.—C. K. Marshall, New Orleans, La. Antedated January 2, 1869.
85,748.—Heel for Boots and Shoes.—George W. Martin, Boston, Mass. Antedated January 6, 1869.
85,749.—Method of Securing Rubber Rings or Disks to the Doors of Vats, etc.—Charles H. Mellor, Philadelphia, Pa.
85,750.—Self-extinguishing Railroad Car Stove.—John Minor, Peoria, Ill.
85,751.—Curtain Fixture.—James A. Morrison (assignor to John H. Morris and William F. Hood), Pittsburgh, Pa.
85,752.—Mortising Machine.—Peter A. Mowers, Cleversburg, Pa. Antedated January 2, 1869.
85,753.—Reversible Latch.—W. T. Munger, Branford, assignor to P. and F. Corbin, New Britain, Conn.
85,754.—Reversible Latch.—W. T. Munger, Branford, assignor to P. and F. Corbin, New Britain, Conn.
85,755.—Gate.—Michael Neudgent, Hartland, Mich.
85,756.—Clothes Hook.—O. A. North, New Britain, Conn.
85,757.—Horse Rake.—Sherman R. Nye, Barre, assignor to himself and Andrew B. Barnard, Worcester, Mass.
85,758.—Railway Frog.—Sidney Parke, Chicago, Ill.
85,759.—Door Bell.—Chester Penfield, New Britain, Conn.
85,760.—Alarm Bell.—Chester Penfield, New Britain, Conn.
85,761.—Medical Compound.—Jonathan Penoyer, Massillon, Ohio.
85,762.—Machine for Mixing Paints and Chemicals.—Robert Poole, Baltimore, Md.
85,763.—Governor for Steam Engines.—George T. Pracy, San Francisco, Cal.
85,764.—Cigar Makers' Mold.—John Prentice, New York city.
85,765.—Knitting Machine.—Jacob D. Reiff, Skippackville, Pa.
85,766.—Manufacture of Stone Ware for the Use of Chemists and Others.—Richard C. Remmey, Philadelphia, Pa.
85,767.—Car Coupling.—Adam G. Ritz, Elizabethtown, assignor to himself and John B. Carter, Hartsville, Ind.
85,768.—Sulky Plow.—John Root, Hartland, N. Y.
85,769.—Threshing Machine.—John U. Slingluff, Eagleville, Pa. Antedated December 30, 1868.
85,770.—Swage for Saw Teeth.—Joseph Sperrey (assignor to Henry Disston), Philadelphia, Pa.
85,771.—Shaft Tug.—John E. Stuber, Turin, N. Y.
85,772.—Shutter Hinge and Knob.—John W. Tripp, Gallipolis, Ohio.
85,773.—Device for Securing Fastening Loops to Neck Ties.—Benjamin F. Welshampel, Baltimore, Md.
85,774.—Hot Air Furnace.—John W. Wentworth, Minneapolis, Minn.
85,775.—Machine for Making Crucibles.—Joseph Winkle, Pittsburgh, Pa.
85,776.—Door Lock.—Herrmann Ahrend, New York city.
85,777.—Scaffold.—John Anderson, Abel O. Smith, and Isaac C. Wallace, Lakeville, Mich.
85,778.—Water Elevator.—G. M. Atherton, Friendsville, Ill.
85,779.—Governor for Marine and other Engines.—Jearum Atkins, Washington, D. C.
85,780.—Animal Trap.—Samuel Ayres, Worcester, Mass.
85,781.—Vessel for the Formation of Ice.—Benjamin T. Babbitt, New York city.
85,782.—Grain Conveyor.—David L. Bartlett, Rockford, Ill.
85,783.—Baling Press.—J. Berkeley, Washington, Texas.
85,784.—Harness Cock Eye.—S. D. Bingham, Maumee City, Ohio.
85,785.—Sled Brake.—Simeon R. Bolton and Francis Hoyt, Prescott, Wis.
85,786.—Wooden Pavement.—John W. Brocklebank and Charles Trainer, New York city.
85,787.—Universal Globe Joint.—Josiah Bruno, Jr., Lansing, Mich.
85,788.—Toy Blow Gun.—T. Clifford Bush (assignor to himself, Henry P. Ostram, and T. B. Carpenter), New Haven, Conn.
85,789.—Propelling Apparatus.—S. D. Carpenter, Madison, Wis.
85,790.—Composition for Making Self-Cementing Bands.—Elijah M. Carrington, New York city, assignor to Edmund I. Wade, trustee, and said trustee assigns to the Patent Self-Cementing Band Company.
85,791.—Evaporating Apparatus.—Elijah Chitister, Chatham, Iowa.
85,792.—Steam Safety Valve.—Gilbert H. Clemens, New York city.
85,793.—Railroad Car Axle Box.—John C. Creed, Omaha City, Nebraska.
85,794.—Bolt-Fastening for Rail Ties.—Charles H. Crosby, Boston, Mass., assignor to himself, John Ross, and C. A. Trowbridge.
85,795.—Mouth Piece for Smoking Pipes.—J. P. Courtney and William H. Kelagher, Brooklyn, N. Y., assignors to J. P. Courtney.
85,796.—Method of Producing White Pigments from Lead.—John Gallemore Dale and Edward Milner, Warrington, England.
85,797.—Method of Tempering Steel.—Geo. Davis, Elizabethport, N. J.
85,798.—Harness Buckle.—E. S. Dawson, Syracuse, N. Y.
85,799.—Door Knob, etc.—Edwin Day, Chicago, Ill.
85,800.—Veneer Press.—D. Decker, New York city.
85,801.—Grain Separator.—James A. Denton, David W. Shannon, and Elijah Lucas, Winslow, Ind.
85,802.—Centrifugal Pump.—H. A. Duc, Jr., Charleston, S. C.
85,803.—Combined Safety Attachment and Brake for Carriages.—Claude Ducreux, New York city.
85,804.—Gas Heater.—Laurence A. Duval and Wilfrid G. Duval, Charleston, S. C.
85,805.—Padlock.—Louise Eiffler, New York city, administratrix of the estate of Charles Hermann Eiffler, deceased.
85,806.—Metallic Roofing.—Levi S. Enos, Chicago, Ill.
85,807.—Lunch Box.—John Erpelding, Chicago, Ill.
85,808.—Hay and Cotton Press.—Elias Evans, Montgomery, Ala.
85,809.—Oven Door.—C. H. Finn, Syracuse, N. Y.
85,810.—Still for Refining and Distilling Oils.—Samuel Gibbons, Binghamton, N. Y., assignor to Excelsior Oil Manufacturing Company.
85,811.—Sectional Bureau.—Elias Gill, New York city.
85,812.—Cultivator.—J. G. B. Gill, Chester Court House, S.C.
85,813.—Burning Kiln.—James Green, St. Louis, Mo.
85,814.—Stone Pavement.—Charles Guidet, New York city.
85,815.—Swivel Mirror Frame.—Christian W. Hafermalz, Providence, R. I.
85,816.—Weighing Scale.—S. S. Hamilton, Taylor's Falls, Minn.
85,817.—Steam Engine Cutt Off.—Thomas Hansbrow, deceased (Lucy A. Hansbrow and B. B. Redding, executors), Sacramento, Cal.
85,818.—Window Blind.—Jones Harding, Galesburg, Ill.
85,819.—Grindstone Journal Box.—James L. Haven, Cincinnati, Ohio.
85,820.—Trace Fastening.—S. C. Hawkins, Patchogue, N.Y.
85,821.—Washing Machine.—Levi Hermance, Hudson, N. Y.
85,822.—Baling Press.—D. H. Hill, Union Springs, Ala.
85,823.—Wad Greasing Apparatus.—A. C. Hobbs, Bridgeport, Conn.
85,824.—Grain Drill.—P. F. Hodges, St. Paul, Minn.
85,825.—Compound for Paint and Artificial Stone.—Thomas Hodson, Brooklyn, N. Y.
85,826.—Combined Corn Planter and Cultivator.—John W. Hollaman, Maple Grove, Ill.
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85,828.—Corn Harvester.—Nicholas Hosper, Pella, and Morris Sellers, Keokuk, Iowa.
85,829.—Mechanism for Transferring Freight.—John H. James, Jr., Urbana, Ohio.
85,830.—Chain Belt.—Wm. N. Julian and Morris Kidnocker, Tarlton, Ohio.
85,831.—Hay Derrick.—G. E. Johnston, Bloomington, Ill.
85,832.—Cattle Pump.—D. J. Keller, Kane, Ill.
85,833.—Potato Digger.—Seth Kinman, Eureka, Cal.
85,834.—Goblet.—Thomas Leach (assignor to Reed and Barton), Taunton, Mass.
85,835.—Chair and Step Ladder.—Andrew Madson, Paterson, N. J.
85,836.—Extension Table.—G. S. Manning, Danville, Ill.
85,837.—Milk Pail.—Hammond Marshall, Atlanta, Ga.
85,838.—Gang Plow.—Wm. Mason, Independence, Oregon.
85,839.—Gate Latch.—J. A. Martin, Strasburg, Pa.
85,840.—Horse Hay Fork.—Solomon S. Mattis, Curtin, Pa. Antedated January 2, 1869.
85,841.—Land Roller.—Neal S. McLay, Olathe, Kansas.
85,842.—Curtain Fixture.—Benjamin Moser, Brooklyn, N.Y.
85,843.—Manufacture of Curved Elbows.—Frederick G. Niedringhaus and W. F. Niedringhaus, St. Louis, Mo.
85,844.—Hay Fork Grapple.—John K. O'Niel, Kingston, and J. F. Thomas, Herkimer county, N. Y., assignors to John K. O'Niel.
85,845.—Curtain Fixture.—Patrick O'Thayne (assignor to himself and D. W. Canfield), New York city.
85,846.—Curtain Fixture.—Patrick O'Thayne and David W. Canfield, New York city.
85,847.—Stalk Cutter.—R. B. Parks and J. R. Parks, Neponset, Ill.
85,848.—Burglar Alarm.—M. Pierson and M. D. Manville, Adams, N. Y.
85,849.—Cartridge Box.—J. I. Pittman, New York city.
85,850.—Bench Pin.—T. J. W. Porter, Grand Rapids, Mich.
85,851.—Plow.—Samuel Prentiss and George Flint, De Soto, Mo.
85,852.—Fence.—J. J. Reicherts, Delaware, Ohio.
85,853.—Carriage Top.—Lewis Righter, Salem, Ohio. Antedated January 2, 1869.
85,854.—Seed Planter.—John S. Robb and Samuel P. Allison, Cumberland, W. Va.
85,855.—Composition for the Cure of Hog Cholera.—W. B. Robuck, Oxford, Mass.
85,856.—Tuck Creasing Attachment for Sewing Machines.—Anna P. Rogers, Quincy, Ill.
85,857.—Wringer.—Moses Romans, Fond Du Lac, Wis.
85,858.—Hay Spreader.—G. T. Savary, Byfield, Mass.
85,859.—Stave Jointer.—Jas. F. Sayer, Macomb, N. Y.
85,860.—Bleaching Process.—Bruno Schmidt, N. Y. city.
85,861.—Pruning Instrument.—Jeremiah Schroy, Fortville, Ind. Antedated January 2, 1869.
85,862.—Cultivator.—Cyrus Schwanger, Mount Joy township, Pa.
85,863.—Sash-Holder.—W. H. Sible, Harrisburg, Pa.
85,864.—Compound Lever.—John Simpson, Marietta, Ga.
85,865.—Threshing Knife.—Henry Spaulding, Fletcher, Vt.
85,866.—Bed-Bottom.—Otis W. Stanford, Lebanon, Ohio.
85,867.—Blind Fastener.—Simon F. Stanton, Manchester, assignor to himself and J. M. Stanton, Alexandria, N. H.
85,868.—Steam Water Elevator.—C. L. Stevens and Albert A. Denton, Galesburg, Ill.
85,869.—Horse Rake.—Wm. Stinson, Coolspring township, Pa.
85,870.—Harvester Rake.—Ole O. Storle, Norway, Wis.
85,871.—Cement Roofing.—Wm. M. Stuart, and A. J. Chapman, St. Clair, Mich.
85,872.—Horse Rake.—Eli Sweet, Triangle, N. Y., assignor to George T. Guler.
85,873.—Toy Cart.—A. L. Taylor, Springfield, Vt.
85,874.—Toy Bow-Gun.—Howard Tilden, Boston, Mass.
85,875.—Bleaching Ivory, Bone, etc.—D. K. Tuttle, New York city.
85,876.—Hinge Stop.—M. Umstadter, Norfolk, Va.
85,877. — Hydrocarbon-Burner. — Louis Verstraet, Paris, France.
85,878.—Bee-Hive.—Theron Webb, Buda, Ill.
85,879.—Hydrant.—Louis W. Werner, St. Louis, Mo.
85,880.—Clover Harvester.—Jacob Westhafer, Quincy, O.
85,881.—Furnace for Roasting and Calcining Ores.—Ernst Westman, Stockholm, Sweden.
85,882.—Iron Farm Gate.—W. F. Whitney, Milwaukee, Wis.
85,883.—Wood Seat for Chairs.—Geo. C. Winchester, Ashburnham, Mass.
85,884.—Bee-Hive.—John Wood, Alert, Ohio.
85,885.—Bee-Hive.—A. T. Wright, New Vienna, Ohio. Antedated January 5, 1869.
85,886.—Farm Gate.—Geo. Yeomans, Romulus, Mich.
85,887.—Harvester.—G. W. N. Yost, Corry, Pa., assignor to the Corry Machine Company.
85,888.—Tamping Plug.—Hosea Ball, New York city.
85,889.—Treble Attachment for Pianoforte.—A. V. T. Barberie, Brooklyn, E. D., N. Y.
85,890.—Piston Rod Packing.—O. H. Jewell, Chicago, Ill.
85,891.—Machine-Made Stitch.—T. K. Reed, East Bridgewater, Mass.

REISSUES.

80,897.—Safety Bridle.—Dated August 11, 1868; reissue 3,259.—G. W. Barnes, Mount Vernon, N. Y.
81,339.—Self-Cementing Band for Holding Bank Notes, Papers, etc.—Dated August 25, 1868; reissue 3,260.—Elijah M. Carrington, New York city.
59,395.—Hand Stamp.—Dated Nov. 6, 1866; reissue 2,836, dated January 14, 1868; reissue 3,261.—R. B. Hill, Chicopee, Mass.
78,989.—Quilting Frame.—Dated June 16, 1868; reissue 3,262.—Peter H. Mellon, St. Louis, Mo.
74,593.—Valve for Steam-Engines.—Dated Feb. 18, 1868; reissue 3,263.—Jos. Reichmann, Dubuque, Iowa.
43,423.—Churn.—Dated July 5, 1864; reissue 3,264.—Robert Murphy, Jasper, N. Y.
41,788.—Regenerator Furnace for Metallurgists and others.—Dated March 1, 1864; reissue 3,265.—C. W. Siemens and Fred. Siemens, Westminster, England.
52,120.—Roasting and Smelting Metallic Ores in Vacuo.—Dated January 23, 1866; reissue 3,266. The First National Ore Smelting and Desulphurizing Company, New York city, assignees of John Amsterdam.

DESIGNS.

3,334.—Floor-Cloth Pattern.—Hugh Christie, Morrisania, N. Y.
3,335.—Water-Closet Receiver.—Joel Hayden, Jr., Haydensville, Mass.
3,336.—Clock Case.—Geo. R. Holbrook (assignor to Phelps, Dodge, and Company), Ansonia, Conn.
3,337.—Clock Bell Stand.—G. B. Owen, Winsted, Conn.
3,338.—Face Plate of a Sash-Pulley.—Emery Parker (assignor to Russel and Erwin Manufacturing Company), New Britain, Ct.
3,339.—Tea Service.—Wm. Parkin (assignor to Reed and Barton), Taunton, Mass.
3,340.—Butter-Vase or Cooler.—Wm. Parkin (assignor to Reed and Barton), Taunton, Mass.
3,341.—Carpet Pattern.—W. H. Shelmerdine (assignor to Shelmerdine and Aitken), Philadelphia, Pa.

EXTENSIONS.

Dry dock.—J. E. Simpson, of Brooklyn, N. Y.—Letters Patent No. 12,034, dated Dec. 5, 1854.
Circular Knitting Machines.—John Pepper, of Gilford, N. H.—Letters Patent No. 12,046, dated Dec. 5, 1854; reissue No. 1,355, dated Oct. 27, 1863.

Clock Case.—Elias Ingraham, of Hartford, Conn.—Letters Patent No. 159, dated Dec. 3, 1861.

Seats for Public Buildings.—Aaron H. Allen, of Boston, Mass.—Letters Patent No. 12,017, dated Dec. 5, 1854; reissue No. 21, dated Jan. 15, 1861.

Grain and Grass Harvester.—Cyrenus Wheeler, Jr., of Auburn, N. Y.—Letters Patent No. 12,044, dated Dec. 5, 1854; reissue No. 875, dated January 3, 1860.

Harvester.—Cyrenus Wheeler, Jr., of Auburn, N. Y.—Letters Patent No. 12,044, dated Dec. 5, 1854; reissue No. 876, dated January 3, 1860; reissue No. 2,619, dated May 14, 1867.

Grain and Grass Harvester.—Cyrenus Wheeler, Jr., of Auburn, N. Y.—Letters Patent No. 12,044, dated Dec. 5, 1854; reissue No. 877, dated Jan. 3, 1860.

Grain and Grass Harvester.—Cyrenus Wheeler, Jr., of Auburn, N. Y.—Letters Patent No. 12,044, dated Dec. 5, 1854; reissue No. 878, dated January 3, 1860.

Grain and Grass Harvester.—Cyrenus Wheeler, Jr., of Auburn, N. Y.—Letters Patent No. 12,044, dated Dec. 5, 1854; reissue No. 879, dated January 3, 1860.

Grain and Grass Harvester.—Cyrenus Wheeler, Jr., of Auburn, N. Y.—Letters Patent No. 12,044, dated December 5, 1854; reissue No. 881, dated January 3, 1860.

Throstles for Spinning Cotton.—Charles Danforth, of Paterson, N. J.—Letters Patent No. 12,055, dated December 12, 1854.

Hanging Carriage Bodies.—B. F. Brown, of Dorchester, Mass.—Letters Patent No. 12,051, dated December 12, 1854.

Machines for Scraping Metals.—Jeremiah Stever, of Bristol, Conn.—Letters Patent No. 12,076, dated December 12, 1854.

Processes for Treating the Mother-Water of Salines.—Philippine S. Brackenridge, of Natrona, Pa., administrator of Edward Stieren, deceased.—Letters Patent No. 12,077, dated December 12, 1854.

Rattan Machine.—Sylvanus Sawyer, of Fitchburg, Mass.—Letters Patent 12,073, dated December 12, 1854.

Making Nuts.—Martin P. M. Cassity, of Nemaha county, Kansas, administrator of Isaac H. Steer, deceased.—Letters Patent No. 13,118, dated June 19, 1855; antedated December 19, 1854.

Machine for Splitting Rattans into Strips.—Sylvanus Sawyer, of Fitchburg, Mass.—Letters Patent No. 12,141, dated January 2, 1855.

Machinery for Cutting Rattan, etc.—An act for the relief of Sylvanus Sawyer, of Fitchburg, Mass.—Letters Patent No. 8,178, dated June 24, 1851.

Sawing Machine.—Lysander Wright, of Newark, N. J.—Letters Patent No. 12,176, dated January 2, 1855.

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We regard the issuing of the said Circulars as an effort on the part of the above-named firms to injure our trade, and we therefore here give notice to the said J. J. Starr & Co., E. F. Grant & Co., and the said other party, that unless they, and each of them, at once desist from issuing such notices, we shall bring suit against them and deal with them as the law directs for such offences.

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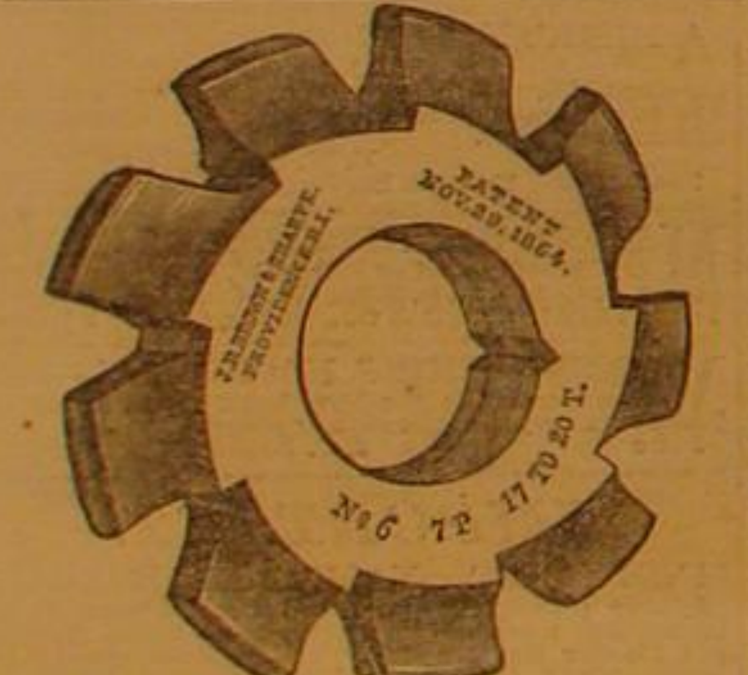

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For 1869.
THE NEW VOLUME

Commenced JANUARY FIRST; therefore, now is the time to organize clubs and to forward subscriptions. Clubs may be made up from different post-offices, but not less than ten names can be received at the clubbing rates. Additional names, however, may be sent in afterward at the same rates, to be designated as belonging to the club.

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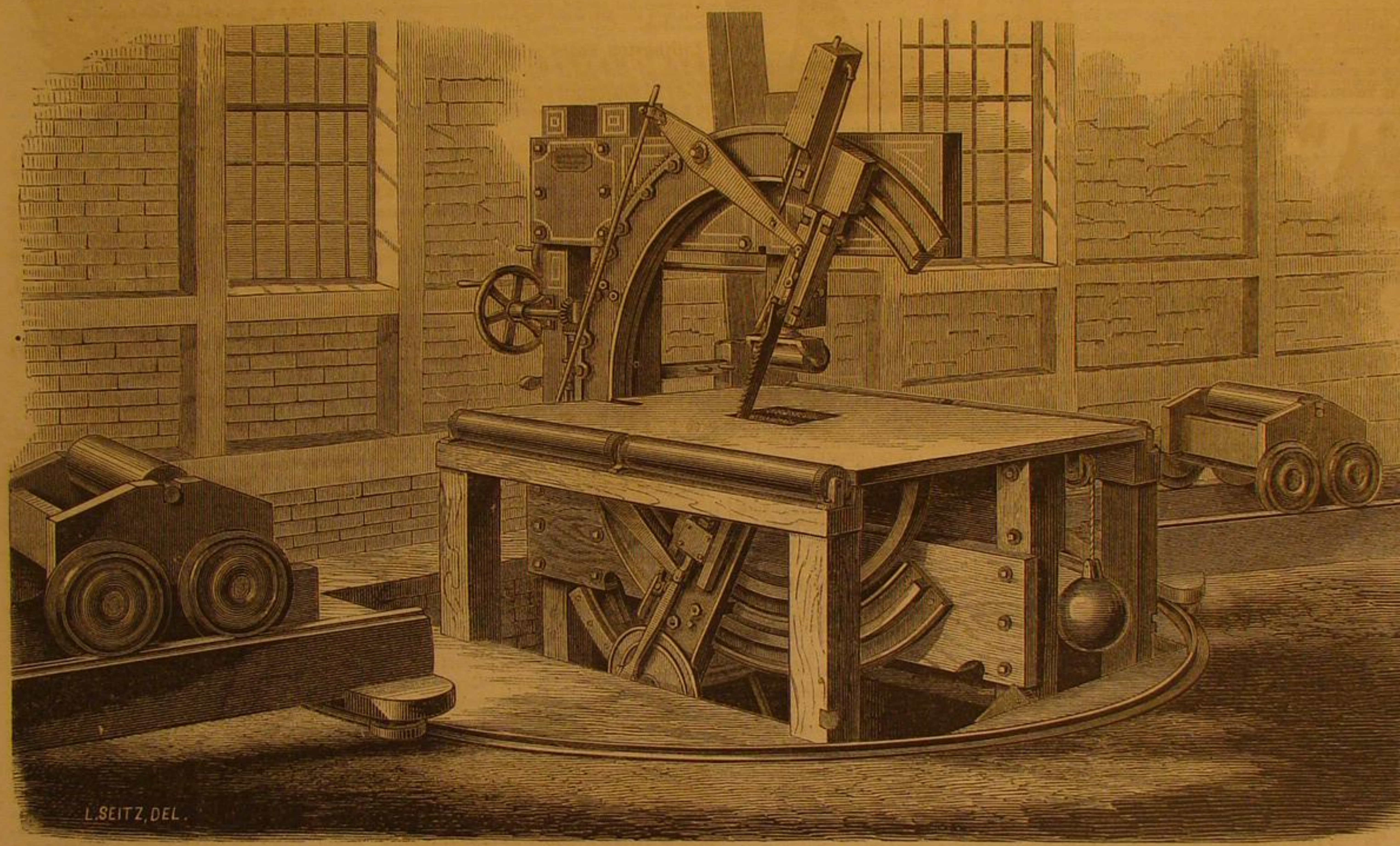


KNOWLTON'S PATENT CIRCULAR BEVEL SCROLL SAW.

Improvement in Machinery for Getting Out Ship Timber.

The invention of the saw has been ascribed by Pliny to Dædalus; but it has been traced to much higher antiquity—the age of the fourth dynasty of Egypt. In sawing, the Egyptians used a large hand-saw: they frequently fixed the wood upright, secured by pins in lieu of a vise, or with pins passing through the piece of timber itself, in order to support the planks as they were cut apart; which is the practice of modern sawyers.

The old mode of making boards was to split up the logs with wedges; and, inconvenient as the practice was, it was no easy matter to persuade the world that the thing could be done in any better way. Saw mills were first used in Europe in the 15th century; and in the year 1555, an English ambassador, having seen a saw mill in France, thought it a novelty which deserved a particular description. It is amusing to see how the aversion to labor-saving machinery has always agitated England. A saw mill was erected in Lambeth (on the site of Lambeth water works), in Cromwell's time, and which he protected by Act of Parliament. Another saw mill was established by a Dutchman, in 1663; but the public outcry against the new-fangled machine was so violent, that the proprietor was forced to decamp. The evil was thus kept out of England, for several years, or rather generations; but in 1768 an unlucky timber merchant, hoping that, after so long a time, the public would be less watchful of its interests, made a rash attempt to construct another mill. The guardians of the public welfare, however, were on the alert, and a conscientious mob at once collected and pulled the mill to pieces!

The business of the ship-carpenter has received probably less aid from the application of machinery and the inventive talent of the world than any other of general inportance; hand tools, as the adze, hewing ax, hand-saw, auger, and pit-saw being the chief reliances for shaping the timbers and dressing the planking of a ship. Compared with other departments of manufacturing industry that of shipbuilding has remained so nearly stationary, amid the general progress of others, that the workman who toiled at the building of the *Blessing of the Bay* more than two hundred years ago, would, if he should return to his old haunts and occupation, find no difficulty in using the tools now employed, and, apart from the greater dimensions of our ships, no great change between the appearance of our shipyards and those of the "good old colony times." Yet the number of ships built and the amount of tunnage employed is recognized as an index of the prosperity of the nation, and while peculiar circumstances in the condition of a country may, for a time, compel a cessation of the enterprise under more favorable circumstances directed into this channel, these hindrances may be partly, at least, overcome by increased facilities and superior advantages of performing the work.

A valuable auxiliary to the labors of the ship-builder is shown in the accompanying engraving. It is a gig or scroll saw, capable of cutting plank or heavy timber at any angle, sawing and shaping the faces, edges, and ends of timber and plank, "insquare" knees, etc., having a sweep of 270° out of the 360°. The feed motion allows the sawyer to cut curves without handling the timber. It will saw any bevel or curve, and cross-cut at any angle, and is completely under the control of the operator. The frame is so constructed as to admit curved timber of the largest dimensions, and trucks are provided, running on curved and radial tracks, for sustaining the weight of the timbers and guiding their presentation to the saw. With the aid of two attendants it will do the work of 40 men usually employed in shipyards, and do the work exact and therefore well, wasting only the sawdust and the small pieces not capable of being used for building purposes, and saving the enormous waste in chips made by hewing and dressing. More than one knee can, by its aid, be made from the same original piece.

The saw occupies a space of only seven feet by eight for the frame, and room for the trucks to work when in use. It is not liable to get out of order and may be used for years with little cost for repairs. One in use at the Philadelphia navy yard has been run two years and six months costing but $7·50 for repairs during that period. The power required to run one of the 12-inch saws is about four horse power. Any man of ordinary intelligence can use the machine and become expert to handle and cut all kinds of timber. A correspondent says: "I have seen at the Philadelphia navy yard a 'half top' finished in eight minutes. It was of southern live oak, ten feet long and ten inches thick. By hand labor half a day would have been required. A knee eight feet long and seven inches thick was finished in ten minutes, whereas it would have been considered a good two days' work if done in the ordinary manner." All the framing, knees, and in fact all the timbers of the sloop of war *Omaha*, built at this yard, were sawed by this machine. All the tops, half tops, timbering, and planking of the *Brooklyn*, Admiral Farragut's flag ship at the attack on New Orleans, now being rebuilt at this yard, are being cut by this saw. One just completed for this yard, with improvements over those first built, cuts planks, both edges, to any bevel or scroll required, and will cut a plank 50 feet long and eight inches thick, both edges, in less than five minutes. The plank then needs no touch of ax, adze, or plane before being placed on the ship. This is an advantage, as sawed surfaces retain the oakum better than planed surfaces. Mr. J. W. Lynn, of Philadelphia, who has used them for months, says that "with the aid of two saws he can save the labor of 50 or 60 men in the construction of a ship."

The machines are in use at Neafie & Levy's, Cramp & Sons', J. W. Lynn's, Birely, Hillman & Streaker's, Philadelphia, the Philadelphia, Portsmouth, and Charlestown navy yards, at S. Stevens' works, Chester, Pa., Mudgett, Libby & Griffin's works, Stockton, Me., and a number of other well-known yards. One will be running early in February, at the Camden and Amboy R. R. shops, Hoboken, N. J.

The machine was patented through the Scientific American Patent Agency April 7, 1868, by John L. Knowlton. All communcations should be addressed to the agent, Theo. F. Taylor, 532 Walnut st., Philadelphia, Pa., or to the inventor at his works, 130 Reed street, same city.

Coal Ashes as a Fertilzer.

A series of experiments conducted at the Museum of Natural History, Paris, during the past year, by Professor Naudin, on the value of coal ashes as a fertilizer, has resulted in the conclusion that they are neither a manure nor even earth of the most infertile quality. An opinion to this effect has prevailed in this country pretty generally, but it is certain that upon heavy clays, they act as a disintegrator if nothing else. This effect is not, we are convinced, merely mechanical, as a very small amount of coal ashes is sufficient to destroy the adhesiveness of a large amount of clay. At least this was the case in a recent experiment of our own, tried in accordance with the advice of one of the most accomplished florists in New York State. By the application of sifted coal ashes with a very small proportion of well rotted horse manure, we were able to make a thrifty flower garden the first season upon one of the stiffest soils it has ever been our lot to own.

AN Italian chemist is said to have invented a process whereby wood, cloth, and other inflammable material are rendered absolutely fire-proof, and which is free from the objections which attend the use of other processes. The details are not yet given.

THE CHEMISTRY OF THE HEATON PROCESS.

The importance of the various questions that have been raised in reference to the method proposed by Mr. Heaton for making steel is sufficiently great to justify some further remarks on the subject from a chemical point of view, especially as the account which has been given of it in this respect is not by any means exhaustive. The statements in Dr. Miller's report that the method is based upon correct chemical principles, and that the mode of attaining the result is both simple and rapid, cannot for a moment be questioned, but it appears that the opinion thus expressed by such an eminent chemical authority has lent a sanction to the wider claims made as to the metallurgical importance of Heaton's process, and to have given it an apparent *raison d'etre* which is not all consistent with the only chemical data yet available for forming a judgment as to the *rationale* of this method, and its practical value for making steel. The merit claimed for this method is that it is applicable for the production of steel from those kinds of pig iron which are of inferior quality, in so far as they contain considerable amounts of phosphorus and sulphur, the presence of those substances disqualifying them for conversion into steel by the Bessemer process. It is unnecessary here to refer particularly to the chemical principles on which this method is based; the main question is as to the result, and a careful examination of the chemical data hitherto published to elucidate that result is, alone, calculated to confirm and justify much of the adverse comment which Heaton's method has called forth.

Taking in the first instance the crude steel as it is obtained from the converter, there can be no question that it is a material differing very widely from that constituting the steel ingots obtained by the Bessemer process. One of the chief merits of the latter material is the homogeneity which it acquires by being run from the converter in a molten state, and being thus thoroughly freed from intermixture of slag. The texture, malleability, and tensile strength of the metal are in a great measure dependent on this homogeneous condition, and on the absence of minute portions of slag separating the metal into laminæ. The steel made by Heaton's method is professedly solidified in the converter, probably made during the process of conversion, and is consequently inter-penetrated with particles of slag just in the same way that a puddled bloom is. Dr. Miller's analyses indicate considerable differences as existing between the crude metal from the converter and the same metal after being forged and rolled. Thus, for instance, the crude and rolled metal contains for one hundred parts of iron as follows, according to the analyses:

	Iron.	Carbon.	Silicon.	Sulphur.	Phosphorus.	Arsenic.	Manganese.	Calcium.	Sodium.	Total.
Crude.......	100	1·855	·274	·018	·908	·042	·093	·329	·148	3·06
Rolled......	100	1·011	·151	trace	·297	·024	·089	·315	trace	1·887
Difference..	....	·844	·123	·018	·611	·018	·004	·014	·148	1·180

According to these data, the impurities in the crude metal would appear to be separated in the operation of rolling to the extent of one-third their total amount. But so far as the composition of mill furnace slags is known, there is nothing to warrant the opinion that there would be such an elimination of phosphorus and silicium as the above analyses apparently indicate. In fact, there is every reason to suppose that the several impurities there specified did not exist as silicon, phosphorus, sodium, and calcium combined with iron, but that they were combined with each other in an oxidized condition, as the constituents of a small quantity of slag which was mechanically disseminated throughout the metal, and was partially squeezed out in the operation of rolling. According to this view, the slag thus separated from 100 parts of iron would consist of:

Silica	·263	—	Silicon	·123
Sulphuric acid	·045	—	Sulphur	·018
Phosphoric acid	·025	—	Phosphorus	·011
Arsenic acid	·027	—	Arsenic	·018
Manganese oxide	·007	—	Manganese	·004
Lime	·019	—	Calcium	·014
Soda	·199	—	Sodium	·148
	.585			

and its per centage composition would be as follows:

Silica	45·106
Soda	23·325
Lime	3·360
Manganese Oxide, Mn_2O_3	1·217
Sulphate of soda	13·718
Phosphate of soda	7·887
Arseniate of soda	5·489
	100.

If the silicon, phosphorus, calcium, etc., in the rolled metal be also regarded as being wholly or partly in the state of slag, it would be more easy to conceive that the metal should have the characters assigned to it by Mr. Kirkaldy. For although it is not specifically stated by Dr. Miller that the metal experimented on by Mr. Kirkaldy had the same composition as the rolled steel analyzed by Dr. Miller, that is, no doubt, implied, and it is quite inconsistent with the hitherto received views that steel containing so much as nearly $\frac{3}{10}$ per cent of phosphorus should have such tensile strength as the metal operated upon by Mr. Kirkaldy. The presence of so much as $\frac{3}{10}$ per cent of calcium also renders it very probable that the metal really contained an admixture of slag. If that be the case, it would be natural to expect that the metal would be very liable on that account to corrosion, and that its tensile strength and coherence would be in time considerably reduced,

In reference to the amount of nitrate requisite to produce steel by Heaton's method from iron having the composition indicated by Dr. Miller's analyses, it is very evident that 10 per cent of nitrate of soda would not suffice to effect the separation of the phosphorus and sulphur to the extent that they were separated in the experiment. The minimum amount requisite for this purpose would be 16·6 per cent of the iron, or at the rate of about 2·4 cwt. per tun of pig iron, that being the proportion actually employed in Dr. Miller's experiments. In considering this point it is necessary to remember that the yield of crude metal from the converter was augmented to the extent of from 7 to 10 per cent by the melting of the cast-iron plate used for keeping down the nitrate, and if this plate consisted of pure cast iron free from phosphorus and sulphur, it would have a proportionate effect in making the influence of the nitrate, in separating those substances from the pig iron, appear greater than it really was. Whatever may have been the case with regard to this point, it would appear that Mr. Heaton must be in error in stating that 10 per cent of nitrate would be sufficient for converting a tun of pig iron, at least, if it contained the same amount of phosphorus, sulphur, etc., as the pig iron analyzed by Dr. Miller, and so far as chemical principles will admit of the necessary amount being determined. No doubt ten per cent or less might be sufficient for iron of superior brands; but that would have no value in regard to the applicability of this method for making steel from Cleveland iron and other kinds, in which the amount of phosphorus and sulphur is not generally less than those given by Dr. Miller, as being contained in the Stanton and Clay Lane pigs.

According to Mr. Miller's analysis of the slag produced in the conversion of the pig iron into crude steel, and adopting his estimate that this slag amounted to 23 per cent of the pig iron, as the maximum, there would have been separated from pig iron, contain 100 parts of iron, the following amount of impurities:

Silicon.	Phosphorus.	Sulphur.	Iron.
·7	·74	·12	3·15

Referring now to the analyses of the pig iron and of the crude steel, it appears that the difference between them was as follows:

	Iron.	Carbon.	Silicon.	Sulphur.	Phosphorus.	Arsenic.	Manganese.	Calcium.	Sodium.
Pig Iron....	100	3·067	3·196	·122	1·576	·044	·344		
Crude Steel.	97·026	1·3	·266	·018	·297	·039	·090	·319	·144
Separated..	2·974	2·267	·930	·104	1·278	·005	·254	....	....
In Slag......	3·15	....	·700	·120	·742	....	....	....	....

Taking the slag as amounting to 23 per cent of the pig iron, the amounts of silicon and sulphur in the slag agree tolerably with the amounts of those substances separated from the pig iron, but the amount of phosphorus is singularly enough only about one-half that which would appear to have been separated from the pig iron. This is the more remarkable, firstly, since there is little reason to suppose that in the presence of such a basic slag there could have been any volatilization of phosphoric acid, which is a remarkably fixed substance, and, secondly, since the slag, according to the data given in the report, would not appear to have amounted to much more than 16 per cent of the pig iron, instead of 23 per cent

Altogether, then, it is evident that the *rationale* of this method is involved in much obscurity, and that from a chemical point of view there is room for considerable doubt as to what is really the result obtained by its application to pig iron containing phosphorus and sulphur.

These circumstances alone certainly justify the demand for much fuller information than has yet been furnished, so that a fair opportunity may be afforded of arriving at a correct estimate of the method.—*Engineering.*

ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

UNITED STATES PATENT OFFICE, }
WASHINGTON, D. C., January 20, 1869. }

SIR:—During the year ending December 31, 1868, there have been filed in the Patent Office 3,705 caveats, and 20,445 applications for patents; 12,959 patents have been issued, 419 have been reissued, and 140 extended.

Compared with other years, the business of the office has been greater than that of any preceding period. The number of patents issued has been more than double the number of 1865, and more than three and one-half times that of 1858.

Since the Patent Office was first established its business has had a rapid growth in amount and in importance. In 1836, eight or ten persons were enough to transact all its business. Now between three or four hundred are required.

This increase has arisen in part from the growth of the country, but more from the stimulus that our patent laws have given to invention. The rewards which they have held out for successful improvements have increased in value with the progress of the country and with the more proper appreciation and greater security of patented property. A really successful invention now brings to its author a competency for life; and, as a consequence, the efforts of almost every class in the community are directed in search of useful improvements.

In all those improvements in life to which patent laws relate, our own age has witnessed more advance than all the preceding ages of the world taken together. One improvement seems to have begotten another. New fields for exploration have been constantly opening, and so far from reaching any limit to invention, we seem but on the way to other advances and improvements beyond our present comprehension

I am, however, unable to attribute the extraordinary increase of the last few years in the number of patents issued to an equal increase of real improvements; for I apprehend that much of apparent prosperity has arisen from the allowance of patents that should never have been granted.

Several causes have contributed to this:

1st. A practice has recently grown up of subdividing inventions and issuing several patents for what was formerly embraced in one. It has served to increase the receipts of the office, but at the same time it has greatly increased the expenses of the inventor, not only for office fees, but for all the other expenditures incurred in obtaining patents. Had the practice been confined to separate and distinct improvements upon different parts of a machine, no exception could be taken to it; but it has been carried to the extent of several patents for the same invention, and patents for parts, which taken alone constituted no invention. It has tended to complicate and confuse patented rights, and, in some instances, I apprehend, been a source of frauds upon the public. I am not aware of any useful purpose that it has served, and believe it should be regarded with disfavor.

2d. Ample provisions have been made from time to time to guard against the improper rejection of applications for patents. In case of a refusal, the examiner in charge must assign his reasons for it, and specifically point out and refer the party to any previous device which, in his view, anticipates the invention. These grounds the applicant may controvert and have a second examination and a second decision. If still rejected, he may appeal to the board of examiners-in-chief, and have their investigation and decision upon his case. From the examiners-in-chief he may appeal to the Commissioner in person, and from the Commissioner to one of the judges of the supreme court of the District of Columbia.

An examiner's action receives no such scrutiny when he allows a patent. If he be pressed for time, or be indifferent as to his duties, he may put an end to his labors by a simple indorsement. If he lacks capacity, there will then be no exposure of his ignorance or of the unsoundness of his views. It may have happened that in some instances the allowance of patents has served to cloak incapacity and indifference to duty.

I have endeavored to provide some means for reviewing briefly favorable decisions before patents were issued upon them, but found that the force in the office was inadequate to such work in addition to the performance of other indispensable duties. The only reliance we have to guard against the issue of improper patents is upon the ability and integrity of examiners and their assistants.

3d. The great increase of the business of the office has not been accompanied with a corresponding increase of the examining corps. Examiners, in some cases, have had thrown upon them an amount of labor they could not perform well and, from the necessity of the case, patents have been hurriedly allowed without the full investigation they should have received. Formerly thirty or forty cases per month were deemed to be as many as an examiner with an assistant could thoroughly investigate and decide. Now it is not unusual for the same examiner, with two or three assistants, to dispose of as many as two hundred cases in the same time. In one room during the past year more applications have been decided than by the whole office in 1855, or in any previous year.

The granting of improper and illegal patents defeats every object and purpose of patent laws. It serves to mislead and deceive the public, and to subject them to the annoyance of unjust and invalid claims. It throws distrust and discredit upon patented property, and injures the salable value of meritorious inventions. Did the practice of the office fully accord with the intent of the law, and its investigations command the entire confidence of the community, so that business operations and the investment of capital could with safety be founded upon them, it would do more to enhance the rewards which the laws contemplate for valuable improvements than any other measure that could be devised.

To improve the qualifications of examiners, and obtain a high order of ability in the examining corps, has been deemed by me an object of the first importance—one, indeed, upon which the success of the office greatly depended.

A committee of three gentlemen, selected for their ability and fitness for the purpose, was appointed to examine into the qualifications of such of the employés as had received their appointments without the examinations required by law. The duty has been, so far, faithfully and judiciously performed, and several changes in the office have resulted therefrom.

Great care has been exercised in supplying vacancies. The positions of examiners' clerks and assistants have been regarded as the schools of the office, in which to qualify gentlemen of ability and culture for higher places; and the qualities sought for in appointees to those positions have been such as, in due time, will make them able and well-instructed examiners.

Questions as to the patentability of inventions become more difficult with the increase in the number of previous devices. An examiner must familiarize himself with all the inventions that have been made in his class—not only in this country, but in Europe. Their great number and complexity have rendered the study of them a profession to be acquired by years of labor. An examiner's decisions involve nice questions of law, of science, and of mechanics. The more recondite principles upon which depend the practical success of processes and machinery, must be familiar to him. Large amounts of property often depend directly or indirectly upon his action. The ability and acquirements necessary to the proper discharge of his duties must be of a high order—scarcely less than those we expect in a judge of the higher courts of law.

I have been strongly impressed with the belief that the salaries now paid these gentlemen are inadequate to procure and retain the best services. They were prescribed in 1848 At that time they would obtain of all the necessaries and conveniences of life more than double of what the same money will purchase now. For all practical purposes it is the same as if those salaries had been reduced one-half. As a consequence, gentlemen who have become experienced and expert in the performance of their duties, resign their places for more lucrative employments. Within the short time that I have been connected with the office, several whose services were invaluable, have resigned, and it is apprehended that others will follow their example. I think I know the wishes of inventors well enough to say that, if the sums they now pay into the Patent Office are insufficient, they would gladly increase them to secure prompt and correct action upon their cases

The reduction in the value of the currency has also operated with hardship upon other employés of the office. So long as the funds of the office admit it without tax on the country, it is believed that their salaries should be made to approximate what they were before 1861.

The act of Congress relative to the Patent Office passed in July, 1836, provided for a machinist at a salary of $1,200 per year. For several years thereafter this was construed to mean a real mechanic to repair and keep in order the models deposited in the office. Afterwards it came to imply a clerk to take charge of the model room. For many years past there have been few or no repairs of breakages and other injuries to models, and large numbers of them are now more or less damaged; some have been totally destroyed. To put them in proper order will require the labor of two men for several years.

Injuries should be repaired at the time they are done, and the persons causing them held accountable therefor. To do such work, and keep in repair furniture, and other articles used in the office, would occupy two men continuously.

Certified copies for models are frequently ordered to be used in courts and for other purposes. To supply them the models are sent to some of the machine shops in the city. Questions involving large interests sometimes depend upon features shown in these models. They lose their force as testimony when suffered to go beyond the supervision of the office. Suspicions of changes have, in some instances, been strongly entertained.

It is believed that the interests of the office will be promoted by establishing within it a machine shop and employing competent persons to do the work I have indicated.

Notwithstanding the ample room for models in the Patent Office, the cases to hold them are now filled, and some of them crowded. More provision for them will have to be immediately made. By narrowing a little the present cases, an additional one may be placed between them and still leave sufficient space for passages. Another shelf may be added and some of the cases lengthened. By these means their present capacity may be more than doubled, and that will meet the wants of the office for many years to come. The time will eventually arrive when the models of those machines that have proved useless will have to be selected out and discarded.

It is recommended to employ a few men in the office to alter these cases and make new ones as fast as the wants of the office shall require and its funds permit.

The subject of copying the drawings of patented devices is one of much importance to the office. There are now about 85,000 of them, and they increase at the rate of about 14,000 per year. There are also about 30,000 belonging to rejected applications. They are kept in drawers in what is called the draftsman's room. There the examiners and their assistants resort to make their investigations. By long experience in examining drawings, they acquire the habit of readily detecting in them any device that may anticipate an invention. Those that are deemed pertinent to the subject of inquiry are taken to the examiner's rooms and submitted to the inspection of parties interested. On appeals they are used in the room of the examiners-in-chief, in the Commissioner's room, and by the judges of the supreme court of the District. For the purpose of being copied for the annual report, and for other purposes, they are also taken from the draftsman's room. Sometimes 2,000 or 3,000 are absent from their places, and this has led to errors much to be regretted on the part of examiners.

Were all the drawings which each examiner has to consult bound in volumes, and placed in his room, convenient for him to study and refer to without leaving his desk, it is estimated that he could dispatch twice as much business as he now does, and with greater accuracy and freedom from mistakes.

The great number of examiners and their assistants who have to resort to the draftsman's room for investigations, and the liability of drawings getting misplaced by accident or by design, have rendered it imperatively necessary to the proper despatch of business to exclude the public from that room. Patent agents and attorneys are thus deprived of their most ready means of investigating the novelty of inventions, and properly preparing specifications for patents. A convenient room for them, provided with copies of drawings, specifications and other works of reference, would be a great convenience to the public, and promote the interests of the office.

Some of the drawings by long use have been much worn, and parts of them obliterated. Unless copied in time they will be lost.

Twenty copies of each specification are now printed. Were there copies of drawings to accompany them, they could be furnished to public libraries, where investigations could be made without the necessity of resorting to Washington.

The Patent Office makes exchanges of its publications with several foreign governments. From Great Britain we receive full copies of their specifications and drawings. In our library we can investigate an English invention as well as can be done in the Patent Office of Great Britain. The volumes are handsomely bound and now fill a large room in the library For them we make but the poor return of a copy of our annual report.

The copies of drawings ordered and paid for by the public now number about 700 per month, and the expense to the office of making them is about $1,400 per month. A reduction of price would probably much increase the number.

Several plans have been proposed for making these copies. Were there as many as fifty of each drawing wanted, the new art of photo-lithography would afford by far the best and cheapest means. It makes a fac-simile of line-drawings, of any size desired, and when once the stone is prepared copies may be taken with little expense. Specimens have been furnished the office which show the wonderful perfection to which this important art has attained. The only difficulty in the way lies in the great number of drawings to be copied. Without reference to those on hand, the current issues will amount to nearly fifty a day. At the low rate of ten cents apiece, without any charge for specifications, fifteen or twenty thousand per year would cost more than many libraries could well expend for them; and the fifty or sixty large volumes annually which they would make would soon require more room than many libraries would have to spare.

For a few copies, enough for the use of the Patent Office, ordinary photography, or some of the late processes, would afford a cheaper means of supplying them.

A photographic establishment in the Patent Office, adapted to copying drawings of large size, would supply the orders for them much more cheaply and accurately than by the method of tracing heretofore pursued.

The receipts of the Patent Office from July last to the 1st of January have exceeded its expenditures by about $53,000. It is confidently expected that for the year to come the excess will not be less than $100,000. By strict economy and system in the management of the office, it is believed that salaries may be raised, necessary changes and improvements made, and every needful expenditure to raise the office up to its highest state of efficiency and usefulness incurred, without any charge or tax upon the public.

The large and growing business of the Patent Office has thrown more labor on the Commissioner than any one person can perform. As some relief, it is recommended that appeals from the board of examiners-in-chief be made directly to the chief justice of the supreme court of the District of Columbia.

The Act of Congress relating to the Patent Office, passed March 2, 1861, I have regarded as abolishing all fees on appeals from the Commissioner; and, since examining the subject, I have not felt myself authorized to receive or to pay over to the judges of the supreme court of the District the moneys they have been accustomed to receive for the hearing of such appeals. A different view of the act has been taken by one at least of the judges. It is important that the question should be settled; and it is respectfully submitted that it will be more in accordance with the general practice of the country, and better suited to the dignity of the court, to increase the salary of the judge performing the duties than to make his compensation dependent upon the business that comes before him.

The business of the Patent Office has outgrown the several acts creating it. It is difficult to find authority for the employment of several of its important and indispensable officers. The gentleman who superintends the preparation of abstracts and drawings for the annual report was appointed as an examiner. The Commissioner's assistant has the grade and compensation of a first assistant examiner. The gentleman who purchases the supplies of the office, and upon whom its expenditures greatly depend, is but a temporary clerk. More than one-half of the employés of the office are temporary clerks—an office intended by statute for copyist merely. A revision of the several acts, with proper amendments, would conduce much to the interests of the office and the convenience of the public.

I have deemed it advisable to make several changes in the practice of the office with a view of simplifying its proceedings and producing more accuracy and promptness in its business. As was to be expected, some inconvenience was at first felt; but experience has justified the changes, and with few exceptions they are now universally approved and commended. System and accountability have been introduced in reference to the expenditures of the office. The mode of receiving and accounting for moneys paid into the office has been entirely changed, and such checks provided as will, it is hoped, prevent mistakes and errors. In reference to applications for patents, the principle adopted is to aid and assist the applicant in obtaining what properly belongs to him rather than to obstruct or delay him. The objects of our patent laws will, it is believed, be best attained by securing to each inventor, with as little expense and trouble as possible, the full benefits of his invention so far as he may be entitled to them.

Respectfully submitted: Elisha Foote,
Commissioner.

Hon. Benjamin F. Wade.
President pro tem. U S. Senate.

BOILER EXPLOSION AT ELIZABETHPORT, N. J.

Our valued correspondent, Mr. F. W. Bacon, has made an examination of the circumstances attending the late disastrous boiler explosion at Elizabethport, N. J., and we condense from his report the following facts:

The boiler is 20 feet long, three feet diameter, with two 12-in. flues—heads $\frac{1}{4}$, full, flat; above the flues the heads were stayed by two stays to the shell; below the flues, as is usual, no stays. The iron laminated, and of good quality, or, at least, as good as is usually put into boilers, with the exception that it was not well welded in the laminæ.

The front head under the flues parted in the angle of the flange turned to rivet to the shell of the boiler, giving an outlet of some 100 square inches. This, of course, afforded an aperture of escape for the pressure inside the boiler; the consequence was, that the boiler was forced in a contrary direction from the escaping steam with a force due to its velocity, which was maintained by the escaping steam on the rocket principle. The rupture took place at the point where the flange was turned on the lower side, hinging on the plate at its junction with the flues.

The escaping steam and water (if there was water) on the lower side of the head would react on the boiler, sending it in an opposite direction and upward, in proportion as the escaping of steam was below the horizontal axis of the boiler. This, of course, gave the rear end of the boiler an elevation in its flight, which was 200 feet, an entire block. It struck a wooden building at the junction of the first and second story, some six or eight feet above the level of its original position. In striking the building, which was a frail affair, the back end of the boiler struck the end of one of the main timbers of the floor, which was spruce, 6 by 4 inches, directly on the end. The point where the boiler impinged on the timber was on the angle of the head, about midway of its perpendicular diameter on the right hand side. On this pivot it swung around to the left, carrying away the side of the house, a partition, and flight of stairs, and fell on the floor, with the ends reversed.

This was, undoubtedly, a giving away of the iron from an over pressure beyond its strength to sustain it under the circumstances. And the circumstances, I think, are a key to the whole mystery, if mystery there be.

The iron where it was ruptured at the front end was, judging from the color, nearly red hot, even at the bottom, showing conclusively that at the time of the rupture there could have been no water in contact with it. At the other end of the boiler, where it struck the timber, it was ruptured, and crippled in a manner to show conclusively that it could not have been done, with the temperature due to any pressure safe to put on the boiler. Then, as the boiler fell, a large hole was made through the shell, and through one of the flues. These ruptures also show, by the color, that the iron was hot.

From the appearance of the boiler and its extraordinary flight, I arrive at the following conclusion: That when the fire was made under the boiler there was but little water in it, sufficient however to make steam of a tension to be nearly all the boiler could stand.

Now, then, we will suppose a pressure on the boiler almost equal to its bursting point; to produce this the water is exhausted, the plates are bare, become heated, and consequently weakened to a degree insufficient to sustain the pressure, and gave way in the weakest point. This being at the lower side of the front end, gave it the direction horizontal and upward. There were no indications of water having been ejected from the aperture, either on its start or during its flight.

It is said that a man was sitting over the front end of the boiler, which went out from under him and left him standing on the grate underneath covered with glowing coals! There is a record of a similar case which occurred in 1861.

The engine is of the common horizontal type; I should say, without measurement, 7 inches in diameter by 12-inch stroke, speed not known. It is capable, if in order and properly speeded, of working 8-horse power. The boiler was, if properly set, capable of working, economically, 15-horse power easily; but from the size of the furnace—12 square feet of grate surface—it could have given off 24-horse power. Now, with this immense preponderance of boiler to the engine, without a steam gage, with a safety valve that none knew any thing about—these elements in charge of no one that was an engineer, alternately in charge of the proprietor, his wife, and his son, it was most fortunate that there was a clear open space through the block from the point where the boiler started on its flight, until it crossed the street and met the building above described.

Three lives are already sacrificed, another is trembling in the balance between life and death; if he lives he will be a cripple; another, whose feet rested on the bed of fire after the boiler left him, must, of necessity, be crippled. And all of this because the owner wished to confirm the idea "Every man his own engineer."

MANUFACTURES IN HOLYOKE, MASS.

In our last issue (No. 5, present volume), we copied from the Hartford *Times*—usually a very reliable authority—some facts relative to the capacity of the Connecticut River at Holyoke, and statements in regard to the manufactures already established. We were led into some errors which have been kindly rectified by C. H. Lyman, editor of the Holyoke *Transcript*. Mr. Lyman gives the following as the leading manufacturing enterprises of that thriving village: Population, over 10,000; paper mills, Holyoke Paper Co., Parsons Co., Whiting, Franklin, Riverside, Mount Tom, Beemis, Hampden, Valley, and Hot Manilla; ten. Thread, Cotton, and Woolen Mills—Hadley Thread Co., including the Holyoke Thread Co.; Merrick Thread Co.; Lyman Mills (2 mills, cotton); Hampden Co. (2 mills, gingham and woolen); Beebe's Mill (woolen); Germania (woolen); New York (woolen); and Holyoke Warp Mill. Among other manufactures are the Holyoke Water Power Co.; Holyoke Machine Co.; Norton & Co., Machinists; Wire Mill; Belt Manufactory; Loom Harness; Steam, Saw, and Grist Mills; Job Printing, etc., and a well conducted weekly paper, if a newspaper can be called a manufacture. The village is evidently growing out of leading strings, and with its natural and artificial advantages it cannot be long before it will be enabled to aspire to the dignity of municipal honors.

COTTAGES FOR LABORING CLASSES.

We herewith reproduce from *Sloan's Architectural Review and Builders' Journal*, published by Claxton, Remsen & Haffelfinger, 819 and 821 Market St. Phila., elevations, plans, and descriptions of designs of cottages for workingmen.

It is the first duty of society, for its own sake, to entertain every practical proposition for the amelioration of that great section of the community whose necessity it is to live in large cities. It will be found always, that the want of an orderly and comfortable house is among the chief evils of the poor.

On the outskirts of our cities are always to be found cheap lands suitable for cottages, such as we would desire to see our suburbs embellished with. Those lands might be secured, in the whole tract, by coöperative joint-stock companies, of which we are glad to see there are many now in active existence in New York, and we hope to see them in every one of our large cities. Such blocks of land could be conveniently and elegantly laid out in lots having, uniformly, gardens in front all of one depth. This plan has been carried out in many of the avenues in Detroit, and adds breadth and beauty to their appearance.

Efficient drainage, dryness, and general healthiness should be the chief objects in the selection of a site for the erection of a cottage; and where a number are to be built, on an entirely new site, they should be so placed as not to interfere with, or injure the effect of the surrounding scenery.

The cottage should be so placed that the sun may shine on the most frequented sides of the house, or, if possible, let all the windows have a certain proportion of sunshine through the day. The design and its features should be so arranged as to have that effect. And every cottage should have a garden attached to it, of not less than about one-sixth of an acre, to be cultivated by the cottager. It should be neatly fenced, on the front especially, so as to add as much as possible to the landscape effect; and if a hedge-row be introduced, so much the better.

The division of lots should be marked by an evergreen hedge; and, until such hedges can be grown, a neat wire fence might be used to advantage.

The first thing to be done, in laying out the foundations, is to see to the *drainage;* and this is a point of the utmost importance, as upon it mainly depend the health and comfort of its inmates. And not only is it requisite that the drainage be perfect, but it must be as little liable as possible to get out of order; and when disturbed for the purpose of cleaning, should be capable of reinstatement with the materials at first used.

Although a complete system of drainage would seem to have but little to do with cottage building, the general use of a tank for the common cesspool is most desirable—and the more especially, as in cases where a number of cottages are erected, one tank might serve the purpose of the whole.

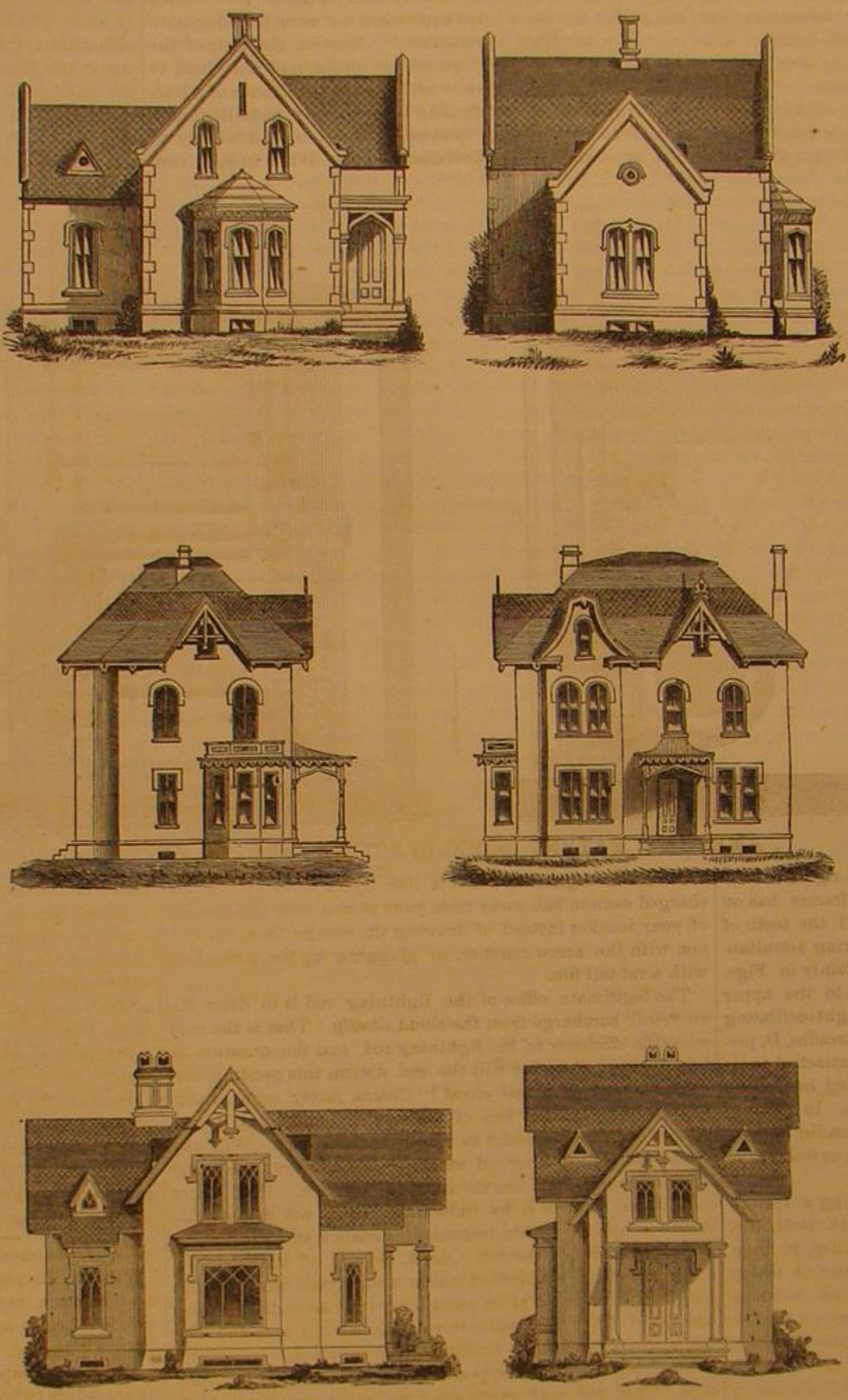
The most essential points to be attended to, in the drainage of buildings generally, are the following: All *main sewers* should be formed with concave bottoms, to allow the water, however small in quantity, passing along with solid matter, to act with the utmost possible effect; and they should be evenly built. They should have arched tops, although flags, well laid, make a good cover. Sewers should have a *fall* of not less than one inch in every ten feet in length, and more than this, in all cases, where the flow of water is variable. They should have a constant flow of water through them, or powerful flushes at stated intervals; and particular care taken to ventilate them.

To prevent the foul air generated in, or returning by the drains, the waste-ways should be double-trapped, by a bell-trap at the sink, where the waste water enters; and by a well-trap short of the inlet to the drain.

All drains should be so constructed, as to admit of being opened for the purpose of cleansing, without breaking them, and of the displaced portion being afterwards replaced.

Each cottage should be provided with the means of collecting and filtering the rain water from the roof; and thus be independent of any other supply, the more especially, as rain water is the purest of all water.

The walls of cottages may be formed of a great variety of materials, and the nature of the material used is a fertile source of variety and beauty.



ELEVATIONS OF COTTAGES FOR MECHANICS.

Wood is the most susceptible of architectural ornamentation at the least expense. Some persons object to it, as requiring frequent painting, being combustible and perishable.

Stone or brick foundations are always to be recommended, even where cellars are not to be used; and by keeping the wooden frame well up from the ground, the objection as to perishability may be greatly lessened.

The walls are either *clap-boarded or vertical-boarded.* A very tasty effect may be produced by clap-boarding, say two feet six inches high, and shingling the remainder, up to the eaves; the shingles to have the corners cut off, to any desired shape; or slate can be very advantageously substituted, and so arranged, as to produce a very pleasing effect, and at about the same cost.

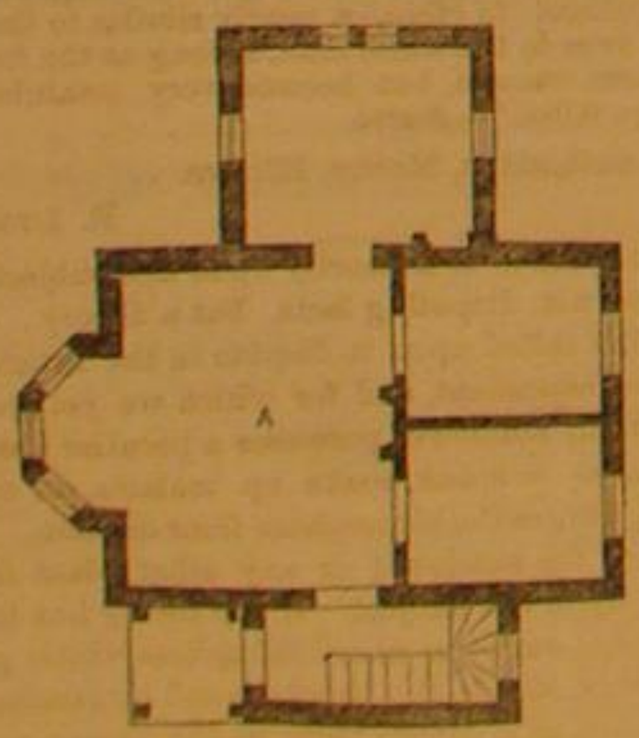
The accompanying designs may be constructed in either stone or brick. The walls, if of stone, should be fourteen inches thick; and, if of brick, eight inches.

The plan is arranged thus: The living-room, marked A has two bedrooms at its rear, kitchen on the left, and hall entrance on the right. The second, or half story, gives bedrooms over each of these.

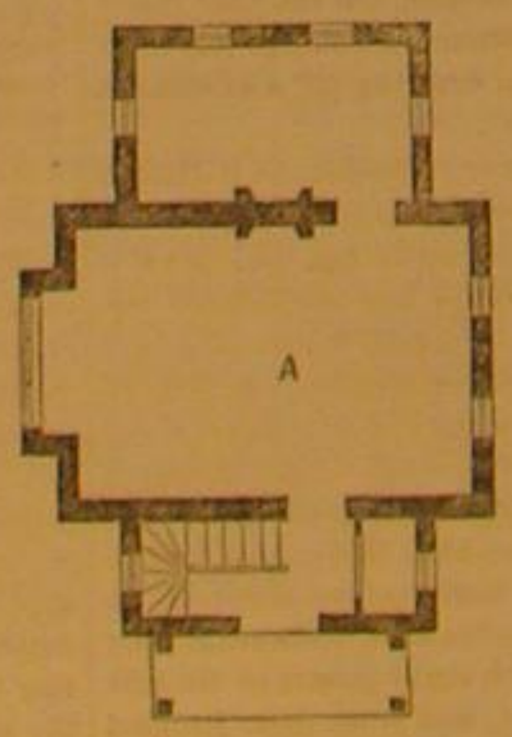
The other plan makes the living-room, A, the whole size omitting the two bedrooms. The house is smaller than the preceding one.

The illustrations following those are of a superior class of dwelling, suitable for a merchant, shopkeeper, artisan, or clerk. A is the parlor, with its bay-window, J; B, the dining-room; C, the kitchen with its shelved pantry, H; D, the hall; E, the vestibule; F, staircase; G, chamber; I, porch.

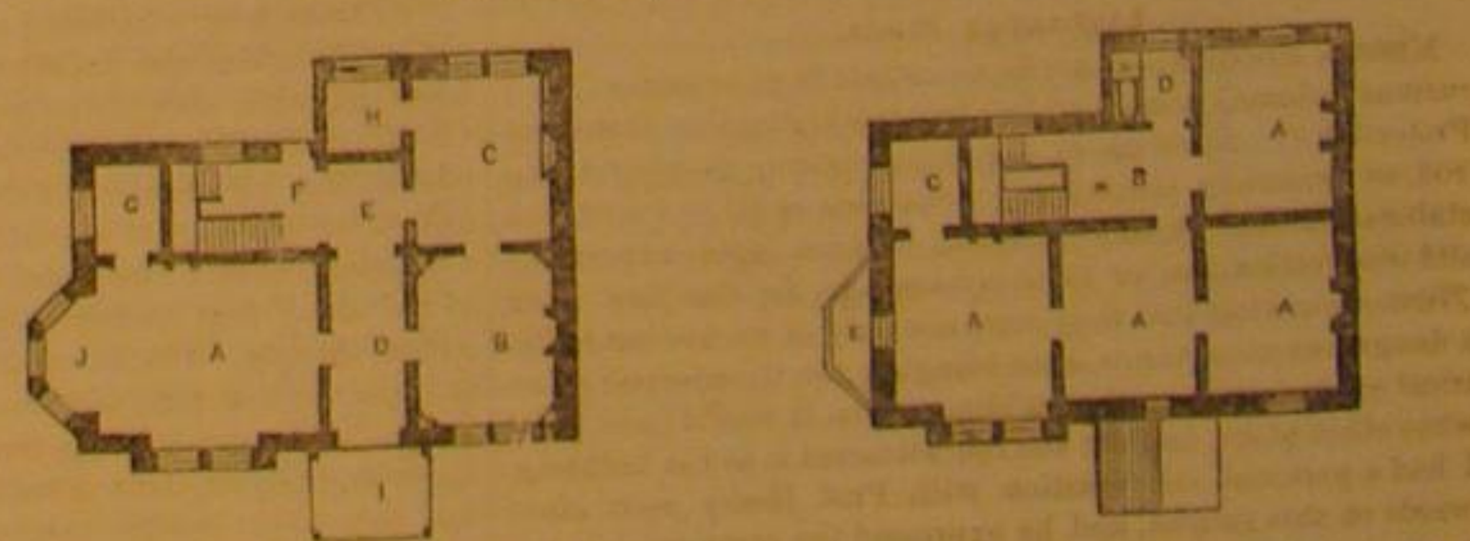
The second story: A A A A, bedrooms; B, hall; C, dressing-room; D, bath-room and water-closet; E, roof of bay-window.



GROUND PLAN OF UPPER COTTAGE.



PLAN OF MIDDLE COTTAGE.



PLANS OF LOWER COTTAGE.

Social Clubs for Mechanics.

A writer in the *Atlantic Monthly* gives a description of one of the workingmen's clubs which have in the last few years been established in many of the large towns of England. These clubs are not political, but simply of a social character. In fact, they are places where the workingman may pass an evening in a comfortable, well-lighted, well-warmed room, smoke his pipe, obtain certain refreshments, read the daily journals and periodicals, avail himself of a small library of amusing and useful books, amuse himself with all sorts of innocent games, and have free intercourse with his friends and acquaintances, without subjecting himself to the evil influences inseparable from the public-house. On Saturday the clubs hold what is termed a free-and-easy; that is to say, all reading and games are put aside, everyone draws around the fire with his pipe, and each one in his turn has to sing a song, tell a story, or otherwise contribute to the general amusement. Once a month the club gives an entertainment to the wives and daughters of its members, either in the shape of popular lectures, readings from "Pickwick," and other amusing works, dissolving views, conjurers, or music; and once a year the members of the club have a grand supper.

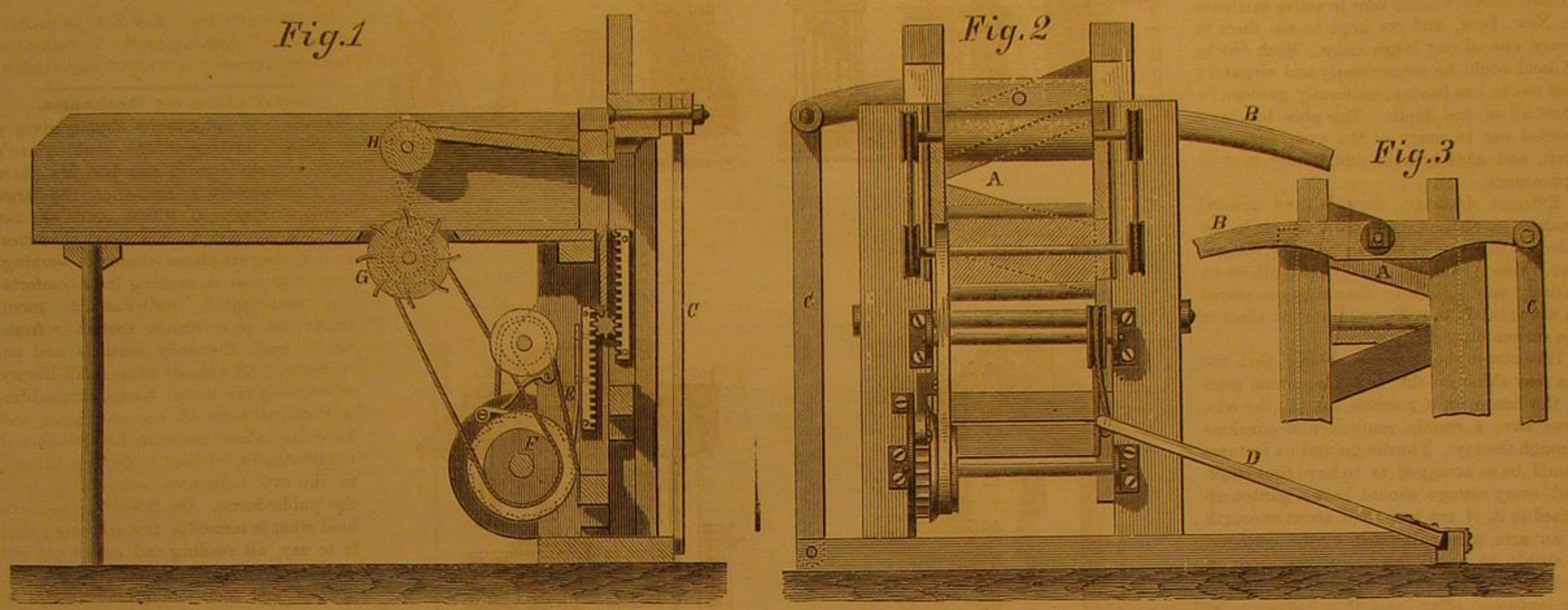
The writer asserts that these clubs have been productive of great good, and in no case have failed of success. The *Sun* says: "We take an especial interest in anything that contributes to the well-being and happiness of workingmen, and should certainly like to see the experiment of a club of a similar description tried in this city. Some people will no doubt say that such an institution is apt to drawn men away from their homes. To these we would reply, that there are occasions when it is just as well that a workingman should be away from home, and that it is more conducive to his happiness and respectability that he should pass his evenings in some such places as these, where he can have innocent amusement or improving occupation, rather than that he should spend his time in some smoky liquor shop. Moreover, there is a large portion of our working population which consists of young unmarried men. To these such a place of resort would be exceedingly beneficial. At all events, the experiment might be tried. We have every reason to suppose that our workingmen are as capable of appreciating the benefits of such an institution as their compeers across the water; and if the experiment should fail of success, its promoters would, nevertheless have the satisfaction of feeling that they had failed in a good cause. An expenditure of $2,000 would start such a club as this on a firm basis, and the monthly payments of the members would be ample to keep it going."

PROF. LIEBIG states that 1,460 quarts of the best Bavarian beer contain exactly the nourishment of a two and a half pound loaf of bread. This beer is similar to the famous English Allsop's, and our more popular American beer.

Improvement in Straw Cutting Machines.

The accompanying engravings represent in section the parts of a new style of machine designed for cutting straw and hay for the feeding of stock. Instead of rotary knives the edges of which meet each other and thus sever the straw, or one rotating cutter bearing on a yielding roller, or even a reciprocating knife passing by a fixed knife, this machine has two reciprocating cutters, each moving in opposite directions simultaneously, and so set as to cut like shears and with a drawing motion. The feeding of the material is also automatic, thus obviating the danger of severed or lacerated fingers. The machine is quite simple in construction, and, as seen from the foregoing statement, easy and exact in operation.

Fig. 1 is a vertical longitudinal section; Fig. 2, a transverse vertical section; and Fig. 3, a view of the knife and hand lever. The two front uprights are double grooved to receive the frames that carry the knives. These are fixed rigidly, at opposite angles, in their frames. Each of these frames has on its inner surface a toothed rack, as seen in Fig. 1, the teeth of which mesh with those of a pinion, thus insuring simultaneous reciprocating motion to the knives, seen plainly in Figs. 2 and 3 at A. The hand lever, B, is pivoted to the upper knife, its end connecting with the top of an upright oscillating bar, C, pivoted to the base of the frame. A treadle, D, pivoted at the end of the base has a cord, or band, attached to its free end that passes over a truck or pulley, and having its other end secured to the lower or rising frame. In cutting, the operator uses the hand lever and also this treadle, thereby giving great impetus, or force, to the ascending, as well as the descending knife.



AMBRUN'S PATENT DOUBLE-ACTING STRAW CUTTER.

The ascending knife has attached to its framing a spring, E, Fig. 1, that on its descent engages with the teeth of a ratchet, having fixed on the same shaft a pulley, F, from which a band, or belt, connects with the feed roller, G, which is either toothed or corrugated. From this feed roller, or from a pulley on its shaft, an elastic band passes to a similar pulley on a roller, H, suspended on the end of a pivoted lever.

This roller is intended to compress the straw to be cut on the surface of the feed roller. This is operated automatically by the spring strap, E, the ratchet, F, and its pawl. These appliances constitute the feed of the machine.

Invented by Julius Ambrun, Leavenworth City, Kansas, and patented through the Scientific American Patent Agency, Nov. 3, 1868. To the inventor all communications for further information should be addressed, as above.

Correspondence.

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

Lightning Rods.

Messrs. Editors:—I notice an article in your paper (No. 3 current volume,) headed, "Are Pointed Lightning Rods any Protection?" Allow me to ask the question. Is a lightning rod, as commonly erected, any protection at all? I wrote an elaborate article on this question, founded upon experience and observation, ten or twelve years ago, for the New York *Tribune*, showing that they were not only of no use but really a dangerous contrivance, often bringing the thunderbolt (electrical explosion) upon the building, when it would have gone some other place, had not the rod attracted it to the building. I had a personal conversation with Prof. Henry soon afterwards on this subject, and he expressed the same opinion you quote, to wit: "The office of a lightning rod is to protect a building from a discharge from the heavens. As a general thing its effect upon a distant cloud must be too small to silently discharge its redundant electricity, though in some rare instances it is possible that it may so reduce the intensity of the cloud as to prevent a discharge, when, without such reduction, a discharge would take place."

That was the ground I had taken in my article, and upon that showed that the lightning rod did not fulfill its intended duty when it received electrical explosions, but in such cases frequently caused the shattering of buildings and setting barns on fire. In a five years' record I kept of lightning strokes in Lancaster county, over two-thirds of the cases had lightning rods mounted, and six barns out of ten were burned to the ground with lightning rods mounted; that is, ten barns burned up, six of which were provided with rods and four had none. About that time a large number of buildings in New York and Boston suffered from electrical explosions, although surmounted by rods, and it was these stubborn facts that induced me to give to a widely published paper the science and facts in the case. The only counter article on the subject that I learned of was from Mr. Quimby, who simply stated that the cases I made reference to "were not surmounted with rods of his construction!" Now for the facts of the science. The discharge generally comes from the cloud to the earth. When it passes within tractive distance of a tractor, which may be a lightning rod or other metallic prominence, or any projecting pointed wood or stone, it will fly to that, at an angle to its previous course. When in such case it strikes the lightning rod it is like trying to knock the discharged cannon ball away from your person with the bayonet of your musket instead of drawing the charge from the cannon with the screw-rammer, or plugging up the prime-hole with a rat-tail file.

The legitimate office of the lightning rod is to draw the electrical surcharge from the cloud *silently*. That is the only scientific efficiency of the lightning rod, and the question is, how far from its point will the rod disarm this pending surcharge of the electrical cloud? Clouds rarely come within fifty or one hundred feet of the tops of houses and barns, oftener over one thousand to fifteen hundred feet. Will any electrician or lightning-rod maker claim for his rod the power of disarming a cloud one thousand feet above it. Prof. Henry said it *may* disarm it by induction. I will not dispute this theory as applied within reasonable distance, say within fifty feet of the point of the rod. Mr. A. George, of Philadelphia, a philosophical instrument maker, and myself saw a lightning rod illuminated at its point for several seconds at a time, one night when a thunder storm was passing over the city, but it was a remarkable condition of the atmosphere—hot and sultry, and the clouds appeared to be brushing the chimney tops. That rod was performing its legitimate office. Prof. Henry mentioned to me a similar instance he witnessed on the rod of the Smithsonian Institution, nevertheless that building has been twice struck by electrical explosions, and the rods on it are put up in the most approved scientific order. With the point of a penknife, or a cambric needle, you can draw the charge from the prime conductor of an electrical machine silently at a distance of ten or fifteen inches, but not that many feet, hence there is a very limited distance allotted to the withdrawing power of a lightning rod in drawing off a surcharge of electricity silently.

Tall trees near a building are better protectors to it than a rod surmounting the building. The top points of the tree, when elevated above the top of the building, will draw a "bolt" to the tree, though that bolt is moving toward the roof of the building. I examined one case where the bolt dashed into the top of a buttonwood tree standing in front of a one-story house: the house had a shingle roof, with a sheet of tin about four feet from the eaves, stuck in to replace a rotten shingle. The electricity run down a main branch of the tree to its crotch, and tore off the bark there, and thence jumped over about fifteen feet and right on the sheet of tin above-mentioned, made a hole in the tin as if a chestnut burr had been fired through, turning down eight points of tin into spiral coils or burrs around the hole, and from there jumped four or five feet down to the tin water conductor, perforating that a dozen or more places about the size of No. 6 shot—running right and left on the water conductor, and at the closed end jumped to the cornice of the house, tearing off splinters and expending itself on the corner bricks; while at the other end it ran down the spout, jumping from its end eighteen inches on to an iron water pan, displacing that and burrowing into the earth under the pan to a depth of a foot. There was no lightning rod on, nor within two hundred feet of the building. I examined a number of cases where tall trees drew the explosions away from the tops of buildings, as the directions of the bolts and the impact upon the trees plainly indicated.

After a five years' investigation of the subject, I took the lightning rods down from two houses I owned, looking upon them as decoy ducks to the errant thunderbolts that might chance to happen in that direction.

A lightning rod, or protector from lightning, either from a pending surcharged cloud, or a bolt, to be efficient, should be elevated on a mast or pole as high as possible—better 150 feet high than 75 feet—and it ought to stand a little distance from the building or buildings, surmounted with a metallic ball and finely-pointed gold or platinum point; it will then silently draw off the surcharge from a proximate cloud, and will also draw a stray bolt to the ball and rod, that may be moving in the direction of the building. By bolt or thunderbolt the intelligent reader will understand me to mean electrical explosions, in distinction from surcharges or surcharged cloud. A bolt is exploded electricity; that is to say, the cannon ball shot out of Jupiter's gun: surcharges or surcharged cloud is the cannon ball lying quietly within the cavity of Jupiter's cannon, but ready to go off at any moment that the match of electrical traction comes within its reach.

As regards the interruption of conduction by paints or other substances on the surface of a rod, I would say that I have often discharged an electrical battery with a pair of fire-tongs in my bare hand, and never felt the least effect upon my hand. A rough piece of iron would, no doubt, let some pass off laterally—the fire-tongs being smooth conducted it all.

Such are the stubborn facts, and science of the facts of electrical forces, as exhibited in thunderbolts and lightning rods, and if I have stated any controvertible points, they thould be pointed out for the benefit of mankind by some one better acquainted with the subject than your correspondent.

Lancaster, Pa. John Wise.

Influence of Sunflowers upon Miasms.

Messrs. Editors:—Concerning the influence of sunflowers upon miasms, treated in the leading article of your issue of Jan. 9, I beg to call your attention to page 154 of "Man and Nature," by Hon. George P. Marsh.

Mr. Marsh, supported by Lieut. Maury and certain Italian philosophers (whose writings have probably been read by the Belgian farmer of whom you make mention), asserts that sunflowers as well as forests are a protection against malaria.

As to swamp vegetation you take issue as follows:

"But it is specially noted that in low, swampy lands, covered with dense rank vegetation, they [miasms] are more numerous than in localities of opposite character."—*Scientific American*.

"It is at all events well known that the great swamps of Virginia and the Carolinas, in climates nearly similar to that of Italy, are healthy even to the white man, so long as the forests in and around them remain, but become very insalubrious when the woods are felled."—*Marsh*.

These are high authorities, Messrs. Editors.

Butler, Pa. E. Lyon.

[With all due deference to authority upon this subject, we submit that we are not disputing facts, but a theory. The theory which we felt called upon to dispute in the article referred to by our correspondent, and for which we yet see no foundation, is, that the sunflower possesses a peculiar absorptive power, which, so to speak, soaks up malaria, or, more properly speaking, purges the atmosphere from miasms. We cannot admit this of the sunflower or any other plant from any light yet shed upon the subject. If the theory has foundation, the microscope ought to detect the germs which give rise to malarial fevers, etc., in the structure and circulation of the plants themselves, as it detects them in the human circulation. Nay, it should not only show their presence but should show that they accumulate there and do not again pass out to breed pestilence.

We are well aware that the presence of forests may act either to retard the production of malaria or to check its progress. One of the conditions required for its development is heat, which is greatly tempered by the shade of large forests over moist vegetation, the rapid decay of which is thus retarded. It is well known, also, that many malarial poisons do not rise but a few feet above the surface of the earth. This fact is so well recognized that it is a common practice with Europeans in India to avoid sleeping upon the ground floors of houses. Sleeping upon top floors to avoid malarial influences is also practiced in other places, and the practice is based upon sound principles. It is easy to see, then, how the interposition of a dense forest between any locality and the source of malaria, would interfere with its progress. Currents of air would be almost as effectually checked by such a forest as they would be by a stone wall of equal hight. The progress of the poisonous stratum of air through such a barrier would be at least extremely slow. We see nothing in these facts to modify our opinions as expressed in the article referred to; but if any of our correspondents have facts at command bearing upon the subject, we shall be happy to hear from them.—EDS.

The Zodiacal Light.

MESSRS. EDITORS:—On page 21, current volume of the SCIENTIFIC AMERICAN, it is asserted by a correspondent (Mr. J. Hepburn) that the zodiacal light is only on one side of the sun, and that the popular astronomical belief, that it constitutes a belt around the sun, is erroneous. He thinks to prove this by the fact that it is only seen at sundown at certain seasons, and at sunrise at other seasons; and further says that "if it could be seen evening and morning of the same day, then our astronomical friends would have somewhat to base their opinion upon."

In scientific, as well as in law matters, it is dangerous to draw conclusions from insufficient evidence. Mr. H. draws his conclusions from the very incomplete information obtained from our common astronomical school books; therefore allow me, for his information and that of your many readers, to state, that between the tropics, principally in the highlands of South America, it is seen not only morning and evening of the same day, but it is there a perpetual phenomenon the whole year round. Almost every night it illuminates the western, and almost every morning the eastern, sky, after sunset and before sunrise. Alexander von Humboldt gives in his "Cosmos" (German edition, vol. i., pp. 142-9, and vol. iii., pp. 587-91) a glowing description of the beauty of this zodiacal light during the tropical evenings and mornings in those regions, where he for several years observed it. He states that often it by far surpasses in splendor the milky-way. That in our northern so-called temperate zone it is only seen in March after sunset and in September before sunrise, is simply because the position of the zodiac is more perpendicular to the horizon in the west during our spring evenings, and in the east during our fall mornings—as at both these periods the sign of the summer solstice stands south of us, and therefore only about 17 degrees from our zenith. In March at sunrise, and in September at sunset, we have the sign of the winter solstice south of us, and as this is about 47 degrees lower than that of the summer solstice, it is 64 degrees from our zenith, and only 26 degrees from the horizon—a considerable difference in the position of the zodaic and the light belonging to it, which, for the reason of not being strong enough to penetrate our damp atmosphere so obliquely, only shows itself when the circumstances are most favorable; that is, when its direction is most toward the zenith. For the same reason the zodiacal light is in the southern hemisphere better visible before sunrise in March, and after sunset in September—just the opposite of the case here, simply because when the zodiac stands low for us it is high for them, and *vice versa*. All these facts are utterly incompatible with the hypothesis of a sun's tail.

The first descriptions of this phenomenon were published about 1650, and Cassini gave, in 1683, the first explanation that it consisted of a ring of luminous nebular matter, very flattened, and lying between the orbits of Venus and Mars. La Place, Shubert, Poisson, Olmsted, Olbers, Herschel, Arago, and Biot—all have observed this interesting phenomenon for years, as well as Humboldt, and after careful study, assisted by the apparatus of the best astronomical observatories, they all agree with Cassini. So it is seen that "our astronomical friends have somewhat to base their opinion upon."

P. H. VANDER WEYDE, M. D.

New York city.

The Polar Sea.

MESSRS. EDITORS:—Is there an open Polar Sea? Perhaps the best answer to this question is, to show cause why such sea should exist. Let us see what would take place if this earth were totally covered with water. The sun sending his rays directly upon the equator, would heat a belt of water to 70° or 80°, and render it lighter, bulk for bulk, than cold water, and raise it above the common level. This would naturally cause the water to flow from all points of the equator toward the pole. In its passage toward the pole it would part with its heat—equalizing temperature, and flow on the surface of the ocean till its temperature would be reduced to about 40°, when, by its greater specific gravity, it would sink below the colder water and ice in the direction of the pole, and be, in a measure, protected from the cold in its passage to the pole. These warm waters approaching the pole from all points would meet, and be thrown to the surface near the pole, causing an open sea for some distance around. The waters now forced to the surface would return toward the equator on the surface, and give out their remaining warmth till they would reach the icy belt, to which they would impart a slight motion toward the equator. To keep up the current from the equator continually, there would be, of course, a counter current of cold water to take the place of, and supply the source of the warm current. This is the condition of our globe, excepting that not all of it is covered with water. This law holds good also in our atmosphere, and is the great equalizer of temperature over the globe.

Will not this theory also explain the causes of the gulf streams and the trade winds? The trade winds are always toward the equator, the same as the colder currents of water. There would be no gulf streams were there not large pent-up kettles of water near the equator, with contracted outlets through which the expanded waters are forced, with greatly accelerated speed; which is the only difference between a gulf stream and the general current setting toward the pole. The Caribbean Sea and the Gulf of Mexico are the caldrons supplying the Gulf Stream of the Atlantic, and the China Sea, that of the Pacific Ocean. All the phenomena apparently militating against this theory are the result merely of local causes, and, I think, we have reason to believe that there is an open Polar Sea.

D. S.

Philadelphia, Pa.

The Hydrogen Gas Theory.

MESSRS. EDITORS:—I note a communication from Prof. Wise, the renowned and daring æronaut, in No. 2, present volume of SCIENTIFIC AMERICAN, on steam boiler explosions. In a little work published by Daniel Burns, of Bay City, Mich., he says:

I shall show that those dreadful explosions occur from the passage of hydrogen gas through the boiler plate, when heated to an improper degree, and when that gas comes in contact with the fire it will explode the iron, for the iron becomes highly charged with gas. Not only is the gas contained in the iron exploded, but also that in the boiler. This class of explosions occur from low water, high steam, boilers being improperly set, and the rolling or careening of a boat. The other class occur from the latent heat set free from the steam in the boiler. As the position taken is entirely new, I will ask you to suspend your judgment until you have examined my conclusions, and then judge for yourselves.

A careful examination of the Burns theory, which may be had by addressing him as above, will furnish a satisfactory answer to all inquiries as to the cause and the prevention of steam boiler explosions.

W. H. L.

Flint, Mich.

[With all due deference to the opinion of our correspondent we do *not* think the Burns theory satisfactory, if the above extract is a specimen. It seems to us that hydrogen gas alone—allowing it to be generated in steam boilers and to permeate the iron, which we much doubt—is not explosive. We have never succeeded in exploding a closed pipe containing it, and we have made several attempts. It is generally supposed that the presence of oxygen is necessary to produce even inflammability of hydrogen. We have treated this theory extensively in our columns already. The idea of igniting hydrogen in a boiler by the explosion of that which exudes through the pores of the iron, must presuppose the advent of oxygen through the same medium. If the hydrogen is forced out by the steam pressure how does the oxygen get in? Is it by atmospheric pressure? Is that at 15 pounds to the square inch more powerful than steam pressure at 70, 80, 90, or 100 pounds?—EDS.

Gas from Gasoline not Peculiarly Dangerous.

MESSRS. EDITORS: In the second number of the SCIENTIFIC AMERICAN, page 28, current volume, you have an article headed "Dangers of the Use of the Lighter Products of Petroleum." You then go on and describe the cause of the late accident in East Cleveland, and say: "The gas pipes in the building had been leaking for some time, and the flame of the candle ignited the free gas in the basement, producing an explosion," etc., thereby showing that the material used had nothing to do with the explosion.

The whole article, headed as it is, leads a person very naturally to believe that the gas machine, which you describe in the first part of the article, was the cause of the explosion, and an opinion expressed by the SCIENTIFIC AMERICAN weighs very heavily in an argument on gas machines. We have been putting up and examining gas machines, used for making illuminating gas from gasoline, for the last four years, and have always claimed that the gas made from gasoline is no more dangerous than city gas. We have seen leaks in gas pipes, both in city and gasoline gas, and found that holding a light to the defective part would have the same results in either case, viz.: the gas flowing out of the broken pipe being ignited, and a flame corresponding in size to the break in the pipe becoming visible. These facts, we think, justify the opinion that the one gas is no more explosive than the other when allowed to fill an apartment.

Now, in justice to the gas machine men, of whom there are no doubt a great many among the readers of your valuable paper, we think, you ought to give us an article on gas machines, or gas from gasoline. When people talk to us about the dangers of gas machines, we call their attention to the fact that there are every night about a dozen glass coal-oil lamps carried about their houses in the hands of careless servants, which makes a dozen dangers to one when using the gas machine.

J. G. & Co.

Cincinnati, O.

[The frequency of explosions and fires, resulting from the difficulty of retaining the volatile and inflammable gas that is given off by gasoline, at even ordinary atmospheric temperatures, is sufficient reason for caution in the use and handling of this liquid. We do not consider—and have never so stated—that the gas from gasoline is more dangerous than other gases of equal inflammability; it is the material from which it is made which should be carefully handled and defended from possible chance of ignition. If its use, as a basis for illuminating gas, can be made as safe as that of the materials now employed, it would be an undoubted public benefit.—EDS.

A Rule for Finding the Exact (?) Length of the Circumference of any Circle.

MESSRS. EDITORS:—The rule and construction given under the above head, page 23, is, in fact, but a very rough approximation, giving a result only correct for two decimals, the third is wrong. Let us call the diameter, D, and express this rule in a formula, it is, circumference $= 10 \times (D\sqrt{2} - D) - 11$; or, $10(\sqrt{2} - 1)D - D$; and adopting the diameter as one, it becomes $10(\sqrt{2} - 1) - 1$; or, $10\sqrt{2} - 11 = 3{\cdot}1421356$ etc.

As we know (see page 44, current volume) that the true circumference for the diameter 1, is 3·1415926 etc., the above rule gives the circumference too large; in fact, so much that it leads to the absurd conclusion that the circumference lies outside the circumscribed polygon of 192 sides, of which the periphery is 3·1418731, etc. This last number is correct beyond the shadow of a doubt, and that the circle itself must be smaller, is evident.

For the benefit of those who perhaps doubt the correctness of the number 3·1415926 etc. (and which is now used by all mathematicians in their calculations), it may be observed that the circumference of a circle must necessarily always lie between the periphery of the inscribed and circumscribed polygons; when these polygons have numerous sides, they lie very close to the circle and include it in very narrow limits; elementary geometry may teach how to calculate the periphery of these polygons, that of 12,288 sides is found to be 3·1415926, etc., when inscribed, and 3·1415927 etc., when circumscribed, so the circumference of the circle must be larger than the first and smaller than the second of these numbers.

I have in a treatise on the quadrature, published in 1861 by Appleton & Co., New York, demonstrated that no geometrical construction or algebraic expression, short of an infinite series, can possibly express the correct relation between diameter and circumference, only simply irrational expressions as the above cannot give but an approximation. One of the simplest I have found is this: multiply the given diameter by $0{\cdot}26 \times \sqrt{146}$. This expression is easily transformed in a geometrical construction for rule and compass, and reduced to a decimal fraction, it gives 3·1415919 etc.—correct to within the fifth decimal, and differing from the true circumference only the half millionth part of the diameter.

New York city. P. H. VANDER WEYDE, M. D.

Digging and Dredging Machines Wanted in British Guiana.

MESSRS. EDITORS:—Some years ago, when residing in Canada, I was a regular subscriber to your paper, and noticed at that time your willingness to afford information on mechanical subjects.

I write now to ask if you are aware of any instrument invented that will supersede manual labor in digging the soil in this colony. Sugar is the only production, and we have made, in 1868, 100,000 tuns; but this is done at a vast expense when compared with other places producing the same staple, and our increased expenditure is due to the fact, that in cultivating the soil we cannot use even a plow. This place is like Holland, below the level of the sea (at spring tides five feet), and the water is kept out by large dams or embankments. The country is perfectly level, not a hill ten feet high to be found in the cultivated districts, and the soil very rich, being the deposit of the river, and not a stone to be found five hundred feet below the surface.

Our labor market is supplied from India and China, the free blacks, some 70,000 in number, doing very little indeed, and many of the estates have from 500 to 1,000 acres in cultivation. The whole of this large surface is dug by the shovel. I send you plan, which will show you how it is that a plow cannot work. The black lines show the canals by which the canes are brought to the mill, while the red ones show the mode of drainage, which has to be very complete, the water being discharged by 30 to 60-horse power draining engines. The drains leading into the main draining trench are 20 feet apart, and two feet wide, while the sucker drains leading to them again are 10 feet apart, and 10 inches in width. You can therefore see how the land is cut up, and how it is that a plow cannot work. Thousands of pounds have been spent in trying to get the steam plow to operate by pumping the drains, but without effect; and the information I ask is, is there any labor-saving machine that would dig the earth and turn it between ten to twenty inches deep, and thus save the immense amount of labor we now use?

Do you know also of any machine that, acting something like a dredge, would dig the main canals, say from 12 to 16 feet wide and 4 to 6 feet deep, throwing the dirt on the side.

The firm, of which I am a partner, have twenty-five estates under their control, on which over 20,000 laborers are employed, and if either of the above machines are feasible and procurable, large orders might go forward for them.

GEO H. OLIVER.

Georgetown, Demarara, British Guiana, Jan. 7, 1869.

[Any parties having machinery which will accomplish the ends sought by our correspondent, will do well to send a description of it to the writer, or communications may be sent to this office.—EDS.

A Regulator for Ordinary Augers.

MESSRS. EDITORS:—Can any of your inventive readers devise a means by which may be insured perfectly true boring with the longer shanked, beautiful American augers, when passing through wood, four, five, or six inches thick, where great accuracy is needed. Not only have I met with difficulties, but carpenters have frequently been foiled, and although I have often essayed to contrive a regulator I have not been successful, and I shall feel greaty obliged if any simple means can be suggested to assist me in the use of the auger and brace. My lathe will not assist me, being too small. I find there is generally a disposition when working the brace to incline somewhat to the right, and if some indicator could be contrived by which the slightest variation from a direct line could be indicated, or, better still, prevented, it would be a great benefit to others beside amateurs like myself.

M. D.

The Villetta, Ensworth, Hants, England.

THE PHOTOMETER--LECTURE BY DR. J. OGDEN DOREMUS.

Reported for the New York Tribune.

Prof. J. Ogden Doremus delivered the ninth lecture of the scientific course before the American Institute, January 22, at Steinway Hall. He said:

"In the beginning God created the heavens and the earth, and they were without form and void; and darkness was upon the face of the profound. "What pen shall describe, what tongue shall tell, what human imagination conceive of that tide of glory and splendor which undulated throughout immensity when God said, "Let light be" and light was! Such is the most beautiful and terse description offered in that Word of God which the Christian, as he leaves his anchorage on earth, blesses the Almighty that he can pillow his head upon. To tell the story of the first light which dawned upon the universe of God is beyond the power of man. To tell indeed what has been discovered concerning it would extend beyond the short time allotted to a lecture. That light moves through space with the immense velocity of nearly 200,000 miles in a second of time; that when we look at the sun we gaze at the light that parted from it minutes ago; that when we look at the stars, no one is so near us but that three and a quarter years have elapsed during the passage of that mysterious influence; and when we look up on such a beautiful cloudless night as this evening, and see the magnificent scenery of the heavens, that those worlds send us light which started on its march long before we were born, and, in many cases, ages before our race was existing upon this world—all this is known to modern science. After some further preliminary remarks, Prof. Doremus said that he should not attempt, in this lecture, to discuss these questions, but should come down to three simple points: 1. How do we produce light? 2. Of what is light constituted? 3. How do we measure it? We produce light, first, by the simple production of heat. He illustrated the production of light and heat by various beautiful experiments—burning the metal antimony in chlorine gas, phosphorus with iodine, and in the oxygen of the air; potassium on a piece of ice; zinc in oxygen, and melting and burning iron before the oxyhydrogen blowpipe. The lights thus produced were of different colors, and of great heat and brilliancy. But, said he, it is not enough to produce heat. If the product of the combustion is only gas—as he showed with the flame of a common Bunsen burner—intense heat, but very little light is produced. To change the heat to light, we must have a solid body to give out the light. By heating a bit of lime in common street gas, burned with a jet of oxygen, the brilliant calcium light is produced.

He showed the same light with small pieces of compressed magnesia, heated the same way. He also produced a similar brilliant light by burning the metal magnesium in the air. But, said the lecturer, we can produce light by certain means which far surpasses any of them. He then exhibited the electric light, produced by the aid of a battery of 250 jars, such as are used in our electric telegraphing. By using points of brass, copper, and iron, light of different colors, and degrees of intensity was produced, but with points of charcoal he produced electric light of most dazzling brilliancy, almost equal to the light of the sun. He also showed beautiful revolving lights of different colors, produced by sparks from the electric machine passing through partial vacuums of different gases. He stated several means of measuring light: by means of degrees of heat—its chemical action—or its illuminating power. He exhibited two kinds of photometers for measuring the illuminating power of light—one, that of Bunsen, the one commonly used—and the other a large screen, on which the shadows produced were successively obliterated by the light of a candle. The gas-burner, the Drummond light, the magnesium light, were successively obscured and obliterated, until the more brilliant electric light obliterated them all. The lecture was full of valuable instruction, and his experiments as brilliant and beautiful as his theme. But perhaps the most interesting of all was what he said of the new and cheap method of making oxygen gas by passing superheated steam over manganate of soda, and of the great improvement this will effect in lighting our streets, public buildings, and light-houses. He said that the improvement would effect a saving of 30 to 40 per cent, and would not render the air impure by burning up its oxygen or filling it with noxious gases, and by its harmonious blending of the different colors, would furnish a more beautiful and perfect light resembling that of the sun. It is already used in Paris and soon will be in New York, some of our heaviest capitalists having taken it in hand. With 18 burners lighted in this way, he illuminated the entire hall most brilliantly, the large number of common gas burners paling before it into a sickly yellow light. It was greeted by the delighted audience with the greatest enthusiasm.

NOTES ON THE VELOCIPEDE.

The Commissioners of Prospect Park, Brooklyn, have not only decided to admit velocipedes, but are, we understand, making preparations to afford special facilities for this delightful sport. In regard to schools of instruction in that city, the Brooklyn *Morning Union* of Jan. 20th, says: "The first school for instruction in the art of riding velocipedes had not opened its doors a month before it had to be enlarged, for though commencing with twenty-five pupils, it closed the first month's book with a list of two hundred and twenty-five. Of course another school had to be started, and Pearsall's Twenty-second Street Academy, up town, was followed by Monod's William Street School, down town, the former being crowded at early morning and in the evening, and the latter at spare half hours in the middle of the day. Last night, too, Parker opened a school on Broadway and Forty-ninth street, and the Hanlons open another on eleventh street and Broadway. What New York had Brooklyn must have; and as we found a man who could beat New York fearfully in gymnasiums, we looked to him to whip them in velocipede schools, and our energetic, enterprising townsman, Avon C. Burnham, 'has gone and done it' in his usual masterly style, and now we can crow over having the best velocipede school in the country." It is proposed to use the Clermont Avenue Rink as a great school, as soon as the frost breaks; and it is stated also that the Capitoline, a popular skating park, will also be utilized in this way. So much for Brooklyn, which nobody thought to be a fast place.

The velocipede fever is raging in Massachusetts. A flourishing school exists in Middleboro', and another one is to be opened in Plymouth, where a building recently occupied as a Methodist meeting house is to be fitted up as a rink.

The Cincinnati Velocipede Club have been giving a series of races of which the following is a brief account from the Cincinnati *Commercial*: "The first race was one of a mile in three heats, six runs around the hall being counted one third of a mile. The contestants were Mr. George W. Gosling and Mr. George C. Miller.

"Mr. Gosling lost the first heat by a fall. Mr. Miller made his first third of a mile in one minute and twenty seconds. Mr. Gosling maintained his equilibrium in his second heat and came home in 1 :16. Mr. Miller beat this time in his second heat, finishing his sixth round in 1 :15½. Mr. Gosling made his third heat in 1 :16½, and Mr. Miller accomplished his third heat in 1 :16, and was declared winner of the race, and the prize, a handsome silver goblet, worth $100, given by Mr. William Wilson McGrew.

"The second race was one of a third of a mile, the fastest rider to receive a silver wine-service, the contribution of Henry R. Smith & Co.

"Mr. Gosling was the first in the field. He made the third of a mile in 1 :29 2-5. Mr. Miller followed, and made the distance in 1 :16 3-5. Master Curtis, a vigorous little velocipedist, made a valorous struggle for the prize, but his brisk little pony was not equal to the task. He made the six rounds in 1 :35. Mr. McKinney followed, but lost by a fall. He gave way to Mr. H. L. Perry, who lost by touching the floor with his foot in the second round. At this juncture St. Clair, the skater, plunged in with an impetuous steed, which made directly for a post, and threw him to the floor, thus being the means of losing the race for Mr. St. Clair. Mr. Wm. H. Davis put his animal on the track, but unfortunately gave him so much rein that he broke badly in the third round and lost the race. This ended the race, and Mr. Miller was declared the winner.

"The third prize, a silver goblet, contributed by Duhme & Co., was the person who could ride the velocipede at the slowest gait. This slow riding on the velocipede is a delicate task, and good requires judgment and a deal of fine management on the part of the man who attempts it. Mr. Gosling prolonged his three circles around the hall to 3 :15 3-5, and the spectators thought him very slow. But Mr. Miller, his only rival, was much slower, and crept around the hall like a tortoise, finishing the feat in 5 :10. By this achievement he won the third prize, and the plaudits of the whole assembly. The sport wound up with an exhibition of the skill of all the velocipedists present. All the races were interesting, and those for the fastest time were very exciting indeed, rousing the spectators, and drawing from them cheer after cheer as the particular favorites gained advantages."

One of the Troy, N. Y., dailies having asked the question, "Who is the young man destined to be the first to introduce the velocipede in Troy?" has received the following answer from a correspondent:

"You ask in your Thursday's issue, 'Who is the young man destined to be the first to introduce the velocipede in Troy?' That young man has long since 'gone to that bourne from whence no traveler returns.' The velocipede is no new thing in Troy—it may be new to the present generation, but it long since rattled over the streets of our city at a rate of speed that would make the famous 'Dexter' sweat, or a second class locomotive puff and blow like a Third avenue clam horse. Forty-six years ago, or thereabouts, a then young man (and one of the best that ever lived in this city, too), by the name of Silas Davis, who resided on the south-west corner of Liberty and First streets, exactly opposite to where the holy temple of St John now stands, and who was an apprentice to one of the best machinists that ever lived in or carried on the business in Troy, by the name of John Rogers (father of our fellow-townsman Alexander Rogers), and whose business was then located on the south-west corner of Division and First streets, which shop is now a dwelling, and was lately occupied by Justice Neary; and he, in connection with said John Rogers, constructed three of these wonderful vehicles called velocipedes, and introduced them upon the streets of Troy, for the use and benefit of all who were disposed to pay the then considerable sum of twenty-five cents an hour for their use. The first one, if I remember correctly, was brought out for exhibition and trial on a magnificent moonlight night in the month of June. No public announcement heralded its coming. It appeared, nevertheless, in front of the hotel of the late William Pierce, located on River street between Congress and Ferry streets, between 8 and 9 o'clock in the evening, and although the mansions of our city in those days were as far apart, on the average, as village lamp posts, and our population could hardly be counted for the paucity of its numbers compared to what it can be now, a respectable crowd soon gathered, and a disposition to try the untamed and wonderfully curious steed was soon manifested by many of the young men who had there gathered. The first man to mount and give an exhibition of its operation was Davis himself. He handled it with perfect ease and drove it with tremendous velocity from Congress street to Washington street and back. All were astonished and delighted. The velocipede was declared to be one of the world's greatest wonders—bound to supersede horse flesh for traveling purposes. Livery men began to look blue and almost made up their minds that their occupation was in danger of simmering down to such small ends that they might as well abandon the business at once, and substitute, on dry and pleasant weather at least, velocipedes for saddle horses. The next person to mount the prodigy was Benjamin Bayeux. He was the fortunate possessor of a 'quarter,' and could use the thing for an hour. After one or two capsizes he got under full headway, and made excellent work of it, driving the machine at a 2:40 gait down River to Division, up Division to Third, up Third to River, up River to Mount Olympus, and back to the hotel, in an incredible short space of time, when he surrendered it to Moses V. Yevnett, who was equally successful in its operation, and the velocipede was pronounced a success. They were used after that about the embryo city for a year or two by the young bloods of the town, and then finally disappeared, to re-appear again at the expiration of almost a half century, to make a sensation and excite the greater admiration and astonishment of their beholders." This velocipede was probably one of the old style propelled by contact of the feet with the ground.

Captain Du Buisson, Commander of Prince Napoleon's yacht, the *Jerome Napoleon*, has an invention whereby he proposes to run a velocipede upon the water with almost the same facility that Burnham and Hanlon run theirs upon the land. It is composed of two parallel tubes of cast iron, cigar-shaped, connected by iron cross-pieces. In the center is a propelling wheel, covered by a house or drum, on the top of which the person using the vessel sits comfortably in a sort of saddle, with stirrups. By means of these stirrups and a hand crank upon each side, he gives the wheel its motion, precisely as it is given to a velocipede on shore. The novel craft is easily propelled at the rate of six miles an hour.

A correspondent of an English paper announces that he has invented, and will shortly exhibit, a one-wheeled velocipede, and says that it is safer and in every way superior to the two-wheeled machine. A steam velocipede has also been invented in England, an engraving of which, with description, will be shortly given to our readers.

A gentleman residing in Twenty-second street, in this city, comes down to his business in Church street, on a velocipede, every morning, in twelve minutes.

A lady residing in Brooklyn, writes to us that, for her part, she objects to the double side-saddle plan, suggested by our fair correspondent from Georgia, noticed last week. She sees no objection to ladies donning a proper dress and using the velocipede pure and simple. She argues that the exercise would be much more thorough and healthful, than it could be on any such mongrel machine as the one suggested by our Georgia correspondent, while one of the principal charms of velocipede sport, its delightful independence, would be entirely lost in such a machine. She is willing to grant that the company of an agreeable gentleman would go far to reconcile her to the disadvantages of such a machine, but if two ladies were to be paired thus she thinks it would be simply intolerable. One thing is certain, the ladies can not be left out in the consideration of this subject by manufacturers.

Speaking of manufacturers, we understand that establishments devoted to velocipede making, have their hands more than full to meet the present demand.

The "Kenosha" Steam Frigate.

We have received the following account of a splendid ship just finished at the Brooklyn yard, built under the supervision of B. F. Delano, constructor at this station: "The U. S. S. *Kenosha*, built at the navy yard, Brooklyn, N. Y., is of the same class as the *Alaska*, built at Boston, the *Algoma*, at Portsmouth, N. H., and the *Omaha*, building at Philadelphia. They are all from one design by John Lenthall, Chief of Bureau of Construction and Repair. The machinery was designed by B. F. Isherwood, Chief of Bureau, Steam Engineering.

"The first frame of this ship was raised on the 27th of June, 1867, and she was launched on the 8th of August, 1868. Her principal dimensions are: Length, extreme, 268 feet 9 inches; length on load line, 250 feet 6 inches; extreme breadth, 38 feet; depth of hold, 19 feet 7 inches; tunnage (new), 1119·68 tuns. She has two decks beside the poop and forecastle, with 6 feet head room in clear of beams. The ward room is arranged with ten comfortable state-rooms, five on each side, and a good sized "country" between. In the after end is a large ward room pantry and two store rooms. Forward of the ward room is the steerage, which contains three good staterooms, beside a room for assistant engineers, 12 feet long, and the midshipmen's room, 18 feet long. The necessary store and mess rooms are forward of the steerage. Below decks are the magazines, shell rooms, store rooms, etc., forward and abaft the machinery. The rig of the vessel is barque. The armament is one 11-inch pivot, six 8-inch guns on iron carriages, one 60-pounder on forecastle deck, and two 24-pounders on poop, beside two 12-pounder boat howitzers.

Her engines are double piston rod, back acting, having two cylinders, 50 inches diameter by 42-inch stroke, Sewell's condenser; 4 main boilers, 5 furnaces in each, superheater in uptake; grate surface 390 square feet; total heating surface 7,260 square feet; two smoke pipes 64 feet above grates, 72 inches diameter; two bladed, hoisting screw, 16 feet 4 inches diameter.

The ship will soon be in commission, the work on her being nearly completed. The machinery was all built at the Brooklyn navy yard, except the screw shaft which was forged at the Washington yard.

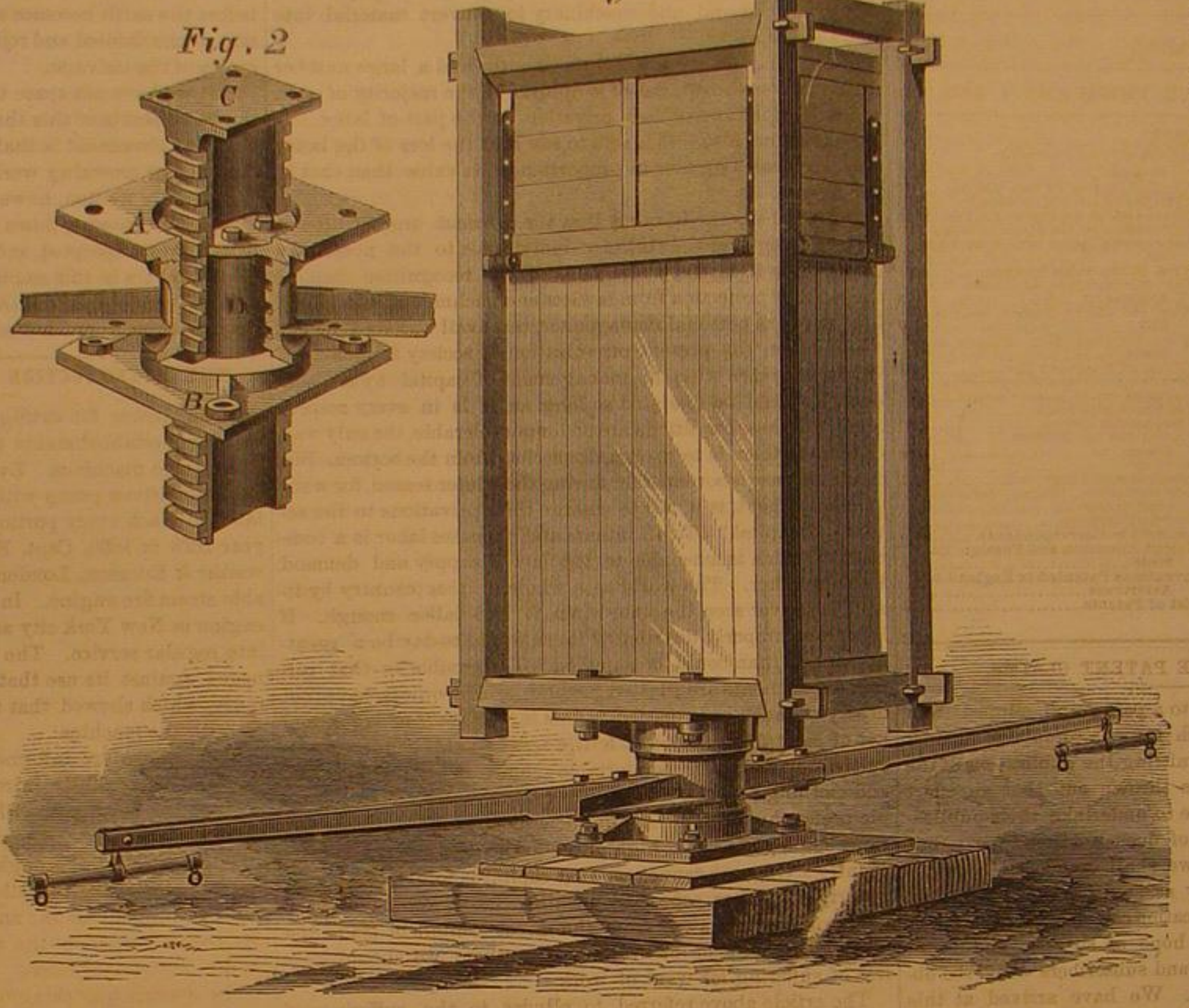
Improvement in Cotton and Hay Presses.

The simplest device for pressing and baling cotton is the screw, usually of wood, and is employed on three-fourths of the Southern plantations. It has generally a diameter of from sixteen to twenty inches, with a pitch of thread of from six to nine inches, and is operated by two long levers extending from the top of the screw at an angle until they nearly reach the ground, to the ends of which horses or mules are attached for working it. Various attempts have been made to supersede these presses, which are rude and cumbersome, work with great loss of power from friction, and, as they cannot be housed, wear out more from exposure to the weather than from actual use; and a great many presses have been invented, none of which has realized the anticipations of their inventors. They worked too slow, were too weak to give the enormous pressure required to bale cotton, could not be repaired, if broken, by means at hand on the plantation, or, perhaps, more than from any other reason, were too expensive. The wood screw has these advantages, which overcome in a measure its many disadvantages: It can be built entirely from material to be found on the plantation, requires but little iron work, works with great power, and is not complicated with levers, ropes, pulleys, and windlasses. Owing to its coarse pitch but few turns are required to run it up and down, a very important matter when it is considered that the horses move in a path from thirty to forty feet in diameter. Of late years the cast-iron screws have found favor, as the planter has only to purchase the iron work, and the wood work is done, as heretofore, on the plantation; and many forms of adapting these screws to their work have been devised, some of them having great merit.

The objections to the common cast-iron screws are these: They cannot be made of a diameter large enough to receive the coarse pitch of thread that is required to save the travel of the horse, and bale the cotton rapidly; and being of cast iron and small diameter are liable to be twisted off, as the screw presents the greatest length when the strain is the heaviest. The design of the screw here shown is to be obviate as far as possible the objections against both the wood and iron screws.

Fig. 1

Fig. 2



ALBERTSON'S PATENT SCREW PRESS FOR BULKY MATERIALS.

The receiver is a box, or pentstock, in the usual form, having at its upper part hinged sides or doors for removing the bale. A follower traverses the lower portion, being connected with the elevating screw. The whole is supported on a pedestal composed of two plates of any required size and form, one bolted to the receiver and the lower one to a suitable platform. They are represented in Fig. 2 by A for the upper plate and B for the lower. The follower is bolted to the end, C, of the screw. The screw is a double or triple segment of threads—in the engraving double—recessed below the depth of the thread on either side. Segments of a cylinder, D, forming portions of the plates, A and B, and hollow, admit bolts through to secure the two plates together. Between these plates turns a nut, outside the segments of the cylinder, which represent the size of the screw, the nut being furnished with sockets for the reception of levers to the outer ends of which the power—animal—is attached. It will be seen that the pedestal is the entire support of the superstructure, and the power being applied directly, near the ground, and the screw traversing through a fixed column, no unnecessary torsion or twisting of the fabric occurs.

The screw, however, may be secured to the top of the press, or, in other words, the press be inverted, if desired, although the friction and consequent power required will be greater. It will be seen that the screw cannot receive any twist, being firmly held by the pedestal at the point where the power of the nut is received by the screw, and the only strain that the screw receives is in the direction of its length. By relieving the screw from twist, the following important advantages are secured: The screw can be made very light in comparison to the weight that would be required for a cylinder receiving the twist, and any desired pitch, however coarse, can be used. There is no friction of the follower on the sides of the press box. The nut is supported by, and revolves entirely on the body of the pedestal. The iron work can be made and shipped to the plantation, and the wood work of the press made there as heretofore.

This press was patented December 15th, 1868, by James M. Albertson, of New London, Conn., to whom all letters for information regarding the manufacture and sale should be addressed.

Nearly two millions of false teeth are annually turned out of a single manufactory in Philadelphia.

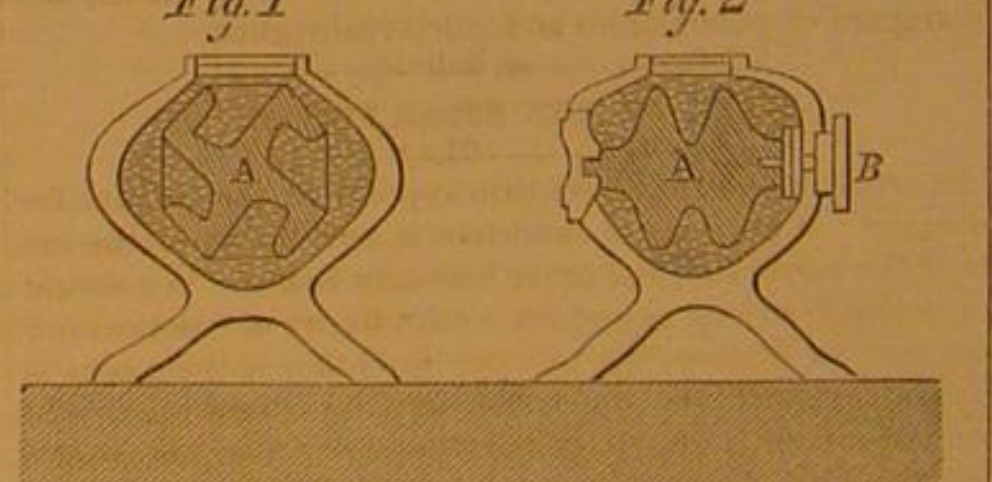
The Philosophy of Tea-Making.

The results of the investigations of careful experimenters are hardly, perhaps, sufficiently known to the multitude of tea-drinkers. The whole subject is carefully summarized by Dr. Letheby in his recent lectures. There is a popular notion, which is an incorrect one, that soft water is best for tea-making. As a matter of fact, water which has about five degrees of hardness when boiled, makes the best flavored tea, provided that it be allowed to stand upon the tea sufficiently long. Boiling tea is one of the follies of which the officials in work-houses and other large establishments are guilty. This makes a deep-colored solution, containing the worthless bitter extractive matter, which is devoid of physiological or dietetic property. In point of strength, it is found experimentally that infusions of tea and coffee are strong enough when about two and a half teaspoonfuls of tea, or two ounces of freshly roasted coffee, are infused in boiling water.

THE STOLTZ ROTARY INKSTAND.

Years ago we suggested as a worthy object of scientific research and mechanical ingenuity the discovery and production of something to supersede the slow, dirty, annoying, and laborious device of pen and ink. The mere muscular effort of carrying the hand back and forth from paper to inkstand and *vice versa* is no small tax on the bodily powers, and no less a tax on time. So firmly are we rooted in this opinion that we prefer the use of the common lead pencil to pen and ink whenever its use is permissible. But, in addition to this annoyance, are those of oxidized pens and oxidized ink; the first rough

Fig. 1 Fig. 2



and unyielding, and the other thick and muddy. A pen that will not shed the ink, and ink that blurs, blots, leaves a *bas relief* of dirt on the paper, or sticks to the pen like molasses are not calculated to soothe the ruffled feathers of the hurried or worried pen driver.

We copy from the London *Mechanic's Magazine* two views of a rotary inkstand, which, it is claimed, prevents the introduction of foreign bodies, allows the contents to be shaken without spilling, and permits the quantity presented for use to be varied according to demand, while at all times the ink is preserved from contact with the air and consequent oxidation. Fig. 1 is a cross section and Fig. 2 a vertical section of the inkstand. A disk, A, containing four cups, rotates in the body of the inkstand, being turned by a button, B, projecting on the outside. Turning the button to the right fills one of the cups and brings its top or mouth to the aperture in the stand. Turning it to the left empties the ink contained in the cups and leaves the solid part of the disk under the aperture, closing the orifice. Thus the ink need never stand long enough exposed to the air to become fouled with dust or to become oxidized. Packings of rubber are interposed between the axis of the rotating disk and the side of the stand to make a hermetical joint and secure sufficient friction to keep the disk in place. These are important advantages and if they can be secured by so simple a device as the one illustrated are certainly worthy attention. We have never yet used an inkstand that fulfilled all the requirements necessary to a proper enjoyment of the delights of writing or the demands of business. If this is not perfect we are certain that its suggestions will not be lost on our inventors.

Acarus Sacchari, The Sugar Insect.

The following is a synopsis of Robert Niccol's research as to the *acarus sacchari*: Every variety of unrefined sugar contains more or less acari, minute insects, resembling somewhat the sea crab. These are well known in sugar warerooms; and no one who sees them running nimbly along the tables would ever use raw sugar. Many believe it more economical, and sweetens better, and really a teaspoonful does go farther than the white article, but it is because it is heavier, but if an equal weight of the refined was used, it would be far better. It not only impairs the flavor of the tea and coffee, but also is injurious to the health; the dry, large-grained, and light-colored is the most nutritious and economical. In a pound of sugar there are no less than 100,000 of these insects. Dr. Hassel says that out of seventy-two samples, he observed sixty-nine in a living state. By dissolving a spoonful of raw sugar in a glass of water, these may be seen on the surface as white specks. In refined sugar they do not occur, because they cannot pass through the charcoal filters of the refinery, and because it does not contain any nitrogenous substance, as albumen, for even the most insignificant animal cannot exist if entirely deprived of nitrogen. When the refined article is left too long in iron cisterns, after its solution in water has been effected, a trace of the metal may become dissolved, in which the sugar is impure, this rarely however occurs. Grocers and sugar-warehouse men are subject to a kind of "itch," affecting their hands and wrists only, and as they are usually of cleanly habits, the disease can only be accounted for in this way, that the *acarus sacchari*, like its congener, the *acarus scabiei*, has burrowing propensities, bores into their skin, and breeds there. These two resemble each other closely, though the sugar insect is larger and more formidable. Pure sugar is almost as desirable as pure water, and who would, who has any pretension to cleanliness, drink stagnant water if he could as easily obtain it pure, and who would eat raw sugar, teeming with animalcules and vegetable impurities, if the refined article were as easily purchased?

Utilization of the Refuse Lime of the Gas Works for the Manufacture of Sal Ammoniac and Prussian Blue.—The lime used in the gas works for the purification of the gas becomes charged chiefly with two products of the destructive distillation of coal—results of the combination of its nascent nitrogen, viz., ammonia NH_3 and cyanogen NC_2. When steam is passed over such lime the ammonia escapes and may be passed through sulphuric acid, when sulphate of ammonia is obtained. By treating this with common salt (chloride of sodium) is easily decomposed into sulphate of soda and chloride of ammonium or sal ammoniac. The remaining lime, freed from the ammonia, contains the soluble ferro-cyanide of calcium; this is extracted by solution in water, and after filtration the clear solution is mixed with a solution of sulphate of iron, when the ferro-cyanide of iron or Prussian blue is precipitated. This is collected, washed, and dried.

Dr. Detheir, of Constantinople, gives a description of the great bronze cannon used by Mahomet in the siege of Constantinople. Its weight was 80,596 lbs.; length, thirty feet; caliber, 46 inches; and the charge of powder required was 200 lbs. The balls used were stones, weighing 1,200 lbs. The American Rodman gun weighs 116,497 lbs.; has a length of 25 feet; caliber, 20 inches, and carries a ball of 1,000 lbs., with a charge of 100 lbs. of powder.

A System of metallic ceilings, which consists in the application to the joisting of very thin stamped metal in ornamental embossed panels, has lately been invented. These stamped panels are fitted for every kind of decoration in color, and if inserted as plain surfaces may be used as the ground for every description of cartoon painting, combining with lightness and durability, artistic and ornamental effect.

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NEW YORK, SATURDAY, FEBRUARY 6, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

PUBLICATION OF THE PATENT CLAIMS.

Our attention has been called to a paragraph, clipped from some unknown newspaper, which utters a complaint against the SCIENTIFIC AMERICAN, for omitting the publication of the patent claims. The intimation is thrown out that an effort is being made to induce some one to undertake their publication. What this effort consists of does not yet appear, but doubtless whenever it matures we shall know all about it, but of one thing we are perfectly assured from our own experience, namely, that such a publication can only be undertaken by the Patent Office with any hope of success, and there would be a loss unless one thousand subscribers could be obtained at ten dollars a year each. We have arrived at this conclusion by a careful calculation of the cost of paper, composition, labor, and material necessary for its printing and circulation.

The readers of the SCIENTIFIC AMERICAN are well aware, that, during the few years past, the claims of patents had become a serious burden upon its columns, and complaints were numerous that three or four pages each week were given up to claims, which in too many instances failed to convey an intelligible knowledge of the thing patented. After a thoughtful consideration of the whole subject, and not without some misgivings, we decided to test the matter, and in the issue of our annual prospectus in December last, we announced our determination to try the experiment of discontinuing the claims.

In taking this step we had no other motive than to enhance the value of the SCIENTIFIC AMERICAN to the greatest number of its readers, and at the present moment it does not appear that any considerable number are dissatisfied with the course we have taken. Up to this time we have not received over a dozen letters of complaint, and our circulation is much larger than it was last year at this time. We have also received several letters commending our action. This is about the way the matter stands at the present moment. The question of expense has had nothing to do with our action in this matter. We desire simply to make the SCIENTIFIC AMERICAN as valuable as possible to all its readers, and we stand ready at any moment to resume the publication of the claims whenever it is made to appear that any considerable number of our readers demand it.

LABOR AND CAPITAL NOT ANTAGONISTIC.

The mistakes frequently made in discussing the relations of capital and labor, and the false views of these relations entertained by many superficial observers and illogical thinkers upon the subject, arise in great part from a consideration of them under abnormal circumstances. The natural relations of capital and labor are interdependent. The interests of neither can suffer without injury to the other, unless the normal and healthy condition of society has been disturbed by a force sufficient to destroy harmony of interest between both. Capitalists may individually regard labor, in some instances, as something to be got at the lowest possible price without regard to the rights of the laborer. But such an opinion can only be entertained by a man of narrow and superficial views of affairs. Equally narrow and superficial is the view of the laborer who demands for his work all that he can get without regard to the real value of his services. It is not our purpose at this time to recapitulate what we have so often written upon this subject; but we can not pass unnoticed a statement like the following taken from the *Detroit Union*. That paper asserts that capital and labor are ever at variance. "Capital has the advantage, because able to close her door on the outside world, and live in luxury until the laborer, whose family cry for bread, humbles all the manhood in him, and like a whipped spaniel he returns to his master. This may not be slavery in name, but it is even worse than the meanest slave, shackled and bound. Winter is upon us, and already scores of men are thrown out of employment; perhaps they have been blest with health and strength through the busy season, and have saved enough to barely support their families through the winter, and come out in the spring as poor as they were the year before, one year older, and with no brighter prospects for the future."

It is true perhaps (and only so in a very limited sense) that capital sometimes shuts its doors while labor cries for bread. But this is only temporary and compulsory with capital invested in material and machinery to convert material into marketable wares.

A mill may be closed for three months and a large number of operatives thrown out of employ. In the majority of such cases there is more or less privation on the part of labor, but capital suffers also. It is safe to say that the loss of the latter is in such cases greater in proportion to its value than that of the former.

It must be borne in mind that the present organization of society recognizes the rights of individuals to the possession of property if lawfully obtained. Such recognition implies the right of protection from lawless encroachments, and against loss, so far as personal management can avail to avoid losses. And further, the present organization of society forbids that any interference with the management of capital by its possessors, should be tolerated so long as it is in every respect legal. If these conditions are no longer tolerable, the only way to remedy them is to re-organize society from the bottom. But again because laborers suffer during the winter season, for want of employment, is it fair to charge their privations to the account of capital? To all intents and purposes labor is a commodity which is amenable to the law of supply and demand like any other. The world as a whole or this country by itself has never seen the time when it had labor enough. If labor was properly distributed there would to-day be a greater demand than could be supplied. The trouble is that certain departments are glutted for help, while others have not nearly as much as is needed. This is the fault of labor and not of capital. Millions of fertile acres in this country await cultivation and offer comfortable homes and abundant food and clothing to any who will work them, but so long as people prefer the filth and squalor of crowded cities with precarious employment, and high prices to the comparative ease of country living, we cannot see that capital is to blame for their poverty. If labor, especially unskilled labor, would adopt the policy, of getting away from the great centers of trade, the large cities, instead of overcrowding them, we should hear less of suffering for want of work.

The article above referred to alludes to the sufferings of seamstresses in large towns; but very few of these if asked to leave their present occupations, and perform housework where they would have plenty of food and comfortable shelter, with wages ample to supply clothing, would accept the offer. This is proved by the fact, that, although there is a scarcity of such labor, and the country constantly sends to the cities for its supply, it cannot be obtained. How is capital to blame for this. So long as human nature feels the effects of Adam's fall, so long there will remain those who will not scruple to profit from the necessities of others. Nothing can justify such a course; neither can anything justify the folly that exposes itself to imposition, and chooses want rather than comfort.

Such articles as the one from which we have quoted, are to be deprecated. Without touching upon the fundamental principles of existing things, or suggesting anything practical toward the amelioration of the working classes, they foster discontent, blind repining at inevitable consequence, and a disregard of public order and individual rights.

BIRTH OF THE SOLAR SYSTEM.

An article under the above title appears in the *Atlantic* for February. It purports to enunciate a new theory of the origin of the earth, sun, and other heavenly bodies. We should not, perhaps, strictly say origin, as the theory of cosmical vortices held in common by La Place and other philosophers is retained, but with the difference that in the new theory the cosmical matter is considered to be intensely cold, and its precipitation toward, and concentration around the vortices to be the cause of heat, which increases with the size of the orb thus formed until the body becomes self-luminous, in short becomes a sun. Thus the earth is, according to this doctrine, an embryo sun in a meteoric vortex, constantly growing by the attraction of cosmical matter to itself and its temperature constantly rising. The sun is considered to be also in a meteoric vortex, and to have derived his light and heat from the precipitation of meteoric matter upon his surface.

This theory is absolutely startling in its audacity. It stands in its principal points, directly opposed to the opinions of the greatest philosophers of the past or of the present. The earth has hitherto been supposed a cooling body. The cosmical nebula of LaPlace was matter indefinitely expanded which, upon condensation, formed rotative concentric rings which, upon further contraction, became broken into fragments assuming the spherical form. The chemical geology of Dr. J. Sterry Hunt, and the old school of geology, are simply absurd if the new theory be true. Jupiter, hitherto considered by astronomers as very much colder than any of the interior planets, is by the author of this remarkable doctrine, regarded as being so hot that water, as water, cannot exist upon the surface, being entirely vaporized and floating in his atmosphere.

The sun is, by and by, to become so hot that it will be reconverted into cosmical matter, but when its matter becomes so intensely cold as it must be before it can again fall as meteoric matter upon the surfaces of other bodies, its heat will have disappeared. What will have become of the heat? The author gives us no satisfactory answer.

Comets are masses of cosmical matter. When approaching the sun, this theorist tells us they act as lenses collecting a beam of light, which becomes visible by reflection from the particles of meteoric dust everywhere distributed about the sun for many millions of miles in all directions. But he does not account for the cases where comets have projected a tail *toward* the sun instead of away from it. Are comets in such cases concave reflectors instead of lenses? Man "little man," destined to be gradually roasted, will have disappeared long before the earth becomes a sun, to be finally reduced to chaos, and reconsolidated and rejuvenated, for thus run the perpetual cycles of the universe.

But we have not space to note at length all the strong or the weak points of this theory, among the latter of which not the least prominent is that man is merely an incident of creation, not its crowning work.

Evidently written, however, by a daring and speculative mind, and throwing down the gage of battle to all the systems hitherto accepted, and appearing in a periodical read by most thinkers in this country and many abroad, this "new theory" cannot fail to attract great attention and will probably give rise to much discussion.

THE INTRODUCTION OF STEAM FIRE ENGINES.

Steam power for extinguishing fires was in use in manufacturing establishments many years before it was employed on portable machines. Every factory of any pretensions had its steam-driven pump with hose and other attachments calculated to reach every portion of the establishment. About the year 1829 or 1830, Capt. Ericsson, then of the firm of Braithwaite & Ericsson, London, Eng., built and exhibited a portable steam fire engine. In 1842 or 1843 he produced a similar engine in New York city and it was tested, but never brought into regular service. The writer remembers a great objection urged against its use that it burst any hose that could be made, which showed that the fault of want of success did not lie with the machine.

So far as we are informed, the credit of overcoming prejudice and successfully introducing the steamer in cities and large towns belongs to Miles Greenwood when mayor of Cincinnati, Ohio. Mr. Greenwood, being a man of great tenacity of purpose and a thorough mechanic, and having, moreover, the confidence of his fellow citizens, succeeded where only failure awaited others; and in consequence Cincinnati was the first city to adopt the steamer as a permanent portion of its fire department force.

The reasons why this most efficient agent—steam—was not sooner utilized for the protection of property from fires, may be summed up in one word, prejudice, prejudice born of ignorance. Fire and steam careering through the streets instead of inducing confidence and a feeling of security, inspired terror or created apprehension. Our municipal authorities, too, are not generally engineers or mechanics—and—the steamer does not vote.

The metropolitan fire department of New York city numbers 34 steamers of about 50 H. P. each, equal to 185 men, or in the aggregate 6,290 men, while the actual number of men employed even adding the 12 hook and ladder companies is only about 550: thus relieving 5,740 men from the labors, dangers, and exposure of the fireman, and allowing them to become producers rather than merely protectors of property. The time is past to question either the superior efficiency or the economic advantages of the steamer over the hand engine. As well might we return to the old hand press and the spinning wheel, print our newspaper editions of 100,000 daily and clothe the teeming millions by hand labor, as to discard the powerful agency of steam in the protection of our property from fires.

WHY THE RIGHT RATHER THAN THE LEFT?

It is somewhat attractive to attempt to trace, through the convolutions of custom and the traditional usages of men, the reason for every day habits that seem so natural as not to deserve notice, much less investigation; but, as nothing is created without an object, so we may assume that there is a reason for those of the habits of our kind which, being general, escape notice or criticism, but which, if isolated by the practice of individuals only, would arouse attention and awaken inquiry. Among these habits none are more marked or provocative of investigation than the habit of preferring the right hand or side to the left. In meeting an obstacle in walking it is easier to turn to the right than the left; in ascending staircases we prefer to take the right side, although that side may not have a rail for the hand, to assist the riser; we test the weight of an object by taking it in the right hand, and if we attempt the test with the left we find the result, as felt by the muscles, to be very different from that by the right hand trial. So in a hundred ways we always show our preference of the right over the left. It is not enough to account for this preference to say that general custom and personal habit make it imperative. To be sure, civilized and enlightened peoples, generally, are careful to instruct their children to use the right hand rather than the left, but this may be because manual instruments for performing all descriptions of work are constructed with a view to be used by the right hand. It is possible, however, that what may be considered the cause is only a result of some organic law that demands this sacrifice of the left in preference to the right. This view receives color from the fact that even among savage and uncivilized peoples the right is preferred. Among them, as among ourselves, the proportion of left-handed men is small. The Benjamites were considered odd by the children of Israel for their peculiarity of being left-handed. Either in ancient or modern times the proportion of left-handed men was always small.

Why does a man lost on a plain, where there are no guides for his course, make a circle in his efforts to go forward, turning always to the left? It may be said because the left being the less used side, and, therefore, less developed and weaker, must give way to the superior energy of the right; but this reason does not hold good, because we walk with our feet and not with our hands, and the feet are educated alike. We are ambidexters as regard our feet. In military evolutions we are taught to put the left foot first—to start off with the left foot; but in the dance we are instructed to start off with the right. Beside, we know of a person left-handed from his infancy, who, being lost in a snowstorm on Seekonk Plains, near Pawtucket, Mass., wandered in concentric circles, or spirals, for more than two hours, before being relieved, turning always to the left. Ambidexters, or those who can use equally well either hand, generally prefer to employ the right even when using an instrument not specially designed for the right hand. Those who like gymnasts, or pugilists, have to use the left with equal facility with the right hand, are compelled to submit to a severe course of discipline to attain equal force and dexterity with the left that they possessed with the right. The word just used—dexterity—perhaps, may be a clue to the question underlying these suggestions. Dexter, the right, sinister, the left. May there not be some meaning in these Latin terms and their derivations, physical, moral, and generally philosophical, beyond their application to manual operations? To be sure the Latin *rectus* may be offset against the other term, but the practice of the Romans, as well as our own justifies their interchange.

In some sense all mechanics and laborers are ambidexters. The wood-chopper should wield his axe with the right hand near the blade, as well as with it at the handle end; so the dresser of timber or the ship-carpenter, the adze; so the blacksmith's striker with the sledge, the farmer with the hoe, rake, or flail, and the housewife with her broom; but each and all prefer to give the dexter hand the precedence. Our guardian angel is the "angel over the *right* shoulder;" the sheep go to the *right*, the goats to the *left*; we give the *right* hand of fellowship, and of friendship, and in the latter case if circumstances demand the proffer of the *left*, the act is always accompanied wtih the palliating excuse "nearer the heart." Possibly this phrase has a physiological significance; muscular action or violent exertion should be kept as far from the delicate and active seat of life as possible for fear of too great a stress upon that organ.

Is there not something in this universal instinct—apart from custom—that demands investigation at the hands of our scientists, our social philosophers, and our moralists? It is not accident, circumstance, convenience, nor even tradition that compels us to prefer the right; what is it?

GLASS BLOWING.---HOW BOTTLES ARE MADE.

In a former article we treated of the composition of glass, and the construction of the furnaces in which the materials are melted preparatory to the operations by which the fused glass is made to assume the various familiar forms of glassware. The arrangement of these furnaces varies considerably, but a common form is that of a truncated cone with a chimney at the apex. Around and upon the interior of the base, the pots are placed, so that the workmen are distributed entirely around the furnace. The implements used in glassblowing are of the simplest description and few in number. On this account a great degree of manual dexterity is required. During our recent sojourn at Pittsburgh, we took especial notice of the glass manufacture, of which nearly all branches are represented there, and with the readers permission we will step into some of the numerous establishments and witness, first the

MANUFACTURE OF BOTTLES.

Before we commence the description of glass-blowing, however, it will be proper to state the general principles upon which glass-blowing depends. If iron, or lead, or clay, in a plastic state, were the material desired to be worked, we should find the application of this method entirely impossible. What is it then about glass that makes it advantageous to work it in this manner? Why can it not be cast in the shapes required like iron? or why can not iron be blown like glass? A comparison of the properties of the two substances will elucidate the whole matter. Iron is one of the best conductors of heat, while glass is one of the worst. A body of iron unless very large, will when heated or cooled in one part rapidly become heated or cooled in all its parts. Glass on the contrary may be heated at any one point to redness, while parts very near to the heated portion remain cool. To illustrate this, suppose it to be required to blow a bulb upon one side of a straight glass tube. By directing a sharp pointed flame against the side of the tube at the proper point, a well defined disk of redness will be produced. The borders of the spot will show but little shading out of color, and the rod may be held in the fingers at only a very short distance from the heated disk. The spot thus heated has become plastic; and if one end of the tube be now closed with the finger and the other placed in the mouth, and a strong blast of air forced into it, the internal pressure upon the yielding spot will immediately expand it into a bulb. If now it were required to produce a depression in the bulb itself, it would only be necessary to reheat the center of the bulb, and exhaust the air from the tube when the external pressure of the atmosphere would press it inward. An iron tube could not be thus mánipulated it would be impossible to heat it upon one side without heating the other, and the heat would also extend along the tube on either side of the point to which the heat should be directly applied. Beside this, the iron would never assume that doughy plasticity possessed by properly tempered and heated glass. The limit between the temperature when it becomes plastic and that at which it melts and runs down is very much narrower than that of glass. Beside the same conductive power which prevents heating in a given spot without also heating others, tends to cool down very rapidly any portion which is heated above the rest, while the reverse is true of glass. Again, air is a very bad conductor of heat—even worse than glass—and its low conducting power aids very materially in the process of glass-blowing. These facts borne in mind will enable the reader to perceive the rationale of the several manipulations we are about to describe.

The chief instrument used in the blowing of bottles, as well as all other glass-blowing, except fancy glass ornaments and toys, to be described subsequently,is what is technically known as the "pipe." It is a wrought-iron tube, from four to five feet long with a small knob at one end and a wooden handle at the other, terminating in a mouth-piece through which the air is forced; the bore extending entirely through the instrument. The end upon which the knob is fixed is used to collect a mass of the fused glass, to be fashioned into a bottle. With this simple instrument the workman approaches the "working hole" of the furnace,plunges the end into the fused glass, and rolling it around collects a ball of the material, and, immediately withdrawing it, blows a slight blast through the tube which expands a small hollow in the mass. After the ball has cooled a little, he plunges it in a second time, thus accumulating more material, and repeats this process until sufficient material has been taken up. As soon as the ball is large enough it is brought into one of the hollows of the "marver"—a wooden block in which hemispherical concavities have been excavated, the hollows being kept moistened with water. The mass is rotated in one or more of these cavities while a gentle blast is forced through the tube to keep open the internal opening. After a little the plastic mass assumes the form of a pear. This pear is now subjected, after reheating in the working hole to a complex manipulation. It is elongated by the swinging of the pipe to-and-fro like a pendulum, the centrifugal force thus generated, stretching it out longitudinally and, at the same time, it is kept round by turning the tube on its major axis, and expanded by a stronger blast than heretofore. By these means combined the metal assumes the form of an egg with a long tubular neck extending from the smaller end. As soon as this stage in the process is reached, the vessel is inserted into the mold—a block of iron containing a cylindrical hole the size of the desired bottle—and expanded to fit it by a strong blast, at the same time its neck is elongated by a succession of jerks, the inertia of the body of the bottle being sufficient for the latter purpose. By this time the yet unfinished bottle is so cool that a reheating is necessary. This time however, the bottom only is heated in order to give it the requisite concavity. As soon as it acquires enough plasticity, an assistant—usually a boy—who has in the meantime attached a small mass of fused glass to a rod of iron called a "punty," places this instrumént with its little ball of glass as near the center of the bottom as possible and presses it inwards. As soon as the bottom becomes cool, the bottle is detached from the pipe by dropping a little cold water upon the neck as near the pipe as possible. This cracks it short off, and the bottle is now supported by the punty attached to the bottom. The neck is now reheated and a thread of hot glass wound around it at the top to form the rim, and a finish is given to it by rotating it; the punty resting acrоss the edge of a bench upon which the workman is seated, who, while rotating the bottle, applies an iron instrument to the yet plastic glass. A boy then siezes the punty and carrying the bottle to the annealing oven detaches it by a quick jerk. This completes the work on an ordinary champagne bottle.

The process we have described is varied in some particulars in making other kinds of bottles, for perfumers, druggists, etc. We have often heard people express wonder that letters panels, figures of animals and other ornaments could be blown in the sides of bottles, but it is the simplest thing imaginable. The letters or other designs are cut in the side of the mold, which for fine work is generally made in halves and so adjusted that it can be opened or closed by a foot lever. The molds for such work are also formed so that the top closes with the exception of an aperture for the neck. The glass having been blown into a pear-shaped ball of the right size is placed in the mold and a sharp blast forces it into every depression. At some future time we may describe the modes of making pressed glassware, and window glass.

EFFECTS OF IMPROPER DIET.

The *Radical* for January contains an able and somewhat humorous review of a new work on health, by R. D. Mussey, M. D., which, not without show of reason refers a vast number of the real and imaginary "ills to which flesh is heir," to improper diet. The following extract from this spicy review will be read with interest by gourmands and Grahamites, as well as the intermediate grades of eaters who do not believe either in stuffing or starvation:

Now it is triumphantly asserted, by those who do not know, that everything about man shows that he is cut out for a large feeder. Especially they insist upon the fact that his teeth and digestive apparatus show that he combines the capacities of the three classes of animals—the fruit, grass, and flesh eaters. He leads the animal world in his capacity for assimilating all kinds of food—which shows, they argue, that it was intended he should be a great feeder. A cow has no power to import mo lasses into her pasture, or to make a plum pudding. Yet man has, and he can do it safely. But the doctor denies both the fact and its conclusion. He quotes from Cuvier, who says that "the natural food of man is fruit, roots, and the succulent portion of vegetables. His weak jaws and small canine teeth would not allow him, in a state of nature, to live on herbage or flesh." He alludes to the three tests which should determine the food for man—first, the make of his teeth; second, the make of his digestive apparatus; third, the eating habits of the kinds of animals nearest man. And he contends that these three marks show that man was intended for a vegetable eater. First, the teeth. The fore ones in carnivorous animals always meet. In man they do not meet, but overlap, as in all fruit-eating creatures. Besides, they are not strong, as the lion's or wolf's: but weak, as with the fruit eaters. Second, the side teeth are not long and projecting, as with the carnivorous, who thus can seize their prey; but are short, as with the fruit eaters. Third, the back teeth of man have the grinding motion which the fruit and grass eaters have, but which the flesh eaters do not have. Then they meet squarely. But those of the carnivorous overlap, so as to act as shears in cutting the flesh. Then they are not notched, as the carnivorous orders require in order that they may hold their food while eating it. In fact, he remarks that all omniverous quadrupeds, like the bear, the raccoon, the opossum, the hog, have no lateral motion to their back teeth. But man, in common with the cow and fruit eaters, has this peculiarity. Second, the form of the digestive apparatus. This, with the grass eaters, is always long and complex. With the flesh eaters, always short and simple. With the fruit eaters, as to length, it is intermediate between the two classes; as to simplicity, not so simple as the flesh eaters, not so complex as the grass eaters. But man has precisely the peculiarity here of the fruit eaters. His intestines are not short, like the flesh eaters; nor complex, like the grass eaters; but intermediate—showing, therefore, that he was meant to eat the grains and fruits. It is true, as the doctor remarks, some cows and horses have been known to eat and relish oysters and fish. But this fact does not show an original intention. But if a complex diet brings disease, as it always does to these animals, if the distillery-fed cow has her teeth diseased and crumbling, like those of the over-fed urchin, we must reason in the same way as to man. Third, the eating habits of the animals next to man. Now what animals are most similar to him, in make, in teeth, in digestive apparatus? The gorilla, the ourang, the chimpanzee. Teeth and intestines are similar. But these are all, with our other monkey friends, *fruit* eaters. Flesh is detrimental to their health. Now if all these facts do not show, as the doctor is inclined to think they do, that men and women are meant to be grain eaters *exclusively*, they certainly do show that we were not meant to be Falstaffs with unbounded stomachs. They do show that we were intended for simple food, like corn, or the apple or the potato; and that such food is compatible with high health. As the rejoicing invalid said, "If man could only know the inspiration that will come from the feed of rye porridge and oatmeal tea, he would pay higher prices for that than for the gorgeous lunch." They do show that our vast varieties of food, though produced by that glory of man, woman, are slightly demoniac in their origin and results.

We have hinted that often disease in its varions forms could be traced to an unhappy digestion and the contents of the stomach. The doctor is sure of this cause, though not so wild as to think it the only one. Now all know the weak saws that a man will whine out when his lungs, nerves, or stomach, are in bad trim. "Oh! it is my poor constitution!" The poor constitution has to take it. "Confound these lungs! they were never good for anything. I inherited bad nerves from my good mother." (Not a very shining compliment). But the doctor would say, "Friend, your digestion may be at the bottom of part of the trouble." Don't be too fast. And to show this he proceeds to pile up a small mountain of cases, illustrating how diseases far off from the stomach can be reached at that pampered center. We will give a few of the cases. A lady teacher. For two months in constant nausea, utterly prostrated. A good emetic made her digestive apparatus give up the green leaves of some dandelions which she had eaten six weeks before. Presently got well. A fat old gentleman. Would have sharp cramps in his feet, and at times convulsions. The doctor would instantly relieve him by a little medicine administered to his sinning stomach. Dr. Wollaston, the English scientific man. Had once a most violent pain in his ankle. Presently he threw up a large ice cream, and the pain departed. A woman blind for three and a half months. Slight doses of guaiacum administered to the stomach brought back her sight in one week. A gentleman with terrific pains at the heart, an intermittent pulse, was sure his heart was diseased. His doctor, in one attack, sounded his stomach, found in it the greater part of a roast chicken. The chicken removed, heart all right. Then the common case of a cold. It is known that after eating there is always a secretion of mucus in the lungs and their tubes. And, with some not overhealthy, the secretion is apt to be very large. A very fat fowl, therefore, will often make a very foul throat. Cleanse the stomach, probably, and the cold will often and at once yield. A lady with disease of the liver. Often with most acute, fierce pains from the jaundice. Once, after a long cessation of pain, a single mouthful of her "pet ham" brought back the entire round of troubles. The ham subdued, she became all right. A lady who entirely lost her voice—of a very costive habit. A successful treatment of the digestive organs (reached through the kidneys, which were also sluggish), by a single dose of medicine, brought back almost instantly her voice. A young child, always ailing, weak, irritable, stupid, body covered with sores, with most voracious appetite. The greater the quantity of food, the greater the appetite. A diet exclusively of baked apples was commenced. Soon the passion, stupidity, voraciousness, sores, disappeared. A perfect recovery. A person fearfully afflicted with ulcers. No remedy. Cured through the stomach by a diet of bread and water. Asthma. A gentleman had a severe form of it. Seven bad attacks in six months. Dosed with morphine, etc. Cured perfectly by a spare bread-and-water diet, and in a short time. Dr. Gregory suffered from an attack of palsy. Several light shocks. Was of full habit. Turned about in his diet. Lived exclusively on bread, milk, vegetable diet, and in moderate quantities. Got well. Lived thirty years to be ninety-three. A case of epilepsy of fourteen years' standing. Violent medicines given, including arsenic. Treatment through the stomach. Milk and crackers. Recovery perfect.

Now we have reluctantly gone through with this dismal catalogue to show a great truth: that often, after raking heaven and earth to reduce a disease located far away from the unsuspected stomach, a proper treatment at that vital point will do the business. We could give many more such cases, for the doctor's book seems to sport with them. He runs them off as a Yankee does whittlings from a stick. But these are enough. We shall be glad if they teach sound sense. Tell us to seek causes where causes belong.

We concede that the teeth of man indicate that the natural food of man, *in his natural state*, is vegetable; but there is pretty good reason to believe that man is not living in his natural state, but in one much more elevated in all respects. In this state he needs many things easily dispensed with in his primitive condition, and a great physiological mistake is made by those who write upon the laws of health, if they ignore this fact. Hence we cannot fully concede that a strictly vegetable diet is what man needs in temperate climates, but we are quite ready to admit that many eat too much not only of meat but every thing of which they happen to be fond, and that this excess is the fruitful cause of disease. Having made this admission we shall continue to order our beefsteak for breadfast as usual, and so we judge will most of our own and Dr. Mussey's readers.

Archeological and Geographical.

Putnam's Monthly for February gives the following items of interest:

A CURIOUS discovery, kept secret for fourteen years, has just come to light at Ravenna. The workmen engaged in digging a canal near the present railroad station, in 1854, found a skeleton with a breastplate of fine gold buried face downward. The precious piece of armor, which weighed six pounds, was broken up and the pieces secretly sold to jewelers. Two larger pieces, which appear to have been the shoulder bands, and are covered with chasing and enamel, have been given up by a jeweler in Faenza, but the remainders are probably lost. It is known that Theodoric buried the body of Odoacer, after his murder at Ravenna, face downward; and the Italian antiquarians suppose that this golden harness is really that of the first king of Italy.

A *Biblia Pauperum* is offered for sale in Augsburg, printed in the year 1420, from engraved wooden blocks; it belongs to the xylographic works which preceded and no doubt suggested the invention of printing. The illustrations are excellent specimens of medieval art, both in composition and engraving. Very few copies of this Bible are known to exist.

A MOST important archeological discovery has recently been made at Hildesheim, in Germany. Some soldiers who were digging rifle pits for a target shooting, came upon a quantity of silverware—enough to fill three wheelbarrows—all of the finest workmanship. There were vases, drinking cups, dishes, and candelabra, richly chased, in a style which was at first conjectured to indicate the Renaissance period. The fact that the field where they were found is still called "Pappenheim's Camp," led to the belief that they had belonged to that famous commander of the Thirty Years' War: but a closer examination has revealed the ancient Roman marks of weight and fineness of metal on many of the articles. As Hildesheim is not more than thirty miles distant from the *Winnefeld*, where Varus and his legions were annihilated by the Cheruskian chief Herrmann, in the year A. D. 9, it now seems probable that these spoils once belonged to the Roman general. The finest and best preserved article is a vase, twenty inches in hight, resting upon four griffins, between which are figures of boys in the act of spearing sea-monsters. There are two shallow dishes, one of which has a relief of a sitting Minerva, the other the infant Hercules strangling the serpents. Some of the drinking vessels are eight or ten inches in hight, the cups surrounded with wreaths of laurel, between which are masks, or the heads of animals. The last accounts from Germany say that Dr. Bendorf has succeeded in deciphering twenty-four inscriptions on the vases, which will shortly be published in the *Archeological Journal* of Gottingen.

GERHARD ROLFFS, the African traveler, has set out for Tripoli, whence he will forward by caravan the presents from the King of Prussia to the Sultan of Bornou. They consist of a gilded throne, a carriage, and weapons of various kinds. Afterwards, Herr Rolffs will spend three or four months in the exploration of the Cyrenaica—"the parts of Libya about Cyrene"—and the oasis of Jupiter Ammon. He is accompanied by an experienced photographer, and intends to make a complete series of views of the interesting Grecian, Carthagenian, and Roman ruins, which have heretofore been only very superficially explored.

THE discoveries made by the American Consul in Larnaca, Cyprus, are attracting the attention of archeologists in Europe. The identity of the modern village of Dali with the ancient Idalium is thereby established. It seems that the Consul was led to make excavations by the reports of a peasant living near the spot. The result was, the discovery of an ancient Greek necropolis at a depth of only three feet, under which were older Phenician graves, oven-shaped, and closed with great blocks of stone. In some of them were found vases with Phenician inscriptions and statuettes of women. The spoils of the Grecian tombs are exceedingly rich. Among the articles are golden necklaces and ear-rings, silver bracelets, copper, and bronze battle axes, lance, and spear heads, mirrors, tripods, coins, medallions, gems (especially of amethyst, ruby, and agate), glass vessels, statuettes, busts, and a great quantity of objects in terra-cotta. Many of the painted vases are three feet in hight. What disposition will be made of these treasures has not yet been announced.

AVENCHES, in Switzerland, is the ancient Roman Aventicum. Among its remains are traces of battles, a temple, a circus, and theater, from which the inhabitants quarry blocks for building from time to time. As M. Fornerod was digging in his field for building material he came upon a block of marble weighing more than a thousand pounds, upon the side of which, in a sunken panel, was an exquisite bas-relief, in perfect preservation. It represents Romulus and Remus under the wild fig tree, the she-wolf giving them suck, the nest of magpies, the laurel tree, and, finally, the sentinel goose. Connoisseurs who have seen this sculpture pronounce it one of the very finest of ancient art.

PROFESSOR NORKENSKJOLD, of the Swedish Polar Expedition, reports that after four desperate attempts to penetrate the ice, the violent storms and increasing cold obliged the expedition to return. The highest latitude reached was 82 deg. 42 min., which surpasses that attained by Parry. The Professor says: "During a cruise of a month and a half along the parallel of 82 deg., we have obtained admirable and unexpected results, concerning the temperature and ice-formation of the polar basin." All accounts agree that the amount of ice in the polar waters last summer was greater than ever before known.

PETERMANN'S *Mittheilungen* publishes a most interesting account of the land of the Njamnjams, and the southwestern watershed of the Nile, given by Piaggia, an Italian, and the French brothers Poncet. These travelers have penetrated to long. 24 deg. E.—seven degrees west of the White Nile, and nearly to lat. 1 deg. N. They have established the fact of the existence of another immense lake, lying on the equator, out of which flows a river, Babura, in a northwesterly direction, towards the Benui and Lake Tsad. Piaggia spent nearly two years among the Njamnjams, who are tailless, but cannibals. He was kindly treated by the chief, and was only prevented from reaching the new lake by civil wars. The account is one of the most important recent contributions to the geography of Central Africa. It is accompanied by a map of the region, by Dr. Petermann.

Management of Street Cars.

The following suggestions in regard to stopping street cars at stated intervals, extracted from Mayne Reid's new periodical *Onward*, meets with our entire approval: "The idea may not be new; but if adopted, we venture to say, it will give convenience to all—sparing the patience of the carried, and the strength of the creatures that carry them.

"Every one who rides in a street car must have observed two things; that there is a great deal of unnecessary delay caused by the frequent stoppings; and that it is these that try the sinews of the horse. It is not 'the pace that kills,' but the oft-repeated 'startings.' There are, therefore, two questions; one of convenience, the other of humanity; and both may be satisfied by a contrivance so simple as not to cost the corporation a single dollar—beyond what they may charge for the passing of an ordinance.

"This ordinance can be expressed in less than twenty words, thus: "Street cars to pull up (if required) at every second street from their last stopping place—but not between."

"Of course we refer to the cross streets—those carrying numbers.

"Let us look into the matter, and see how this regulation would work. There can be no great diffiulty in coming to a conclusion.

"It would surely not be asking too much of the would-be-passenger in a street car to walk one block before getting in? It is only two hundred feet, and this is the longest distance required of him to play pedestrian, in fact the longest possible, for whether he step out of his own door, or come in from a cross street, he will be within two hundred feet of a stopping place, one way or the other.

"He goes then to the right or the left, whichever seems most convenient, and arriving at the known station, remains there till the car pulls up, when he gets in along with a knot of others who like himself have been in waiting.

"This method can cause no extra delay. On the contrary, the living freight will be taken in quicker than if caught up in driblets, each taking some time to scramble over slippery stones, and climb up the platform of the often awkwardly-placed car.

"And just as time is gained in the collection of the live parcels, so will it be in their delivery—by their getting out in batches instead of being dropped here and there in odd lots.

"He must be indeed dull who does not perceive the advantages of this arrangement; and lazy, or something worse, who would not work two hundred feet to aid in carrying it out. By doing so, he will not only accommodate others but himself, for the time saved would be alike beneficial to all. And above all would it benefit the poor horses, whose terrible contortions at each fresh starting is a sight sufficiently painful—even to those less sensitive than the humane Mr. Bergh.

"With most, the saving of time would no doubt be the great question; and this should be enough to influence the obtaining an ordinance. Merchants, of a morning, intending to go down town, could swallow their breakfast without burning their throats, while their clerks, preceding them, would keep better time at the counting house."

Rat Proof Buildings.

Can no one invent a style of building which shall be rat-proof? We have water-proof compositions for roofs, heat-proof material for walls, and fire-proof structures for the starvation of insurance companies and the disbandment of fire companies, but, thus far, no one has invented a mode of keeping rats out of buildings. And every year the plague of rats increases. They are like the flies, "if you kill one, a hundred will come to its funeral." They are increasing in numbers in Chicago at a fearful rate, and, unless something can be done, ere long they will assume the aggressive, and drive out the human population.

We heard only last week of a workman in one of our city elevators who essayed to ascend the upper flight of steps in the structure, and had mounted but half the distance when he saw on the top step seven or eight large rats; another step, and they turned round toward him in single rank, like infantry forming to receive cavalry. Another step, and no sign of retreat on the part of the rodents; he was afraid to proceed; he went back. It was only after he had beaten the top of the steps with a long stick, from the bottom, that the man dared to complete the ascent.

Chicago is peculiarly adapted to the multiplication of rats. The lumber used so largely on buildings and sidewalks affords them hiding places from which it is almost impossible to dislodge them, while our immense stores of grain form an extraordinary alimentative attraction. The peculiar needs of the situation stimulated inventive ingenuity in the matter of constructing swing bridges and moving ponderous buildings, perpendicularly and laterally. Is not the *gnawing* necessity great enough to incite the formation of some plan to protect ourselves and our homesteads from the plague of rats.

Even if it should not be necessary to fight down the rodents as a measure for the preservation of our lives, it is highly important to do it from economical motives. The rats which swarm in almost unaccountable numbers in our grain elevators and flour mills, and go out in troops with every grain-laden vessel, devour in the aggregate vast quantities of breadstuffs in the year. Ten rats consume as much as a human being, outside of the sustenance which they gain by eating each other. It is not too much to assume that ten thousand rats live in and around each of our seventeen elevators, consuming, in the aggregate, as much as would sustain the lives of seventeen thousand persons. Add to this the loss in flouring mills, and we have an aggregate loss of at least ten per cent of the amount of food necessary to feed the entire population of Chicago. Put this into figures, and the loss aggregates four hundred thousand dollars yearly. These figures will be fully doubled by the abstraction from the stocks of dealers, from the stables, and from the household stores, of all descriptions of food.

The man who will invent some plan of construction, which shall render a building rat-proof will confer an immeasurable boon on the community, and make a fortune for himself and his children's children.—*American Builder.*

Transparent Colors.

There are several colors that are natural transparents; others that may be made so by mixture.

The transparent colors are Terre de Sienna, Asphaltum, Dragon's Blood, Carmine, Rose Pink, Chemical Brown, all the Lakes, Gamboge, and all the Gums.

Semi-transparent—Umber, Vandyke Brown, Chrome Red, Emerald Green, Brunswick Green, Ultramarine, Indigo, Verdigris.

Remarks.—These colors should be ground very fine and spread on evenly.

If to be shown with a strong light two coats may be given; but if a subdued light one coat is better.

Transparent colors are purer if elutriated; that is, ground fine in water; let it settle; pour off the top part of the settlings; mix that up with more water; let it settle, and take the top half of that, which will be free from all sand and grit. If the pure part of the pigment, however, should be the heaviest, discard the top and use the bottom of the sediment. Usually, however, the purest coloring part settles upon the top.

Any of these colors will work more evenly, and be more transparent, if a small quantity of water be mixed while grinding.

Turpentine makes transparent colors work crumbly.

Bleached boiled oil, or white varnish, is the best vehicle for flowing evenly. Raw oil does very well, only that transparent colors are always difficult to dry.—*The Painter's Manual.*

Prevention of Mildew in Cotton Goods.

An investigation recently held in England upon the subject of the occurrence of mildew in cotton goods on shipboard, has resulted in the recomendation of the following means of preventing it: In the first place the size should be perfectly fresh—that is, not made from moldy flour, nor permitted to become either moldy or sour before use. This is absolutely necessary to prevent the formation or deposit of the spores or germs of mildew. It should also be free from extraneous mineral matters and especially deliquescent substances, which, however good the size may be in other respects, would attract moisture, and thereby contribute the only requisite (all others being present) for the development of fungi or mildew. In the second place, the compartment of the vessel in which the goods are stored should be well ventilated and heated. Shippers can, it is believed, obtain from the seller a guarantee of the purity of the size. If not, however, they have an easy remedy in their own hands. Any analytical chemist can with facility, in comparison with an equal weight of a standard piece of cloth, determine the purity of another piece. This can be done in a simple and almost mathematically correct manner, and, therefore, reliably for commercial purposes, by thoroughly drying, say fifty grains of the cloth, and noting the loss in weight, that is moisture, then igniting and weighing the ash. Indeed, for all practical purposes, merely igniting, weighing the ash, and comparing its weight with that of the standard would be sufficient. The increase over the standard multiplied by two, would give the per centage of mineral adulteration of the size. All the salts liable to be driven off by ignition, are too expensive to be used as adulterations. Inquirers into the size of the sale of adulterations for size, have ascertained the fact that Epsom salts are regularly sold for size admixture. One hundred and fifty tuns of th's substance are disposed of weekly in Manchester for this purpose alone. This is a ponderous quantity, and its statement will be advantageous to those who are financially interested in the matter. Commercial magnesium sulphate, moreover, contains 51·21 per cent, of water, while, owing to its contamination with foreign salts, it is deliquescent, or attracts moisture from the atmosphere, without which fungi or mildew cannot exist. There are mineral substances that can be adopted with safety and if size adulteration must prevail, they should at once, at least for India goods, be substituted for Epsom salts.—*New York Mercantile Journal.*

WITHOUT SLEEP.—Five young men in Berlin lately made an agreement, for a wager, to see who of them could keep awake for a whole week. They all held out for about five days and a half, by drinking largely of strong coffee, and keeping up a constant round of active exercises and exciting amusements. At the end of that time two of them yielded to drowsiness; a third soon fell asleep while riding, tumbled from his saddle and broke his arm; a fourth was attacked by severe sickness, and compelled to retire from the list; the fifth held out to the end, but lost twenty-five pounds of flesh in winning the wager. Long ago, Frederick the Great and Voltaire made a similar experiment, making use of the same stimulant of strong coffee, but they did not succeed in driving away sleep for more than four days.

OBITUARY.

Mr. Elbert Perce, a literary gentleman, as well as an inventor, and formerly an esteemed client of ours, died recently at his residence in Brooklyn, aged thirty-seven years. He was well known in literary circles as the author of the "Battle Roll of the Wald," and other works, and he was the inventor of the "magnetic globes," so well and favorably known to educators throughout this and other countries. He was a highly accomplished gentleman, and his amiable character gathered about him a host of warm friends, who will mourn, together with his afflicted family, his untimely end.

Specimens of Large Belts.

Messrs. Hoyt Brothers of Nos. 28 and 30 Spruce street, New York City, have lately finished two very large belts, a portion of an order for the American Print Works of Fall River, Mass. One is 228 feet long and 38 inches wide, double; the other 107 feet long by 36 inches wide, also double, each about five-eighths of an inch in thickness. Weight of the larger belt 1,998 lbs., and of the smaller one 810 lbs. One hundred and fifty of the choicest "buts" were selected from 3,000 hides, themselves sorted from about 9,000. The leather of these belts is wholly from domestic cattle, and tanned with oak bark only, at the tannery of the company in Cumberland, Md., no extraneous acids or hot liquors being used. At first price the value of the largest belt mentioned would amount to over $2,800. The material and workmanship are certainly creditable to the manufacturers.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

TIE SPOTTING.—The Chief Engineer of the Chicago, Burlington & Quincy Railroad, has invented a machine for "spotting" railroad ties. Tie spotting is cutting down the end, so that the outer part is a little higher than the inner, so that when the rail is laid it will incline inward. By placing a rail in this position, when the wheels of a car are run over it, the whole face of the rail comes in contact with the face of the wheel—a car wheel is always beveled; this distributes the friction over a greater space and of course reduces the wear. The machine is being made at the Aurora shops. The Aurora *Beacon* thus describes it: When finished, the machine will come out an engine on the track, run 200 miles a day, to where the track is being laid, or a pile of ties in readiness; the engineer will jump off, disconnect the connecting rods from the drivers, attach them to another wheel, start his machine, and as fast as four men can place ties on the little table, they will be carried by an endless chain under the knives, revolving 1,600 times each minute, and pass off the other side ready for the rails, each one the same in inclination.

It is stated that there are now before the Senate, lying on the table or referred to committees, no less than one hundred and ten bills, asking aid for the Pacific routes or connecting lines in the Territories and Pacific States. In the House there are one hundred and twelve pending. An approximate statement puts the amount of the bond subsidy asked for at about $250,000,000, and the land grants at 120,000,000 of acres.

A rigger, aged 85, recently walked from Duxbury to Kingston, Mass., worked hard all day, and in the afternoon rigged the masts and crossed the royal yard of the vessel, working 120 feet above the water. Sam Slick would say he was rather spry for his age.

One day last week the rollers in the eight-inch mill at J. Painter & Son's works, in West Pittsburgh, Pa., with one heating surface, made twenty-one thousand and forty-seven pounds of three-eighths inch round iron in eight and one-half hours.

ENORMOUS ROLLS.—The Birmingham (England) *Post* describes the casting of a pair of rollers weighing 18 tuns each or 36 tuns the pair. They are 15 feet 6 inches long and about 36 inches diameter, the largest in the world.

A bar of pure merchantable tin, weighing 85 pounds, has been turned out in San Francisco from ore from a tin mine at Temescal, San Diego county, California.

The works of the Williams Silk Manufacturing Company, at East Bridgeport, Conn., have been sold to a firm who will henceforth use them as a hat factory.

The expressage of a single edge tool manufactory in Waterville, Me., amounted in November to $54,462.

It is reported that mills for the manufacture of prints are soon to be built at Paducah, Ky.

The Columbia and Augusta Railroad is now completed to Graniteville, on the South Carolina Railroad.

Salem, Mass., is to have a new ship yard and a modern marine ship railway.

NEW PUBLICATIONS.

THE MONTHLIES.

The monthlies for February have mostly all come to hand. The ATLANTIC, always good, gives, among other lighter matter, a powerful article on "English Ritualism;" an essay on "The New Education," in which the relative merits of scientific and classical training are discussed, the success and failure of different scientific schools in the United States reviewed, and some valuable suggestions made. An article entitled "Birth of the Solar System," in which an entirely novel and most remarkable cosmical theory, which we think may, and probably will be severely handled by the philosophers, and the second part of the essay on "Consumption in America."

The ECLECTIC has outdone itself in its present issue, and deserves to be ranked at the head of all periodicals of its class published in this country. Its selections are of the highest character from beginning to end.

In PUTNAM'S MONTHLY, which fully sustains its excellent character in this number, we find a well-written article on "Work, Wages, Combinations," etc., which we consider as weak in logic as strong in rhetoric; "A Sermon at Notre Dame" is a splendid article, in our opinion the best thing in this number.

In the GALAXY the best things are "Coffee and its Adulterations in New York," and "The Grammarless Tongue," in which latter many excellent points are made and some mistakes. The circulation of the "Galaxy" is rapidly going up.

By the way, why do not publishers cut the leaves of their publications? It costs next to nothing to do it with the proper machinery, and it is a real annoyance to perform the cutting by hand. Most certainly if pausing before a news-stand we were about to choose a magazine, we should incline to the ATLANTIC OR GALAXY rather than to one of equal merit with uncut leaves.

SECRETS OF BEE-KEEPING. By K. P. Kidder, Practical Apiculturist, Burlington, Vt.

This is the title of very entertaining and instructive little volume of 182 pages. Nothing in the insect world has attracted greater attention from the student of nature than the habits and marvelous instincts, if instincts they are, of the honey bee. The work before us seems to be admirably adapted to the wants of bee-keepers, especially those who have not a large experience to guide them in the care of these diminutive but industrious workers. The price of the work is seventy-five cents, and may be obtained of the author.

THE AMERICAN YEAR BOOK AND NATIONAL REGISTER FOR 1869.

Messrs. O. D. Case & Co., Hartford, Conn., proposes soon to publish the above named work, which will embrace a great variety of information—astronomical, historical, political, financial, commercial, together with a general view of the United States Government, with educational, religious and industrial statistics. It is intended to be a permanent work, and will be valuable to every citizen. The work will be sold by traveling agents.

THE TEXAS ALMANAC FOR 1869, AND EMIGRANT'S GUIDE. D. Richardson, No. 12 Barclay street, N. Y.

This work contains a great deal of information concerning the climate and resources of Texas—useful to persons who desire to emigrate to that State.

THE ARCHITECTURAL REVIEW AND BUILDERS' JOURNAL.

The seventh number of this excellent periodical is at hand. It fully fulfills the promises made in its prospectus, both in character of the matter and typography. Its department of Practical Carpentry and Joinery is alone worth the subscription price to any mechanic; while its general articles on all subjects connected with architecture are carefully and skillfully prepared by a master hand. The high character of its designs is admitted by all who examine them. Published by Claxton, Remsen & Haffelfinger, 819 and 821 Market street, Philadelphia.

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; beside, 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 advertisemets at $1 00 a line, under the head of "Business and Personal."

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

J. G., of N. Y., asks "what is the rule in relation to the employment of eccentrics and cranks, a given amount of motion and power being required, which is preferable? and in what cases is one better than the other?" The eccentric is a modification of the crank. A steam engine may have its reciprocating motion converted into rotary by an eccentric instead of a crank, as some foot or treadle lathes are driven; but while the crank, to produce the slight throw required for this purpose, could not be easily attached to the main shaft the eccentric could. Both crank and eccentric are means of transmitting rotary into reciprocating motion and *vice versa*, and the choice of either of these means is to be governed entirely by the circumstances of the case.

A. R., of D. C.—The sum of the latent and visible heat of steam is found by adding the latent heat 967°·5, to the visible heat 212°. It is strictly 1179°·5, or in round numbers 1180° as given by Professor Silliman in the lecture referred to.

W. E. B., of Pa.—The circumference of an ellipse is found by adding together its major and minor diameters, dividing by two, and multiplying the quotion by 3·1416. Any of the ordinary text-books on Geometry will serve your purpose.

A. M. W., of Conn.—To make paint dry quick, use a large proportion of Japan varnish in mixing.

D. L. P., of Pa.—To polish raw wood there is nothing better than shellac dissolved in alcohol rubbed in thoroughly with a rag until dry. The solution should be quite thick, as that will save labor.

F. A. C., of N. H.—We think there can be no doubt that the impetus of a shot is greatest at the instant of its leaving the muzzle. If experiment should prove that its penetration is greater at a distance than near the muzzle, it must be due to other circumstances than its initial velocity.

M. A., of Ky.—All patented methods, the one you refer to among the number, are the exclusive property of the patentee. For a right to use the one of which you speak, address the patentee. Women may produce many useful as well as beautiful articles of household convenience with twigs, dried leaves, pine cones, seeds of vegetables, bark, roots, etc., twine, glue, varnish, a pocket knife, and a pair of scissors. Not a very extensive or expensive stock, but capable of being wrought and combined into very elegant articles. Natural taste and patient application will suggest patterns and insure success.

J. S. M., of Me.—We do not think that a properly tempered band saw is peculiarly liable to break. The fact that they are used for sawing iron would seem to preclude the idea of their easy breaking. There are no patents on the band saw. It is an old device, beyond the reach of patents, except for its adaptation to particular work, or some peculiar arrangements of its accompanying parts.

C. G., of Ohio.—Gum Dextrine or British Gum is the substance used for gumming envelopes and stamps. You can purchase it ready made or can make it yourself, by adding to starch 11–4000 of its own weight of strong nitric acid, diluted with water enough to moisten the starch, drying the mass, by a very mild heat, pulverizing coarsely, and heating in air raised to 160° Fah., pulverizing again finely, sifting, and finally reheating to 228° Fah. This process will give you a fine article. To use it dissolve in water to the proper consistency.

N. C. B., of Canada.—No definite rule can be given for proportioning irons for castings, as the proportions must vary according to their thickness. A thin casting will be very much harder than a thick one of the same composition. Judgment matured by experience must be your guide. The more old iron you mix with the pig the harder your castings will be. For machinery never use less than about twenty-five per cent, nor more than seventy-five per cent of old metal, and between these extremes you will by experiment find the proportion required.

Recent American and Foreign Patents.

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

PLOW.—Joel H. Jones and Henry P. Jones, Herndon, Ga.—This invention comprises several important improvements in the manner of constructing plows, among which may be mentioned a new construction of the swingletree, a new form of plow standard, a new method of bracing said standard, a new form of the plow handles, a new mode of fastening the handles, standard, and beam, and a new form and arrangement of harrow to be used in connection with the plow.

WASH BOILER.—W. D. Hillis, Elgin, Ill.—This invention relates to that class of wash boilers in which the steam generated in the lower parts of the vessel is made to force a column of hot water up and discharge it upon the clothes, and the present improvement consists in a new form of the piece which is placed in the boiler to confine the steam and direct the upward current of water.

COMBINED BOOT HEEL AND SPUR.—C. F. Woodruff, Newbern, Tenn.—This invention is a neat and simple combination of metallic boot heel with sheathed spur, the parts being so constructed and operating that while the spur will always be in place and ready for use, it will not be in the way of injuring the clothing, carpets, etc., or of receiving injury from stones or from the pavement.

SHEET METAL CAN.—Conrad Seimel, Greenpoint, N. Y.—This invention relates to new and improved method of fastening the tops and bottoms of sheet metal cans, and it consists in the peculiar construction of the joint for the purpose, so as to form a rigid, firm, and tight connection, at slight expense and with but little labor.

HORSE SHOE.—H. S. Hitner, Marble Hall, Penn.—This invention relates to that class of horse shoes in which a plain curved plate without calks, is fastened to the hoof, and to this plate the shoe, bearing either sharp or dull calks, is attached by means of screws. This improvement relates to a new device for strengthening the shoe and attaching it to the curved plate more firmly than has been done heretofore.

GEOGRAPHICAL GAME.—Levi Branson, Raleigh, N. C.—The object of this invention is to produce an interesting and agreeable game, the successful playing of which shall depend entirely upon the skill of the player, and which cannot be played by any one without his acquiring thereby a vast amount of correct information as to the conformation, extent, population, and resources of the geographical divisions and subdivisions of the earth, or of some particular continent, nation, or territory thereof.

BRICK MACHINE.—David Packard, St. Joseph, Mo.—This invention relates to a new and improved machine for molding and pressing bricks, and it consists in a peculiar construction and arrangement of parts.

BEE HIVE.—Calvin R. C. Masten and Abram D. Van Vlack, Pleasant Valley, N. Y.—This invention relates to a new and improved bee hive, and it consists in a novel construction and arrangement of the same.

CULTIVATOR.—J. H. Coleman, Columbia, Mo.—This invention relates to a new and improved cultivator for plowing or cultivating crops grown in hills or drills, and it consists in a novel construction and arrangement of the plows or shares and manner of applying the same.

GAS REGULATOR.—Samuel P. Mervine, Philadelphia, Pa.—This invention relates to a new and improved method of regulating the pressure of gas, and it consists in the arrangement of a float in a gas holder, which float is provided with a hollow perforated valve and certain gas apertures and gas channels.

BRAKE BLOCK HOLDER.—Arthur W. Dorr, Lake Valley, Cal.—This invention relates to a new and improved device for securing brake blocks to the brake bars of railroad cars, whereby the blocks are firmly held in position, old ones readily removed, and new ones secured in their place.

BREECH-LOADING FIREARM.—Henry Carter and George H. Edwards, Stepney, England.—This invention is chiefly applicable to that class of breech-loading firearms which close with a sliding rotating bolt provided with a projecting hand lever.

BURGLAR PROOF LOCK.—G. W. Dana, Racine, Wis.—This invention relates to a burglar proof lock, and is improvement on a lock for which Letters Patent were granted bearing date December 27th, 1859.

TEA-KETTLE.—Joseph H. Downing, Healdsburg, Cal.—This invention relates to a new and useful improvement in kettles for boiling water and other liquids, and it consists in attaching to the handle or bail of such kettle, straps or pieces of metal, in such a manner that the lower ends of such pieces will rest on, or nearly on, the cover of the kettle when the bail is in a vertical position, and so that when the bail is turned down the cover can be removed.

MACHINE FOR GRINDING THE SICKLES OF HARVESTERS.—Milton Fowks, Leeds, N. Y.—This invention relates to a new machine for sharpening the cutter bars of mowing and reaping machines, and consists in the arrangement of machinery for imparting combined reciprocating and rotary motion to the grindstone, so that it will move along the cutting edges and at the same time sharpen them. The invention consists also in beveling the grinding edge of the stone towards both sides, so that it will at once grind two diverging edges of the sickle. The invention also consists in providing for the vertical adjustment of the stone so that it may be lowered when worn smaller by use.

STOP-COCK.—H. P. Kreiner, Berlin, Prussia.—This invention relates to a new manner of making the spigot or stopper of a faucet or tap fit tight in its seat, and consists in making such spigot or stopper of two or more longitudinal pieces or sections, which are pressed against the sides of the enclosing pipe by means of springs interposed between them. By this invention the spigot will always be perfectly tight, even when it is somewhat worn and will not be liable to get out of order.

GENERATING HEAT BY FRICTION.—Pedro Vera, Bogota, United States of Colombia.—This invention consists in revolving metallic disks in contact with metallic diaphragms; said metallic disks and diaphragms being combined and arranged in one or more columns, or series, and confined in a properly constructed shell or casing.

THILL COUPLING.—Rutland M. Garrettson, Sag Harbor, N. Y.—This invention relates to the manner of attaching the thills of a carriage to the axle, and it consists in forming a divided clip for the thills, and in securing the same by a screw bolt.

SURGICAL INSTRUMENT.—Silas J. Howell, Orange, Mass.—This invention relates to an instrument for extracting bullets in the treatment of gun-shot wounds, and for other purposes, and consists in operating expansible lever jaws by a rod sliding through a tube and forced against a spring.

CAR BRAKE.—James H. Beatty, Franklin, Penn.—This invention relates to an improvement in brakes for checking or stopping railroad cars or trains when the same are under motion, and which brakes may be applied to land carriages if desired. The said improvement affording amost efficient and expeditious means for stopping railroad cars.

STRAW CUTTERS.—Charles H. Brown, Bloomingburg, N. Y.—This invention has for its object to furnish an improved machine for cutting straw, hog corn stalks, vegetables, etc., which shall be simple in construction and effective in operation, and which may be easily adjusted to cut the straw, hay, or stalks of any desired length, or the vegetables of any desired thickness, whether said vegetables be large or small.

STOVEPIPE SHELVES.—S. J. Anderson, Cazenovia, N. Y.—This invention has for its object to furnish a simple, convenient, adjustable, and detachable device for attachment to stovepipes for the reception of dishes or other things that may be desired to be kept warm.

COMPOSITION FOR PAINTING STONE COPING, ETC.—James Judge, New York city.—This invention has its object to furnish an improved composition for painting stone coping upon roofs, in areas, and in other situations, which will make the joints perfectly water tight, and will be unaffected by changes of temperature.

BOX SETTER FOR WHEEL HUBS.—F. W. Dexter, Randolph, N. Y.—This invention relates to the boring out of a conical set in wagon hubs, to receive or "set" the axle box therein; and combines a number of devices which conduce to provide a more convenient and desirable apparatus for the purpose than has heretofore been known or used.

RULER AND COURSE INDICATOR FOR NAUTICAL PURPOSES.—Reuben A. Briggs, New York city.—This invention relates to a new apparatus for laying down the course of vessels, and for finding directions on charts. It is so arranged that it can also be used for a ruler. It consists in pivoting a protractor to a rule, so that when the edge of the rule is placed between the required points of the chart, with the center of the protractor upon one of the meridians or lines of latitude, the direction of the rule on the chart, and the course to be steered will be readily obtained by means of the protractor.

APPARATUS FOR SMOKING MEATS.—Robert Thornton Burnett, Port Jefferson, N. Y.—This invention has for its object the construction of a smoking apparatus for all kinds of meats, in which all the smoke of a fire may be utilized for the desired object.

MANUFACTURE OF WROUGHT IRON.—T. C. Coleman, Louisville, Ky.—This invention relates to an improved process for the manufacture of iron and consists in the manner of mixing and combining iron cinder or other flux with molten pig metal previously to working it into puddle balls.

DRILLING AND BOLT TAPPING MACHINE.—Chas. W. Coe, Fentonville, Mich.—This invention consists in a new and improved means for feeding the drill or screw-cutter to its work, whereby much friction is avoided and a very desirable implement obtained.

KNITTING MACHINE.—G. M. Patten, Bath, Me.—This invention consists in an improved arrangement of means for reversing the movement of the reciprocating comb bar; also an improved arrangement of means for operating the looper; also an improved method of operating the index mechanism by frictional contact with the comb bar, and also several other improvements of details.

CAR COUPLING.—W. H. Hall, Malone, N. Y.—This invention consists of a coupling head or bunter formed with a vertical longitudinal slot, extending through the upper part of the bunter down to the cavity of the same, and in which is pivoted a coupling link of peculiar construction, and which is a link continuous with, and forming part of a coupling pin through which latter the pivot bolt of the bunter passes.

MACHINERY FOR DRESSING AND SHAPING STONE.—Jos. Ellicott Holmes, New York city.—In this machine a vertical cutter head is arranged to slide horizontally to and fro, along the side of a platform whereon the stone to be dressed is clamped, and to oscillate on its vertical axis by which latter movement the cutters are caused to act on the stone, as they move from end to end thereof. The cutter head may be adjusted to oscillate from right to left, or *vice versa*, as its direction of motion along the stone is changed. The stone is turned on its sides as each face is dressed to present the other faces, and the said faces may be dressed to any required angle relatively to each other. Robert Gray, of Erie, Pa., has an operating machine which he has recently brought from England. An illustration of the machine is in course of preparation, and will be soon published in these columns.

GROOVED IRON AND OTHER METALS.—Benj. F. Morey, Clinton, Ind.—This invention relates to a new and useful improvement in iron and other metals for wagon tires and other purposes of a similar nature; and it consists in forming one or more groves on one side of the bar of iron, steel, or other metal, which grooved side is designed to form the interior surface of the tire band or other article for which the groved metal may be used.

SKATING FLOOR.—Wm. S. Nelson, St. Louis, Mo.—The object of this invention is to provide a surface or floor suitable for skating upon with common runner skates, and which is designed to be laid in public halls, rinks parks, and private rooms for the purpose of skating upon.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,456.—SEWING MACHINE.—A. Macaulay, Northampton, Mass. November 12, 1868.

3,502.—BOXES FOR TRANSMITTING PATTERNS, SAMPLES, ETC.—E. Moore, Brooklyn, N. Y. November 18, 1868.

3,551.—PRESSES.—J. N. Smith and H. B. Geer, Jersey City, N. J. November 23, 1868.

3,643.—MACHINES FOR OPENING AND CLEANING COTTON, ETC.—R. Kitson, Lowell, Mass. November 30, 1868.

3,651.—IMITATIONS OF, AND SUBSTITUTES FOR WOOD, IVORY, STONE, AND OTHER HARD SUBSTANCES.—D. Blake, Albany, N. Y. November 30, 1868.

3,671.—REFLECTOR.—A. Hubbell, New York city. December 2, 1868.

3,674.—CHAIR.—T. Sampson, Providence, R. I. December 2, 1868.

3,686.—KNITTING MACHINE.—J. G. Avery, New York city, and S. V. Essick, Worcester, Mass. December 4, 1868.

3,687.—MACHINE FOR CUTTING EDIBLE ROOTS.—S. Van Ransalear Hakes, W. B. McCrury, and W. S. Patrick, Flint, Mich. December 4, 1868.

3,692.—NOZZLES FOR OIL CANS, ETC.—H. Page, Boston, Mass. December 4, 1868.

3,722.—ROOMS AND APPARATUS FOR PHOTOGRAPHING BY ARTIFICIAL LIGHT—G. K. Proctor, Salem, Mass. December 7, 1868.

3,747.—BLOCKS FOR SUPPORTING VESSELS IN DOCKS.—J. T. Parlor, Brooklyn, N. Y. December 9, 1868.

3,762.—STEAM BOILER.—C. Nelson, Troy, N. Y. December 11, 1868.

3,786.—TREATMENT OF ORES, OF GOLD AND SILVER, AND OF QUARTZ AND SILICIOUS SUBSTANCES, IN ORDER TO OBTAIN AND APPLY THE PRODUCTS THEREFROM TO VARIOUS USEFUL PURPOSES.—A. L. Fleury, Boston, Mass. December 15, 1868.

3,792.—MACHINERY FOR TRANSMITTING POWER AND MOTION.—C. C. Hull, Williamsburg, N. Y. December 15, 1868.

3, —PROCESS OF RESTORING OR RENEWING WORNOUT FILES.—T. Thornley and G. B. Wing, Massachusetts, U. S. December 17, 1868.

3,803.—MACHINERY FOR GINNING, BURRING, AND CLEANING COTTON AND OTHER FIBROUS SUBSTANCES.—G. Sargent, Graniteville, Mass. December 15, 1868.

3,852.—TEA AND COFFEE URNS, AND OTHER SIMILAR VESSELS.—G. Jones, New Haven, Conn. December 18, 1868.

3,872.—LADIES' SKIRTS.—C. Langdon, New York city, and W. S. Thomson, London, England. December 19, 1868.

3,890.—BANDAGE FOR FEMALES.—A. Hubbell, New York city. December 21, 1868.

3,892.—SPRING PAUL WASHER.—P. Justice, Philadelphia, Penn. December 21, 1868.

3,900.—CURRYING AND DRESSING LEATHER.—T. Saunby, New York city. December 21, 1868.

3,941.—STEAM VALVES AND THEIR ADJUNCTS.—E. H. Ashcroft, Lynn, Mass. December 24, 1868.

3,950.—MACHINE FOR PEGGING OOTS BAND SHOES.—D. C. Rogers, Conway, Mass. December 28, 1868.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JANUARY 19, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On filing each caveat	$10
On filing each application for a Patent (seventeen years)	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design (three and a half years)	$10
On filling application for Design (seven years)	$15
On filling application for design (fourteen years)	$30

In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

For copy of Claim of any Patent issued within 30 years..........$1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from..........$1 *upward, but usually at the price above named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them..........$1·25

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85,892.—WATER WHEEL.—Edwin Adams, Orelewa, Cal.
85,893.—FILLING FOR FIREPROOF SAFES AND CHESTS.—William Alford (assignor to himself and James H. Chambers), Philadelphia, Pa.
85,894.—SAWING MACHINE.—Richard Atkinson, Cleveland, Ohio.
85,895.—SLEIGH.—S. R. Bailey, Bath, Me.
85,896.—SLEIGH BOTTOM.—S. R. Bailey, Bath, Me.
85,897.—BREECH-LOADING FIREARM.—Cyrus W. Baldwin, Boston, Mass.
85,898.—HOLDBACK.—Alvin C. Beckwith and George H. Graham, Oriskany, N. Y.
85,899.—MACHINE FOR APPLYING STRENGTHENING PATCHES TO BUTTONHOLES OF COLLARS.—E. F. Bradley, Derby, Conn.
85,900.—WATER METER.—John A. Bradshaw and William H. Brown, Lowell, Mass.
85,901.—ADJUSTABLE EXTENSION PEDAL FOR PIANOS, ETC.—Albert G. Brewer, Hopkinton, Mass.
85,902.—BUT—Thomas W. Brown, Reading, Pa.
85,903.—BUNG.—Walter Calhoun, West Troy, N. Y.
85,904.—IRON PLANER.—Charles Carr, Boston, Mass., assignor to Boston Machine Company.
85,905.—LET-OFF MECHANISM FOR LOOMS.—Benjamin F. Carter (assignor to himself and S. S. Cook), Woonsocket, R. I.
85,906.—METHOD OF PREPARING NITRO-GLYCERIN.—Stephen Chester and Otto Bürstenbinder, New York city.
85,907.—SEED SOWER.—Sanford S. Clark and John G. Whitney, Independence, Iowa.
85,908.—CARPET STRETCHER, TACK DRIVER, AND PULLEY COMBINED.—Lucius Colby, Morrissville, Vt., and John D. Gilman, Boston, Mass.
85,909.—WATER CLOSET VALVE.—William S. Cooper, Philadelphia, Pa.
85,910.—CONDENSER FOR SPIRITS, STEAM, AND OTHER VAPORS.—Alonzo W. Cram, St. Louis, Mo.
85,911.—MACHINE FOR CUTTING SHINGLE BANDS.—John H. Crawford and William H. Crawford, Oshkosh, Wis.
85,912.—MODE OF DYEING COTTON, ETC.—Adolphe Jean James d'Andiran, Mulhouse, France.
85,913.—FREEZING BOX FOR FISH, ETC.—William Davis, Detroit, Mich.
85,914.—APPARATUS FOR PRESERVING AND TRANSPORTING FISH.—William Davis, Detroit, Mich.
85,915.—MUCILAGE BOTTLE.—Baltis De Long, Washington, D. C.
85,916.—REELING AND MEASURING YARN.—William A. Ditson, Girard, Ill.
85,917.—MACHINE FOR STRAIGHTENING RAILROAD BARS.—Sarah Downing, Grafton, W. Va., administratrix of the estate of Thomas M. Downing, deceased, assignor to Alpheus D. Casteel.
85,918.—FOLDING EXTENSION TABLE FOR SEWING MACHINES.—John F. Elliott, Cincinnati, Ohio.
85,919.—TRUNK.—Maurice Fitzgibbons (assignor to himself and Ralph S. Jennings), New York city.
85,920.—MILK COOLER.—Abiathar Foot, Warren, Conn.
85,921.—LAMP SHADE.—Frederick E. Foster, Cressona, Pa. Antedated January 7, 1869.
85,922.—PLAITING FABRIC.—William Fuzzard, Chelsea, Mass.
85,923.—THILL COUPLING.—Rutland M. Garrettson, Sag Harbor, N. Y. Antedated January 2, 1869.
85,924.—SCHOOL DESK.—Ernest W. Gilles and Jules Wendell, Oswego, N. Y.
85,925.—CARPET STRETCHER.—John B. Greenalgh, Providence, R. I.
85,926.—PITMAN.—Manasseh Grover, Clyde, Ohio.
85,927.—MODE OF MOUNTING ARTIFICIAL TEETH.—Robert Haering, Melrose, N. Y., now residing in Montreal, Canada, assignor to John B. Newbrough, New York city.
85,928.—PEN HOLDER.—David E. Hall, Detroit, Mich.
85,929.—BAND FASTENING.—David E. Hall, Detroit, Mich.
85,930.—CONSTRUCTION OF ELEVATOR BUCKETS.—Nehemiah Hawkins, Chicago, Ill.
85,931.—STOVEPIPE DAMPER.—Theophilus Hessenbruch, Philadelphia, Pa.
85,932.—FRUIT JAR.—P. M. Hinman, Rochester, N. Y.
85,933.—CHURN.—Timothy H. Hutchinson, Gorham, N. H.
85,934.—PORTABLE COOKING APPARATUS.—George B. Isham, Burlington, Vt.
85,935.—SLED.—Amasa C. Kasson (assignor to himself and Nelson C. Gridley,) Milwaukee, Wis.
85,936.—DREDGE CHUCK.—Daniel Keller, Baltimore, Md.
85,937.—WARMING SLEIGHS.—F. D. Kennedy, Albany, N. Y.
85,938.—SPRING FOR FURNITURE.—J. M. Kirkpatrick, Utica, Ohio.
85,939.—FLOORING CLAMP.—Francis G. Lafayette, Middletown, Ohio.
85,940.—STEAM CYLINDER.—Joah Lawson, Allegheny City, Pa.
85,941.—SAW SET.—Samuel F. Leach, Bangor, Me., assignor to himself and Ebenezer W. Elder.
85,942.—WASHING MACHINE.—William Leighty, Ebensburgh, Pa.
85,943.—WASHING MACHINE.—P. H. Lewis, Boston, Mass.
85,944.—MACHINE FOR DRYING HAIR.—Thomas Malley, Allegheny City, Pa.
85,945.—VULCANIZABLE COMPOUND TO IMITATE HORN, HARD RUBBER, ETC.—Frank Marquard, Newburyport, Mass., assignor to Vulcanized Wood Company.
85,946.—CARRIAGE CURTAIN BUTTON.—Nathan F. Mathewson, Barrington, R. I.
85,947.—WAGON BODY.—J. C. McFerran and A. P. Blunt, Washington, D. C.
85,948.—MACHINE FOR DRESSING MILLSTONES.—Watson A. McGlaughlin, Greenland, Pa.
85,949.—MUZZLE FOR SHOT GUNS.—James A. McKenzie, Galesburg, Ill.
85,950.—SLEEPING CAR.—C. C. Millar, Savannah, Ga.
85,951.—HOUSE-MOVING TRUCK.—William Millikan, Thorntown, Ind.
85,952.—HOISTING APPARATUS.—John H. Mills, Boston, Mass.
85,953.—WINDOW SHADE TASSEL CLIP.—Frederick Muller, Boston, Mass.
85,954.—METHOD OF REMOVING AND PROTECTING STORES IN CASE OF FIRE.—J. Hubert Page, Whitewater, Wis.
85,955.—MACHINE FOR DEFECATING AND BLEACHING CANE JUICE.—Philippe Paille, St. James Parish, La.
55,956.—HOLDER FOR BROOM AND BRUSH HANDLES.—Frederic S. Pinkham, Boston, assignor to himself and Edward Foster, Middleborough, Mass.
85,957.—REVOLVING COULTER.—R. L. Pitcher and R. Ellwood, Sycamore, Ill.
85,958.—CONVERTING IRON INTO STEEL.—Edward Richard Playle, Jersey City, N. J.
85,959.—PEN.—John T. Price, Arrow Rock, Mo.
85,960.—BED BOTTOM.—Alexander M. Pugh, Bucyrus, Ohio.
85,961.—METHOD OF ATTACHING RUBBER TO PENCILS.—Joseph Reckendorfer, New York city.
85,962.—QUARTZ CRUSHER.—Geo. C. Reeves, Blackhawk, Colorado Territory.
85,963.—STEAM SAFETY VALVE.—George Wm. Richardson, Troy, N. Y.
85,964.—HAT FINISHING MACHINE.—John C. Richardson, Newark, N. J.
85,965.—AUXILIARY KEY BOARD FOR PIANOS, ETC.—Theodule J. V. Roz, New York city.
85,966.—SEED DRILL.—Arnold Rutenfranz, Hammondstown, Ill.
85,967.—CHURN.—Cyrus W. Saladee, Newark, Ohio.
85,968.—CORN CULTIVATOR.—Samuel B. Shank, Manor township, Pa.
85,969.—SHUTTLE FOR LOOM.—Agustus Simpson, Cumberland, R. I., assignor to himself and S. S. Cook.
85,970.—CHURN AND BUTTER WORKER COMBINED.—Charles H. Smith, Boston, Mass.
85,971.—PLOW COLTER.—F. F. Smith (assignor to himself and the Collins Company), Collinsville, Conn.
85,972.—GAS GENERATOR.—J. H. Steiner, Kansas city, Mo.
85,973.—SASH LOCK.—Wm. A Sublett, San Francisco, Cal.
85,974.—THRESHING MACHINE.—J. T. Thornton, Elmira. Ill. Antedated Jan. 6, 1869.
85,975.—DOFFER FOR CARDING ENGINES.—Benj. D. Wheat, Mount Carmel, Ill.
85,976.—CARRIAGE KNOB.—E. S. Wheeler (assignor to himself and J. E. Wheeler), Westport, Conn.
85,977.—HINGE.—Alex. Whelan, (assignor to himself and Jos. W. Parrish), Washington, D. C.
85,978.—CONSTRUCTION OF SAFES.—F. H. Williams, Syracuse, N. Y.
85,979.—CAR COUPLING.—J. T. Wilson (assignor to himself and Frank Rahm), Pittsburgh, Pa.
85,980.—SPRING BED BOTTOM.—Seth Winslow, Charlestown, Mass.
85,981.—LOOM.—John C. Wood, Conshohocken, Pa.
85,982.—CORN PLOW AND MARKER COMBINED—David Wyant, West Lodi, Ohio.
85,983.—MACHINE FOR HEADING BOLTS.—J. R. Abbe, Providence, R. I.
85,984.—SUGAR-CANE MILL.—Wm. Aikin and Wm. Bennett said Bennett as administrator of the estate of J. R. Gates, deceased, (assignors to J. F. Pearson and Wm. Aikin), Louisville, Ky.
85,985.—WATER METER.—A. M. Almqvist and F. W. Ofeldt (assignors to themselves and Thomas Fitzsimmons), New York city.
85,986.—STOVEPIPE SHELF.—S. J. Anderson, Cazenovia, N. Y.
85,987.—CAR BRAKE.—Jas. H. Beatty, Franklin, Pa.
85,988.—PACKING FOR STEAM PISTON AND OTHER RODS.—Henry Bertrand and Francois Velut, Paris, France.
85,989.—CONSTRUCTION OF BOOTS.—L. R. Blake, Boston, Mass.
85,990.—GEOGRAPHIC GAME.—Levi Branson, Raleigh, N. C.
85,991.—COMBINED RULE AND PROTRACTOR.—R. A. Briggs (assignor to Edwy E. Hammond), New York city.
85,992.—GRAIN SEPARATOR.—George E. Bringman, Gettysburg, Pa.
85,993.—STRAW CUTTER.—C. H. Brown, Bloomingburg, N. Y.
85,994.—POTATO DIGGER.—Jacob Brown, Hamlin, Mich.
85,995.—SYRINGE.—C. W. Buffon, Vinton, Iowa.
85,996.—GYMNASTIC APPARATUS.—D. P. Butler, Boston, Mass.
85,997.—TOOL FOR SHARPENING THE CALKS OF HORSE SHOES.—Orren E. Butler, Stephen P. Dunham, and Geo. K. Wann, Marshalltown, Iowa.
85,998.—MEAT SMOKING APPARATUS.—R. T. Burnett, New York city.
85,999.—BREECH LOADING FIRE-ARM.—Henry Carter and Geo. H. Edwards, Dempsey street, Stepney, England.
86,000.—SLED BRAKE.—Frank A. Clark, New Sharon, Me.
86,001.—DRILLING AND BOLT TAPPING MACHINE.—Chas. W. Coe, Fentonville, Mich.
86,002.—CHURN.—J. B. Coffmann, New Richmond, assignor to himself, R. B. Wilson, and H. B. Sinks, Cincinnati, Ohio.
86,003.—CULTIVATOR.—J. H. Coleman, Columbia, Mo.
86,004.—MANUFACTURE OF WROUGHT IRON.—T. C. Coleman, Louisville, Ky.
86,005.—PERMUTATION LOCK.—G. W. Dana, Racine, Wis.
86,006.—HUB BORING MACHINE.—F. W. Dexter, Randolph, N. Y.
86,007.—BRAKE BLOCK HOLDER.—A. W. Dorr, Lake Valley, Cal.
86,008.—TEA KETTLE.—J. H. Downing, Healdsburg, Cal.
86,009.—LUBRICATING CUP FOR STEAM AND OTHER ENGINERY.—Isidore Dreyfus, New York city.
86,010.—MACHINE FOR GRINDING THE CUTTERS OF MOWING MACHINES.—Milton Fowks, Leeds, N. Y.
86,011.—RAILWAY CAR COUPLING.—Wm. H. Hall, Malone, N. Y.
86,012.—MANUFACTURE OF PRINTING AND WRITING PAPER.—W. W. Harding, Philadelphia, Pa.
86,013.—WASH BOILER.—W. D. Hillis, Elgin, Ill.
86,014.—HORSE SHOE.—H. S. Hitner, Marble Hall, Pa.
86,015.—MACHINE FOR DRESSING AND SHAPING STONE.—J. E. Holmes, New York city.
86,016.—INSTRUMENT FOR TREATING GUN-SHOT WOUNDS AND EXTRACTING BULLETS.—S. J. Howell, Orange, Mass.
86,017.—BASE-BURNING STOVE.—Zebulon Hunt, Hudson, N.Y.
86,018.—CEMENT FOR MAKING A WATER TIGHT JOINT IN COPING, ROOFING, ETC.—Jas. Judge, New York city.
86,019.—COMBINED SOWER AND CULTIVATOR.—H.C. Kellogg, Quasqueton, Iowa. Antedated Dec. 22, 1868.
86,020.—STOP COCK.—H. P. Kreiner, Berlin, Prussia, assignor to P. F. Kreiner, New York city.
86,021.—MANUFACTURE OF CURVED ELECTROTYPE AND STEREOTYPE PLATES.—Henry Lovejoy, Henry W. Lovejoy, and James H. Ferguson, New York city.
86,022.—REED FOR MUSICAL INSTRUMENTS.—R. R. Martino, New York city.
86,023.—BEE-HIVE.—Calvin R. C. Masten and Abram D. Van Vlack, Pleasant Valley, N.Y.
86,024.—HYDROCARBON BURNER.—Noeal May and H. F. Stivers, San Francisco, Cal.

86,025.—Wood Pavement.—H. G. McGonegal, New York city.
86,026.—Seeding Machine.—D. E. McSherry, Dayton, Ohio.
86,027.—Gas Regulator.—S. P. Mervine, Jr., Philadelphia, Pa.
86,028.—Metallic Column.—Richard Montgomery, New York city.
86,029.—Tire for Wagons.—B. F. Morey, Clinton, Ind.
86,030.—Injector.—Alexander Morton, Glasgow, Scotland.
86,031.—Skating Floor.—W. S. Nelson, St. Louis, Mo.
86,032.—Brick Machine.—David Packard, St. Joseph, Mo.
86,033.—Knitting Machine.—G. M. Patten, Bath, Me.
86,034.—Sash Balance.—Treat T. Prosser, Chicago, Ill., assignor to himself, G. W. Gillet, and G. H. Rozet.
86,035.—Fire Blower.—A. J. Redway (assignor to Redway and Burton), Cincinnati, Ohio.
86,036.—Wagon.—J. H. Sawyer, Troy, Pa. Antedated January 11, 1869.
86,037.—Bee Hive.—B. F. See, Monroe, Ohio.
86,038.—Sheet Metal Can.—C. Seimel, Brooklyn, N. Y.
86,039.—Milk Can.—A. C. Shorte and H. B. Todd, Plymouth, Conn.
86,040.—Compound for Preserving Fish, Meat, etc.—Thomas Sim, Charleston, S. C.
86,041.—Gasoline Cook Stove.—J. D. Spang, Dayton, Ohio.
86,042.—Omnibus.—H. M. Stow, San Francisco, Cal.
86,043.—Steering Apparatus.—N. L. Tomlinson, New York city.
86,044.—Curtain Fixture.—L. A. Tripp and S. M. Boyd, New York city.
86,045.—Peach Cutter.—J. T. Vaughn, Griffin, Ga.
86,046.—Apparatus for Generating Heat by Friction.—Pedro Vera, Bogota, United States of Colombia.
86,047.—Indigo Dye.—T. Weber, Alton, Ill., assignor to J. G. Sargent.
86,048.—Implement.—Charles Wetzler, Chicago, Ill.
86,049.—Combined Boot Heel and Spur.—C. F. Woodruff, Newbern, Tenn., assignor to himself and J. C. Pinner.
86,050.—Refining and Purifying Iron by Means of Fluxes Introduced by Suction.—J. Absterdam, New York city.
86,051.—Reefing Sails.—H. R. Atwood, Chelsea, Mass.
86,052.—Brake for Sleds.—R. Ayres, Vienna, N. J.
86,053.—Railway Rail Chair.—D. D. Bigelow, White House, N. J.
86,054.—Shoe Pegging and Nailing Machine.—Lyman R. Blake, Boston, Mass.
86,055.—Hand-Power Loom.—G. A. Brown and Julia A. Hunt, Oakalla, Ill.
86,056.—Manufacture of Iron.—J. Burt, Detroit, Mich.
86,057.—Sewing Machine for Sewing Parallel Seams.—F. P. Canfield, Cambridgeport, assignor to himself and J. F. Fales, Walpole, Mass.
86,058.—Paper "Satining" Machine.—Thomas Christy, New York city.
86,059.—Machine for Making Candles.—E. Cowles, Hounslow, Kingdom of Great Britain and Ireland.
86,060.—Mechanical Movement.—F. Creamer, Brooklyn, N. Y., assignor to himself and T. W. Ladd, New York city.
86,061.—Horse Power.—S. W. Davis, Brasher Falls, N. Y. Antedated January 8, 1869.
86,062.—Sash Holder.—W. A. Devon, Port Richmond, N. Y. Antedated January 9, 1869.
86,063.—Bee Hive.—T. S. Engledow, Cedar Falls, Iowa.
86,064.—Printing Press.—W. H. Forbush, Buffalo, N. Y.
86,065.—Steering Apparatus.—Welcome Gilkey, Watertown, Mass.
86,066.—Salt Trough for Cattle.—Timothy Gladding, East Berlin, Conn.
86,067.—Piston Steam Valve.—Robert C. Gray and William B. Brittingham, La Fayette, Ind.
86,068.—Seed and Grain Drill.—D. W. Hamaker, Union Star, Mo.
86,069.—Plate or Grate for Base-Burning Stoves.—L. W. Harwood and Charles D. Newton, Troy, N. Y., assignors to Elihu Hosford, Chicago, Ill.
86,070.—Valve Gear of Steam Engines.—Anton Heupel, John Reinhardt, and S. G. Votteler, Philadelphia, Pa. Antedated January 8, 1869.
86,071.—Submerged Force Pump.—C. C. Hiatt, Ridgeville, Ind.
86,072.—Base-Burning Stove.—Elihu Hosford, Chicago, Ill.
86,073.—Base-Burning Wood Stove.—E. Hosford, Chicago, Ill.
86,074.—Bed Plate for Base-Burning Wood Stove.—C. D. Newton, Troy, N. Y.
86,075.—Stem-Winding Watch.—C. E. Jacot, New York city.
86,076.—Hydrant.—E. T. Jenkins, Ravenswood, N. Y.
86,077.—Wheelbarrow.—C. C. Johnson, Springfield, Vt.
86,078.—Machine for Burring Wool.—D. L. Jones and G. T. Jones, Philadelphia, Pa.
86,079.—Plow.—J. H. Jones and H. P. Jones, Herndon, Ga.
86,080.—Horse Hay Rake.—Wm. S. Kincaid, Leavenworth county, Kansas.
86,081.—Fence Builder.—J. M. Kirkpatrick, Utica, Ohio.
86,082.—Fastening for Covers or Stoppers of Bottles, Jars, etc.—F. Klee, Brooklyn, E. D., N. Y.
86,083.—Churn.—August Kohler and M. W. Wilson, Noblesville, Ind.
86,084.—Lamp Extinguisher.—C. Lanzendorfer, Chicago, Ill.
86,085.—Case for Turbine Water Wheels.—T. Leffel (assignor to himself and H. C. Barnett), Springfield, Ohio.
86,086.—Propeller.—A. C. Loud, San Francisco, Cal.
86,087.—Land Roller.—H. P. Manley, Ellsworth, N. Y.
86,088.—Galvanic Plate for Remedial Purposes.—Chas. Maray, New York city. Antedated January 11, 1869.
86,089.—Fruit Jar.—J. L. Mason, New York city.
86,090.—Fruit Jar.—J. L. Mason, New York city.
86,091.—Firearm.—L. A. Merriam, New York city.
86,092.—Stair Rod.—W. T. Mersereau, Newark, N. J.
86,093.—Rail for Railways.—J. H. Moore, Chicago, Ill.
86,094.—Churn.—G. W. Morter and E. C. Packer, Alliance, Ohio.
86,095.—Clothes Dryer.—C. R. Mumma, administrator of the estate of J. Mumma, deceased, Middletown, Ohio.
86,096.—Lozenge and Cracker Machine.—Charles A. Oehl, Portsmouth, N. H.
86,097.—Gum Scrubber.—Joseph Old, Reading, Pa.
86,098.—Mechanical Adjustment.—Wilbur F. Parker, Meriden, Conn.
86,099.—Fanning Mill.—J. F. Pool, Monroe, Wis.
86,100.—Curtain Fixture.—Silas S. Putnam, Dorchester, Mass.
86,101.—Lead Pencil.—Joseph Reckendorfer, New York city.
86,102.—Stone Sawing Machine.—Abraham Rothwell, Baltimore county, Md.
86,103.—Process of Treating Paper and Woven Fabrics, to Produce Waterproof Sheets and Slabs.—John Scoffern, Finsbury, assignor to Henry Beaufort Sears, Liverpool, England.
86,104.—Sheathing and Coating Ships' Bottoms.—John Scoffern, Finsbury, assignor to Henry Beaufort Sears, Liverpool, England.
86,105.—Combined Corn Planter and Cultivator.—William Scott, High Banks, Ind.
86,106.—Mode of Rendering Safes, Vaults, and other Structures Fireproof.—Benjamin Sherwood, Brooklyn, N. Y.
86,107.—Rest for Carriage Top.—William O. Snyder, Philadelphia, Pa.
86,108.—Cooking Utensil.—Stephen Spoor, Phelps, N. Y.
86,109.—Combined Hay Elevator and Manure Drag.—P. H. Stauffer, Lehighton, Pa., assignor to himself, Edward Maury, and William L. Lands.
86,110.—Combined Cultivator and Manure Drag.—P. H. Stauffer, Lehighton, Pa., assignor to himself, Edward Maury, and William L. Lands.
86,111.—Steam Pump.—Charles L. Stevens and Albert A. Denton, Galesburg, Ill.
86,112.—Harness Saddle Pad.—Retire C. Sturges (assignor to the American Saddle Company), Boston, Mass.
86,113.—Extension Table.—B. D. Sutlief, Wallingford, Conn.
86,114.—Key.—Andreas Vang, Chicago, Ill., assignor to John Mackay.
86,115.—Tubs for Distilling Essential Oils.—Barton P. Van Marter, Lyons, N. Y.
86,116.—Alarm Clock.—O. D. Warner (assignor to himself and S. M. Sutliff, Bristol, Conn.
86,117.—Swing Bridge.—Gustavus R. Winkler (assignor to Bernhardt Berndt, and Martha Winkler), Williamsport, Pa.
86,118.—Lamp.—Willard H. Smith, New York city, assignor to Francis C. Cantine, Orange, N. J. Antedated January 6, 1869.

REISSUES.

36,843.—Harvester.—Dated November 4, 1862; reissue 3,267.—Samuel Johnston, Syracuse, N. Y.
10,903.—Clapboard Joint.—Dated May 16, 1854; reissue 1,541, dated September 22, 1863; extended seven years; reissue 3,268.—William Baker, Utica, N. Y.
83,383.—Hot Blast Furnace.—Dated October 27, 1868; reissue 3,269.—P. Hoop, Jr., and R. Hoop, Berlin Cross Roads, Ohio.
28,440.—Corn Sheller.—Dated May 22, 1860; reissue 3,270.—J. G. Putnam and J. Schieffelin, Jr., Tioga, Pa., assignees of J. G. Putnam.
25,278.—Tinman's Machine.—Dated August 30, 1859; reissue 3,271.—C. H. Raymond, Southington, Conn.
14,368.—Method of Bottling Fluids under Gaseous Pressure.—Dated March 4, 1856; reissue 3,175, dated October 27, 1868; reissue 3,272.—Paul Schmitt, New York city, assignee of Jane Quantin and H. A. Pintard, administrators of Alphonse Quantin, deceased.
57,399.—Carpet Bag Frame.—Dated August 21, 1866; reissue 3,273.—Albert Sonnekalb and J. W. Lieb, Newark, N. J.
72,110.—Pavement.—Dated December 10, 1867; reissue 3,274.—H. M. Stow, San Francisco, Cal.
40,649.—Asphaltic Cement.—Dated November 17, 1863; reissue 3,275.—Isaac Straub, Kenton county Ky., administrator of the estate of Abraham Straub, deceased.

DESIGNS.

3,342.—Inkstand.—T. S. Hudson, East Cambridge, Mass.
3,343.—Floor Oil Cloth Pattern.—J. Hutchison, Newark, N. J., assignor to E. C. Sampson, New York city.
3,344 and 3,345.—Floor Oil Cloth Pattern.—C. T. Meyer, Bergen, N. J., assignor to E. C. Sampson, New York city. Two Patents.
3,346.—Stove.—Apollos Richmond, Brooklyn, and S. G. Richmond, Norwich, Conn.
3,347.—Cook's Stove.—A. Richmond, Brooklyn, and S. G. Richmond, Norwich, Conn.
3,348.—Air-Tight Stove.—A. Richmond, Brooklyn, and S. G. Richmond, Norwich, Conn.
3,349.—Glass Cover of a Fruit Jar.—S. B. Rowley, Philadelphia, Pa.

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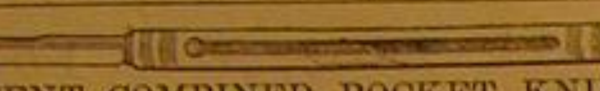

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HUMAN SCIENCE.—THE PHRENOLOGICAL JOURNAL for February, now ready, contains PORTRAITS AND CHARACTERS—Alexander Dallas Bache, late Superintendent of the United States Coast Survey; Napoleon Bonaparte—Concluded; Mrs. Lily M. Spencer, painter of popular subjects; Rossini, the Italian composer; Baron de Rothschild, with a sketch of the rise of the great Rothschild banking house.

OUR SOCIAL RELATIONS.—Influence of Intellect on Social Intercourse—the lapse of thought in fashionable life; Approbativeness; A Sea-shell Song—Poem; How a man made a fortune by a pen; or, The Story of Lafitte.

RESURRECTION OF THE BODY—by Rev. G. J. Geer, D.D.—Effect of Revelation—The Physiological View—Identity, How Maintained—Association Only Effective; Union, the Normal Condition; the Form; Reflections.

PSYCHOLOGICAL.—The Inner Senses, or, Certain Scriptural Phenomena explained; Self-conquest; Spiritual growth; Archbishop Whately on Conscientiousness.

PHYSIOGNOMY, OR "SIGNS OF CHARACTER."—Are we responsible for our faces? The groups of organs—Seven Illustrations; The Yes—But Grumblers; Lights of Omaha—Andrew J. Poppleton—John I. Redick.

PHYSIOLOGICAL.—Diseased Self-esteem and Partial Insanity; Dwelling Sites and Health; Pure Air in Churches; Wintering South; How to Treat the Sick.

EDITORIAL.—PEACE—How to Attain It; What Constitutes a Good Citizen; Gambling in Stocks, Currency, and Gold; Thanks; A Deserving Object; Announcements; The American Lion, Illustrated.

COMMUNICATIONS.—Equality of Minds—Mind and its Manifestations—Education—Sources of Knowledge; Woman's Sphere in Utah; Oratory, Sacred and Secular.

MISCELLANEOUS.—Advice Gratis; Money vs. Enterprise; Be Kind to the Erring; The Human Intellect—a Review of Dr. Porter's new Work; Answers to Correspondents—Community Interest—Digesting Ideas.

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U. S. PATENT OFFICE,
WASHINGTON, D. C., Jan. 4, 1869.
James Emerson, of Lowell, Mass., having petitioned for the extension of a patent granted him on the 28th day of August, 1855, for an improvement in Ships' Windlasses, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 4th, 1869.
Charles Wilhelm and Anna Catharine Wilhelm, of Philadelphia, Pa., having petitioned for the extension of a patent granted them on the 3d day April, 1855, for an improvement in Protector for Lamp Shades, it is ordered that said petition be heard at this office on the 22d day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 5th, 1869.
Chester Van Horn, of Springfield, Mass., having petitioned for the extension of a patent granted him on the 17th day of April, 1855, for an improvement in Slide Rest for Lathes, it is ordered that said petition be heard at th's office on the 29th day of March next.
Any person may expose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 5th, 1869.
Aaron Woodman, of New York city, administrator of Moses Thompson, deceased, having petitioned for the extension of a patent granted the said Moses Thompson, on the 10th day of April, 1855, for an improvement in Furnaces for Burning Wet Fuel, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 8th, 1869.
E. Harry Smith, of Bergen, N. J., having petitioned for the extension of a patent granted him on the 17th day of April, 1855, for an improvement in Sewing Machines, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 11, 1869.
Charles H. Fondé, of Mobile, Ala., having petitioned for the extension of a patent granted him on the 17th day of April, 1855, for an improvement in Dredging Machines, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 13th, 1869.
Finley Latta, of Cincinnati, Ohio, administrator of the estate of A. B. Latta, deceased, having petitioned for the extension of a patent granted the said A. B. Latta on the 10th day of April, 1855, for an improvement in Steam Generators, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 14, 1869.
Joseph Peabody and S. E. Peabody, of Salem, Mass., and Francis Peabody, of Danvers, Mass., executors of the estate of Francis Peabody, deceased, having petitioned for the extension of a patent granted the said Francis Peabody, on the 17th day of April, 1855, for an improvement in Hay-making Machines, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
ELISHA FOOTE, Commissioner of Patents.

U. S. PATENT OFFICE,
Washington, D. C., Jan. 15, 1869.
Walter H. Forbush, of Buffalo, N. Y., Administrator of the Estate of E. B. Forbush, deceased, having petitioned for the extension of a patent granted the said E. B. Forbush on the 17th day of April, 1855, reissued the 26th of April, 1859, and again reissued in five divisions numbered respectively 1967, 1968, 1969, 1970, and 1971, the 23d day of May, 1865, for an improvement in Grain and Grass Harvesters, it is ordered that said petition be heard at this office on the 29th day of March next.
Any person may oppose this extension. Objections, depositions, and other papers, should be filed in this office twenty days before the day of hearing.
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☞ For further notice of the **Lillingston Paint**, see Scientific American for Nov. 18th, 1868.

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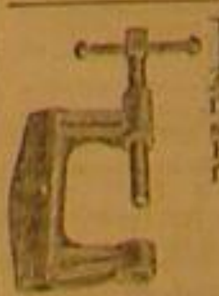

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THE

Commercial Agency REGISTER

For 1869.

McKILLOP, SPRAGUE & CO., 37 Park Row, New York.

BANKERS AND MERCHANTS are informed that the above work is *now ready for delivery*.

Many works of a similar character have appeared during the past ten or twelve years, but, thus far, not one equal to this. The number of names is largely increased, and the care taken to secure **Accuracy in Rating** must render the volume very valuable.

The work is not a mere republication *from old forms of type kept standing*, but is a perfectly new book, *every name being revised.*

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McKILLOP, SPRAGUE & CO. New York, January, 1869. 4 3*

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FREDERICKTOWN, Ohio, Nov. 2, 1868.

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Respectfully yours, HARRY BALDWIN.

For sale by all responsible hardware dealers and the manufacturers, LIPPINCOTT & BAKEWELL, Pittsburgh, Pa., Sole owners of Colburn's and Red Jacket Patents. 3 4os

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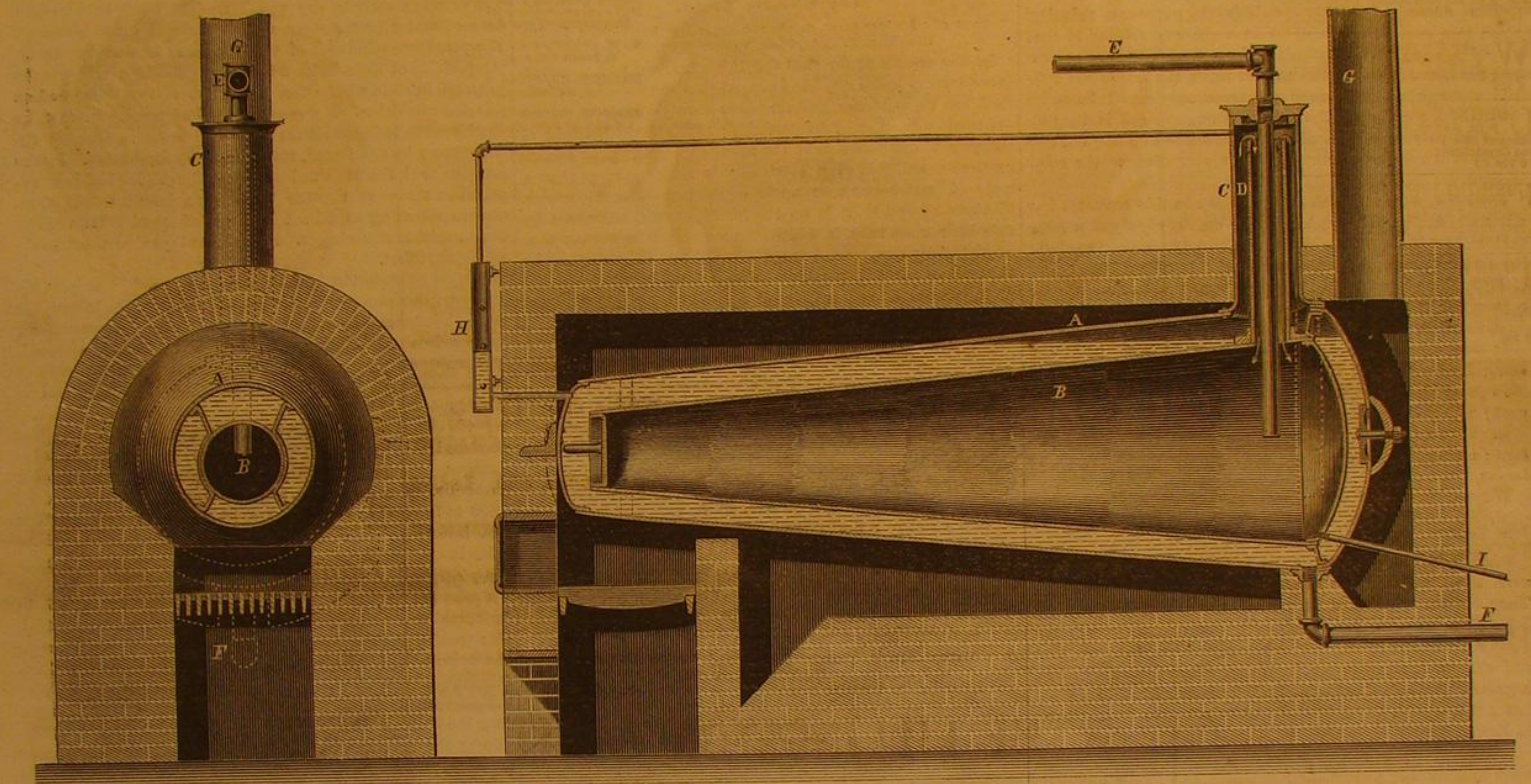
SCIENTIFIC AMERICAN

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

Vol. XX.---No. 7. [NEW SERIES.] NEW YORK, FEBRUARY 13, 1869. $3 per Annum. [IN ADVANCE.]

Improvement in Steam Generators.

When it is considered that only a small percentage of the heating properties of coal, when released by combustion, are made available for the production of mechanical power, it is evident that any improvement that will increase the ratio of the power delivered, as compared with the fuel consumed, is a valuable one. This object has been sought for years by engineers and inventors, who have experimented upon almost every conceivable form of boiler and arrangement of its parts.



THE GERNER PATENT BOILER.

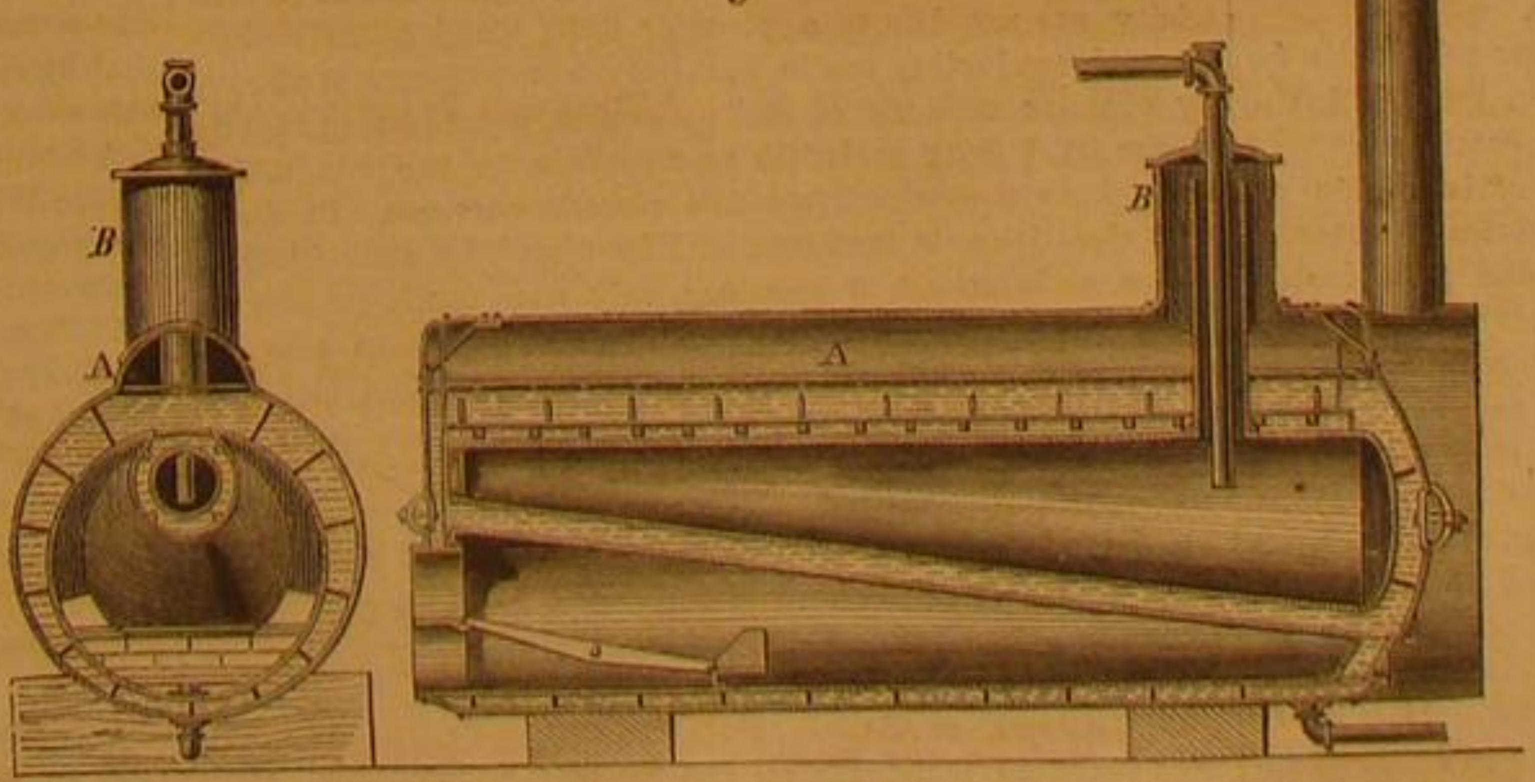
At the Fair of the American Institute, held in New York in the fall of 1867, a new form of boiler, known as the "Gerner," from the name of the patentee, attracted great attention, especially among practical men, for its peculiarities of internal structure and its apparent extraordinary results. We publish herewith representations of this boiler in three forms—stationary, portable (both horizontal), and upright.

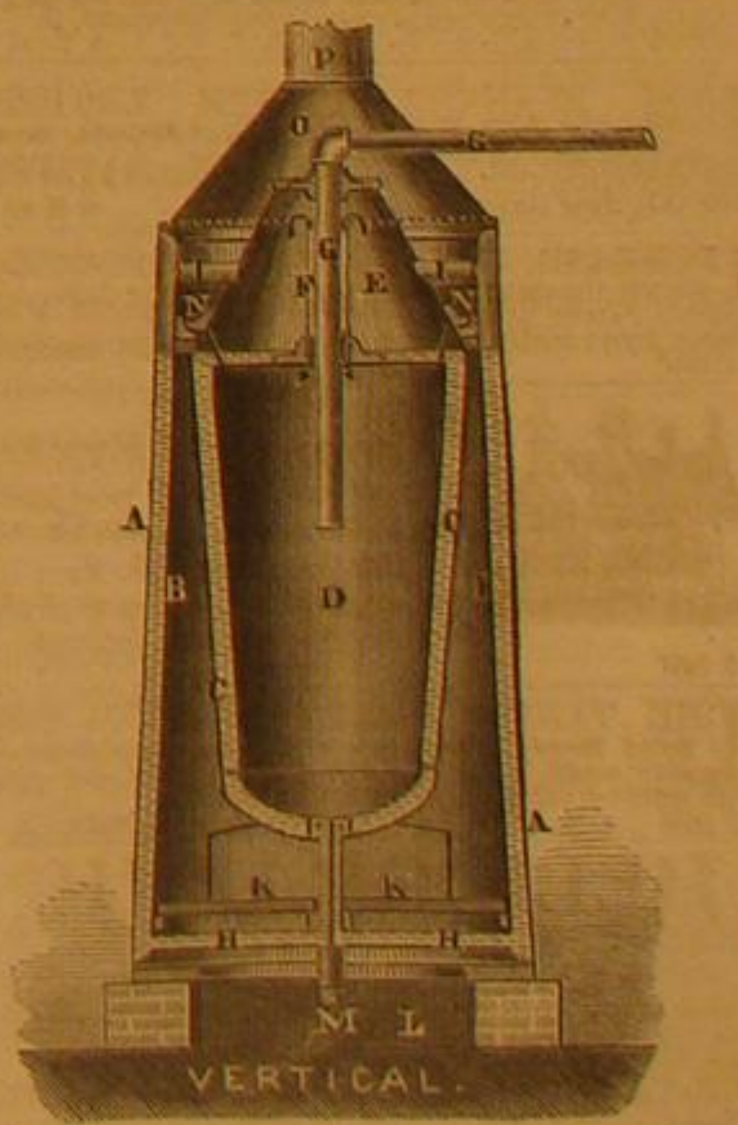
Fig. 1 is the stationary boiler, one view being a longitudinal section, and the other a transverse vertical section near the front end through the fire box. The boiler proper consists of two cone like shells, one inside the other, leaving a space between the two of several inches, varying according to the dimensions of the boiler, which is almost entirely filled with water, completely enveloping the inner cone, as will be seen by reference to the engraving. The interior of the internal shell is wholly devoted to steam, which is thus enveloped with a non-conducting material. A reference to the parts by the following letters and the arrows will render unnecessary a detailed description: A is the outside shell; B, the steam reservoir; C, the steam dome; D is the pipe conducting the steam to the reservoir, B; E, the outlet, or delivery pipe; F, the feed water and blow-off pipe; G, the chimney; H, the water gage on front of the boiler; and I, the pipe for testing the dryness of the steam, leading from steam reservoir.

Fig. 2, shows similar sections of the portable horizontal boiler. We gave a brief description of this boiler on pp. 233-4 in No. 15, Vol. XVII., SCIENTIFIC AMERICAN. This differs somewhat in its details from the stationary, which is set in brick work. The outer shell is simply a cylinder like that of an ordinary cylindrical boiler, but double, both sides and ends affording a water space, as seen in the engravings. Inside this shell are the two cones, so placed, however, that the upper surface stands on a level. The outer cone is not entire but is open at the top along its whole length, and surmounted with a longitudinal dome, A. This arrangement gives communication between the space between the two walls of the outer shell and that between the two cones, both being water spaces. B is the steam dome similar to that on the stationary boiler, and the other parts and appendages will be understood by a reference to corresponding parts in that engraving.

Fig. 3 represents the vertical form of this boiler, and the following letters of reference will explain its construction fully: A, first cylindrical shell; B, second shell; C, third shell; D, steam reservoir; E, dome; F, connecting pipe into D; G, outlet or steam pipe; H, water connection pipes; I, steam connection pipes; K, grate; L, ashpit; M, feed and blow-off pipe; N, brackets; O, smoke box; P, chimney.

Fig. 2





It will be seen that the objects intended by this improved form of boiler are perfect circulation of the water, quick and even generation of steam, entire combustion of the fuel, utilization of the heat evolved, dry steam, and prevention of unequal heating and consequent expansion of the material of the boiler. The arrangement, form, and construction of the parts as shown in the engravings will enable any practical man to decide as to the success attained in the objects sought. The form of the interior cylinder, or cone, and its position, as regards the fire, the protection of the steam by a water jacket from atmospheric influences, seem to insure equable heating of the water-containing surfaces and pure dry steam. The inventor claims an evaporation of over twelve pounds of water to one pound of coal consumed, and one horse power of effective force yielded by from four to eight square feet of heating surface according to size. These claims seem to be established by experiments witnessed and substantiated by practical engineers. Among those who have given their approval to this boiler are Edward Faron, superintendent of the Morgan Iron Works, and Charles H. Haswell, formerly chief engineer U. S. Navy; W. W. Wood, U. S. Navy; W. Vanderbilt, Pacific Mail Steamship Company, and J. H. Lewiness, of the U. S. Revenue Service—these three last, judges of steam boilers at the Fair of the American Institute—T. W. Kennard, of the Atlantic & Great Western R. R., and many other engineers, who speak, in their reports of experiments which they witnessed or conducted, in the highest terms, of the boiler and its performances, fully substantiating all the claims made by the inventor, Capt. Gerner. This style of boiler is adapted in its form and application to marine and land service, to stationary and locomotive purposes; indeed, to all situations in which steam boilers can be used, either for generating steam for power or heating purposes.

The engravings of marine and locomotive boilers are reserved to a future number.

The United States patents bear dates July 18, 1865, and January 21, 1868. Patented also in the principal European countries. Further information may be obtained by addressing Kasson & Co., General Agents, 119 Broadway, or P. O. box 5,195 New York city. See advertisement on last page.

THE MANUFACTURE OF BRONZE POWDERS.

Prepared for the Scientific American.

The waste material of the beating of metals (an art which took its rise in the fourteenth century, in Nuremberg, Germany) was thrown away till 1750. In that year a mason in Fuerth, by the name of Huber, conceived the fortunate idea to grind this material called "Schabig" on a stone, and to sell the metallic powder thus obtained as a color. The goldbeater Martin Holzinger succeeded subsequently in imparting to the powder various lusters by exposing it to different degrees of heat; and in 1781, Courrier, a Frenchman, discovered the mode of preparing gold bronze from leaves, consisting of an alloy of zinc and copper. Although this bronze powder was offered for one florin (fifty-one cents, currency) per pound, it was but little in demand; but since the preparation of various colors, from red down to nearly white, is no longer a secret, the manufacture of bronze powders has attained considerable importance, and is now practiced in several towns in Bavaria and Westphalia, and in the capitals of France and England. The refuse of goldbeating being no longer sufficient, special alloys are flattened. When in Fuerth, Bavaria, in 1864, we counted not less than fourteen bronze powder establishments. In Munich and Nuremberg the value of this article is said to reach yearly $255, 000 in currency.

The process of flattening metals for the purpose of reducing them into powder is carried on in a manner similar to that of goldbeating. When obtained in a thickness so as to permit the transmission of the rays of light, the leaves are rubbed through an iron sieve of exceedingly small holes by means of a wire brush, the powder thus produced is then allowed to pass through a mill under addition of some oil, and finally it is heated to a certain degree, according to the color desired.

Prof. Wagner, a chemist well known in this country, has ascertained that all bronze powders consist chiefly of a fatty matter, oxygen, copper, and iron. The composition used for light shades consists of 83 per cent of copper and 13 per cent zinc; for deep ones, of 94 to 90 copper, and 6 to 10 zinc; for copper red, pure copper is used. The amount of copper in various colors was found to be the following:

In French copper red, 97·32 per cent; orange, 94·44 per cent; light yellow, 81·29 per cent.

In English orange, 90·82 per cent; deep yellow, 82·37 per cent; pale yellow, 80·42 per cent.

In German copper red, 98·92 per cent; violet, 98·81 per cent; orange, 95·30 per cent; deep yellow, 81·55 per cent; lemon, 82·34 per cent.

Wagner discovered a small per centage of iron in the English bronzes, but tin, silver and nickel, or smalt, carmine and indigo, as often asserted, were not met with in any.

Recently various methods have been suggested in order to avoid the dividing of the metal leaves by means of a brush. They are partly founded on mechanical, partly on chemical principles. It was, for instance, attempted to prepare the powder by means of files, but it was discovered to be angular and without luster. When, however, passed through rollers, it gained its original luster again. In Germany, this method has not met with any approval, but it is said to be employed in England.

In 1850, Rostaing proposed to divide metals in their melted state by means of a centrifugal machine, and Fuchs announced that he succeeded in preparing bronze powder by amalgamation. The highly injurious effects of mercury vapors do, however, not allow the introduction of this latter method.

Copper powder may be prepared chemically in various ways which results in forming, with one single exception, crystalline and brittle products, which, in crushing, are converted into a dull powder. In reducing oxide of copper with rhigoline and gasoline, the two lightest products of the distillation of petroleum, Prof. Wagner, for the first time, obtained copper in minute scales. In conducting the process, it is necessary that the metal be left to cool in the vapors of these hydrocarbons. The bronze color is thus obtained is somewhat dark, but may perhaps be changed into brighter hues, by passing vapors of zinc or cadmium over them. In one instance where gasoline containing sulphur was used, the copper bronze exhibited a fine iridescent appearance.

It is only within the last decade that various substitutes for the above described bronze powders have been brought to the notice of consumers. We mention

1. *The Tungsten bronzes.* Of these the "tungstate of oxide of tungsten and soda" is the most important. It forms beautiful crystals of a golden-yellow color and gold luster. The potassa salt, discovered by Laurent, forms violet needles with copper lusters, and possesses great similarity with sublimed indigo. The lithian salt appears in prismatic scales and leaves of the color of slightly tempered steel. In glowing the potassa salt, a brilliant dark blue steel color may be obtained. The tungsten, or wolframium bronzes first appeared at the World's Fair in London, in 1862, and they then attracted considerable attention. The soda compound appeared under the denomination of saffron bronze, the potassa compound under that of magenta bronze. At the exhibition at Paris, in 1867, these bronzes were only present in small quantities. The reason for this fact is stated by Prof. A. W. Hofman as follows:

"It appears, that in order to cover well, and reflect the light with intensity, it is necessary that the smallest particles of the bronze powders should possess the property to split in lamellæ. If their crystalline structure shows this glimmer-like character, their covering capacity remains the same when reduced to a finer state. If these bodies, however, crystallize in cubes, they are in being crushed, not reduced into lamellae but again in cubes. A certain quantity of such a powder covers a much smaller surface, than an equal weight of bronzes consisting of scales. They also reflect the light not in the same degree as purely metallic bronzes."

2. *The tin bronze, or Mosaic gold.* This variety may, as regards brilliancy, well compete with the lighter bronze colors. It is also more durable. Kletzinski proposes to prepare it, by subliming the amorphous sulphide of tin, which is obtained in boiling a tin-salt solution with dilute oil of vitriol and saturating the liquid with the gas of burning sulphur. The sulphid of titanium also deserves attention; it forms scales of a brass color.

3. *Chromium bronze*, or chloride of chromium, forms brilliant violet foliæ, which, in transmitted light, appear blood red. It may be rubbed into the skin like all bronzes.

4. *Crystallized iodide of lead*, a beautiful yellow substance, is proposed for decorative purposes; gold-inks, shell-colors, as a mass for pencils, for the painting of fabrics, wall paper, for filling glass pearls, etc.

5. *Organic bronze colors.* To these belong the derivates of the haematoxylin, already extensively employed in the manufacture of bronze paper, the numerous tar-pigments, of which the corallin is one of the most recent discoveries, the murexide and the green hydrochinon.

The Latest Novelty in Electricity---Non-existence of the Electric Fluid.

(Extract of a Lecture given before the Rensselaer Polytechnic Institution, Troy, N. Y., by Prof. Vander Weyde, M. D.)

In the same manner that the investigations and discoveries of twenty years ago have proved that the so-called caloric fluid has no existence, and that heat is only a state of matter—a mode of motion of its particles; so the investigations of the present day prove that the so-called electric fluid has no existence, and that even electricity is nothing more than a state of matter—another mode of motion of its molecules. Without matter there is no electricity, as will be proved by this little glass tube, in which the vacuum is so perfect that no electricity can possibly pass through it, notwithstanding the ends of the two platinum wires melted in the glass and projecting outside on both ends, and which conduct the electricity interiorly, are only one quarter of an inch apart. I have here a similar tube filled with common atmospheric air, the ends of the wires are also one quarter of an inch apart, and may be separated a half or a whole inch, but the electric current will be seen in the form of sparks to pass easily between the wires, and to charge this Leyden jar. I have here also a so-called Geisler tube, in which the ends of the wires are separated to the distance of twenty inches, and through which the electric current could not pass at all while filled with air; but the air in it is rarefied to such a degree as to make it a good conductor of electricity, and you see the current pass not in sparks, as in the second tube filled with common air, but as a glowing fire, resembling the northern light; through this tube also we can charge this Leyden jar. Through the first tube, in which, by great precautions, an almost perfect vacuum has been produced, there is not only no current seen to pass, but it is impossible to load this Leyden jar when the tube is interposed between the jar and the machine developing the electricity.

The verification of the passage or non-passage of the electric current by means of this charge in the jar, obtained or not obtained, is important, as otherwise it would be doubted if the electricity passed invisibly through the vacuum.

This striking and novel experiment, demonstrating the impossibility that an electric current can overlap a really empty space, even to the small distance of only one quarter inch, proves that there are two errors in our present theory of electricity. First, that the transmission of electricity in vacuo, so-called, is really a transmission through rarefied air or gas, these being good conductors; common air, we know, is a bad conductor. The vacuum is proved by this new experiment to be an absolute non-conductor. Secondly, this experiment proves that if that which we call electricity was really a fluid distinct from common matter, there is no reason why it should not overlap the small empty space of a quarter of an inch. As we saw, however, that electricity cannot possibly overlap that small space, nor be transmitted where no matter exists, we are forced to the conclusion that the phenomena of electricity are not due to a peculiar fluid, which move rapidly through conducting media, but that the propagation is effected by peculiar motions of the molecules, which, being rapidly transmitted from molecule to molecule in the conducting body, form that which we call electric currents. In short, that electricity is transmitted like sound, by some kind of waves, undulations, or rotations, only with much greater velocity. In fact, there exists as little necessity to adopt a special electric fluid to explain the electric phenomena, as there exists to adopt a special sonorous fluid to explain the acoustic phenomena.

Opals--Iridescence--Economy in Using Coal.

The Lyceum of Natural History met, January 18th, at its rooms, Madison avenue. Numerous donations of pamphlets and reports were presented.

Dr. Dailey showed some specimens of chalcedony which had been found in Honduras, on the border of Guatemala, by a friend of his, who, when riding over a section of that state, was attracted by red objects on the ground, which he took to be fruit. On examination, he found that they were pieces of chalcedony.

Mr. E. G. Squier supposed that these specimens were found in the neighborhood of the opal region. Being answered affirmatively, a conversation sprung up about opals, Mr. Squier remarking that he had found many specimens of opals in the region alluded to. They generally occurred in pockets formed, as it were, by the roots of trees. He presumed the matter of which they were formed had filtered through. In answer to a question about the value of the Honduras opals, he stated that an English company engaged in collecting them was making large returns on its capital.

Dr. Feuchtwanger mentioned some instances in which persons similarly engaged had not met with a similar good fortune. He also mentioned cases to show that opals often deteriorated in cutting, and that very few valuable opals could be secured. He knew of a large opal in London which, when rough, was valued at £3,500, but which, when polished, brought only half that sum.

Mr. E. G. Squier explained how so many opals were found fractured. The Indians who collected them worked in bands. When they found an opal it was placed under a hammer and broken, each member of the band taking his share. He gave the history of an opal possessed by a friend of his, which was considered the largest in the world. It was, unfortunately, broken in polishing. The larger piece was polished, and sold to the wife of the Captain-General of Cuba, Serrano, for a large sum.

Professor Eggleston, of the School of Mines, stated there were two kinds of opal, the Mexican, or soft opal, and the precious opal, which retained its luster for a century. He had noticed a curious property of these stones, viz.: that the Mexican opal showed its "fire" according to the dampness of the season, being dull in dry weather. The effect of putting a drop of water on the stone was to make it quite iridescent. The peculiar appearance of the stone was caused by the decomposition of light in its miscroscopic fissures. He was not prepared to state what effect the action of the water had on this decomposition. It was certain it had some. In fact, he considered it indubitable that the opalescence, under the circumstances he mentioned, was caused by hydration. In the precious opal the fire was lost by handling. He had been engaged on some experiments to ascertain how it might be restored. Heating would not do. He had found alkaline solutions useful in restoring it. He had used cyanide of ammonia with good effect.

Professor Eggleston further explained how it was possible to impart this peculiar iridescence to plaster. The iridescence was to be accounted for by either of two causes. It was caused by superficial oxidation, which disappeared when scratched. It was also caused by the decomposition of light by means of the microscopic fissures alluded to. Both at Berlin and in Washington the iridescence had been transferred to plaster.

Dr. Newberry (in the chair) pointed out that fractured glass possessed this property of decomposing light, which was also common to substances formed in laminæ, such as a certain sea-shells. Mr. Rutherford had cut on glass microscopic lines 7,000 to the inch, and these were iridescent. A friend of his had informed him that the Honduras opals were found in veins in trachytic rock. The largest he had ever seen was in the possession of Mrs. Aspinwall, of this city.

Professor Newberry exhibited a concretion, spherical in form, and presenting a curious appearance at one pole, which he regarded as quite puzzling. He mentioned the fact that in the sub-carboniferous system of Kentucky he had found numerous silicious concretions of a very singular form.

Professor Joy presented some of the refuse of refined sugar from the Hudson River Sugar Refinery. He proposed to ascertain by the spectroscope whether there was any caesium or rubidium in it. He called attention also to the invasion of the salt mines of Wieliczka near Cracow by water, supposed to be from a subterranean lake. The water had already risen as far as the famous chapel of St. Anthony, cut from the solid salt, in 1690. The people were leaving the neighborhood for Cracow.

Professor Newberry announced the death of two distinguished naturalists, Dr. Carl Frederick Philipp Von Martius, Professor of Botany in the University of Munich, and Mr. John Cassin, of Philadelphia, another well-known scholar. Professor Newberry spoke in high terms of the scientific labors of the deceased gentlemen.

Professor Eggleston spoke of some of the means adopted to economize coal, and in the course of some very interesting remarks he pointed out that when coal contained a greater quantity of ash than twelve per cent, it was useless for metallurgical purposes. The large proportion of ash in coal was due to the presence of silicate of alumina. It had been found that by crushing the coal and washing it, a large portion of this silicate might be removed, and the coal fitted for coking.

A conversation ensued, in which Dr. Newberry spoke highly of the Western coals as particularly free from ash, containing in many instances so little as two per cent. The Nova Scotia coals contained as much as thirty per cent.

Professor Eggleston, on the other hand, remarked that many of the coals taken from the neighborhood of Pittsburgh contained a large portion of ash, hence the importance of the crushing, washing, and coking process.

Professor Seeley and Mr. Walling discussed the ordinary formula given in the school books for momentum, Professor Seeley arguing that the school books were incorrect.

Removing Foul Air from Wells.

A correspondent gives us an account of an ingeniously extemporized apparatus for removing carbonic acid from wells. It was simply an umbrella let down and rapidly hauled up a number of times in succession. The effect was to remove the gas in a few minutes from a well so foul as to instantly extinguish a candle previous to the use of the umbrella.

A Species of dwarf fossil elephants has been discovered in the island of Malta by Mr. Busk. According to a communication made by him to the British Zoological Society its height is only from two and one-half to three feet. Another species previously discovered by Dr. Falconer had a height of only four and one-half feet.

Correspondence.

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

Superheated Steam.

MESSRS. EDITORS:—In No. 4, current volume of the SCIENTIFIC AMERICAN, it is stated editorially that "ordinary steam contains, mechanically suspended, a large amount of water, it is saturated not pure steam. Superheating or additional heating sufficient to convert this water into steam, pure and simple, is undoubtedly economical, if it can be done without such an expenditure of fuel as to neutralize its economy." Having given much attention to the subject, and from an experience of three years in the practical use of superheated steam for many purposes, I have found it to be economical and otherwise beneficial under all circumstances. Of course, the less the cost of the superheating, the greater will be the gain, but this is always considerable, though variable.

I can also assert that where such steam is properly used, it is impossible for it to exert any injurious influence (but quite the reverse) upon the working surfaces of the engine. A blessing, however great, may become a curse if misapplied, and superheated steam, like the elements, though a good servant, is a bad master. Steam superheated directly to 400 deg. as a maximum, or mixed, so as to have that temperature, is entirely beneficial in its action, as it keeps the cylinder free from water, which is a nuisance for many obvious reasons.

The full economy due to the expansion of steam can only be realized by superheating, which prevents the enormous condensation occurring under such circumstances. Experiments made by Messrs. Geo. Hecker & Waterman in this city (see SCIENTIFIC AMERICAN, Aug. 13, 1864) with the greatest care, showed that the loss from this source was from 20 to 40 per cent of the total amount of steam used, and these results are confirmed by the application of the indicator to almost any engine. The best results from superheating accrue during the first 50 degrees, when experiment shows that the expansion of the steam from its saturated condition is very great, and after this it follows the law of expansion of gases by heat.

Most of our river, sound, and ocean steamers superheat considerably by means of their steam chimneys, and indeed could not obtain the results which they do, without them. Careful thermometrical tests, extending over many weeks, showed that the steam was superheated to 400 degrees on several of these steamers, and to any one who has seen the looking-glass appearance of the interior of their cylinders, the idea that such superheating is injurious, seems wholly impossible.

Steam, as used in manufactories, is almost invariably "wet," containing "spray," unavoidably carried over, or produced by premature condensation. To superheat this steam will save fuel and time in boiling, drying, etc., and often economizes dye stuffs and bleaching powders, owing to the liquids being boiled with less increase of water. For refining petroleum and other liquids, superheated steam is substituted for open fire, with advantage, thus reducing the risk from over-heating, etc. The power of a boiler, as you remark, cannot be doubled by superheating its steam, but (unless the steam is already superheated) an economy in fuel, etc., of from 12 to 25 per cent, is made by the application of a good superheater; this can be seen in this city and elsewhere. The common defect in superheaters, viz., want of durability, may be overcome by a judicious construction and arrangement; while with a liberal amount of superheating surface, they need not be exposed to a heat which would result in damage and final failure. Many of the heaviest manufacturers and steamship owners in Europe have used superheated steam for years with most economical results, and when its merits are more thoroughly understood, there can be no doubt but that its employment will be general. HENRY W. BULKLEY.

New York city.

Steam from Water and from Maple Sap.

MESSRS. EDITORS:—In No. 4, current volume, under the head of "Increasing the Power of Steam by Superheating" you say that, "Ordinary steam (the vapor given off by boiling water in a closed vessel) contains, mechanically suspended, a large amount of water; it is saturated steam, not pure steam."

I understand by this, that simple steam, say at a pressure of sixty pounds, as it rises, carries with it a large amount of unchanged water which is not steam, and which it fails to precipitate afterwards, or before it leaves the boiler. Every spring, to economise fuel in concentrating the sap of the maple tree to a syrup, I use in my constantly running, factory engine boiler, the sap of the maple instead of pure water, and in this way reducing its volume fifty per cent before drawing it off into my sugar kettles.

Now if the sap is taken up and held in "mechanical suspension" by the ascending steam, am I not the loser of saccharine product just in proportion to the quantity of unchanged sap so carried off? In boiling down a full barrel of the water from the condensed steam of this sap to the volume of a single quart, in the open air, not a trace of saccharine product could be detected in it. If in the first boiler the unchanged sap in large quantities is carried off by the steam, what becomes of its saccharine product if it cannot be found in the steam condensed?

I am preparing for the usual spring sugar-making, but if I am largely the loser by using my factory boiler for partial condensation, I shall this spring return to the old plan of open kettles and wood at \$9·00 per cord. Will you be kind enough to advise me which to do. JAS. W. WADSWORTH.

Durh am, Conn.

[We did not state that maple sap is "taken up and held in mechanical suspension," but that water was. The reduction of saccharine liquid by boiling under pressure is too common to be the subject of discussion. Cane juice as well as maple juice is thus treated; but to imagine that the saccharine matter is carried off with steam is "begging the question." The specific gravity of sugar is greater than that of water, as is also that of salt. In fact distillation is the only proper way to obtain chemically pure water. Pure water is thus obtained on shipboard. It is not surprising that our correspondent did not find a trace of sugar in his quart of condensed steam from a barrel full. He may, however, find a trace of acid, but his condensed steam from maple sap will be otherwise as pure as that from water.—EDS.

Degree of Heat to Bake Bread.

MESSRS. EDITORS:—It is stated by various authorities, Prof. Hosford among others, that the heat required to bake bread varies from 212 deg. to 450 deg. I do not write this communication to confound the doctors, but having made bread the subject of various experiments for the past three years, and having eaten the fruit thereof with great satisfaction, I am able to say the degree of heat required, is in round numbers, not over 220 deg. to 240 deg. In the statements made by the authorities alluded to, it seems to me that the question of *time* has not been considered, and that while destructive distillation of the flour, or in other words, forming the crust, cannot go on at a lower degree than 400 deg. within a certain time, it *can* be induced at a lower temperature extending over a longer period. To introduce a loaf of bread to an oven heated to 400 deg., or even 300 deg., would be to burn the exterior hard and dry, while the interior would be "slack." At 450 deg. tin melts, and the result of exposing a loaf of bread one hour to a heat that would melt tin can be imagined.

EGBERT P. WATSON.

A Suggestion for Inventors.

MESSRS. EDITORS:—There are some of your readers, no doubt, who have inventions that would be valuable if brought before the public, but many of them, like myself, are unable to defray the expenses, and therefore do nothing with them, when they might be of value to many of your readers who would be glad to bring them before the public if they possessed merit. Now, I propose to all such persons to make their improvements public property by giving a brief description in the SCIENTIFIC AMERICAN. Let those who have plans or improvements of any kind that they cannot avail themselves of, give them to those who can, thereby benefiting mankind. Mind and time are both money. "Give freely of what ye have." I have a plan (it may not be new) for making an automatic musical instrument. It is to have the keys acted upon directly or indirectly by strips of any suitable material with perforations or projections formed in lines, and corresponding to the music to be played; said strips of music to be passed through the transmitting or conveying machinery by any desired power said perforations or projections to give motion through the transmitting machinery to the keys of the instrument, and the distances between them to decide the time in the music. A. B. C.

[We suggest, instead of the personal sacrifice, so generously proposed by our correspondent, judicious advertising to attract the attention of possessors of unemployed capital.—EDS.

Tempering Taps.

MESSRS. EDITORS:—Most of your readers are aware of the difficulty in tempering taps and reamers without springing, especially long and large ones. To accomplish this let the blacksmith select his steel for the job and forge the tap with a little more than the usual allowance, being careful not to heat too hot, nor to hammer too cold. After the tap or reamer is forged, heat it and hold it on one end upon the anvil. If a large one hit it with the sledge, if a small one the hammer will do. During this operation the tap will give away on its weakest side and become bent. Do not attempt to straighten it. On finishing and hardening the tap it will become perfectly straight. If any are doubtful a simple trial will convince them. GEORGE JONES.

Portland, Me.

Editorial Summary.

WE understand that the Senate Committee have reported in favor of legalizing two bridges over the Connecticut River, one at the mouth and the other further in, known as the Shore Line bridge. This report will meet with very sturdy and protracted opposition in both houses, and its passage at the session is considered doubtful. It always takes a good deal of time to carry such big enterprises, but in the long run opposition gives way.

IT is reported that the employés of the Patent Office cannot get their salaries. From July to December Congress had appropriated \$250,000 for current expenses, which have absorbed the sum. During that time the receipts were \$303,000, all of which, by legislation, goes into the Treasury, and though thus \$52,000 in excess of its expenses, not a cent of the same can be applied to pay the clerks. An appropriation will be needed to pay them.

A MILD WINTER has been felt in Europe as well as in this country. The Paris journals in their endeavors to console those who enjoy the ice and chill of winter, state that in 1822, 1807, and, further back, in 1791, the temperature was as unusually warm as it is this year; that in 1692 the Germans never lighted their stoves; that 1617, 1612, 1607 were likewise wonderfully mild; that in 1538 the gardens were full of flowers in the month of January; that in January, 1421, cherries ripened, and grapes in May; and that in 1172 the trees were covered with leaves, flowers bloomed, and birds built their nests, while the little ones fledged in the month of February.

THE Mercantile Library of this city has now 100,000 volumes, embracing the best works on every topic. Popular works are largely duplicated, and about 10,000 volumes are added yearly. The Association has a yearly income of \$60,000, and holds real estate valued at \$500,000, and books at \$150,000; number of stockholders 2,000, and of members 10,000. Reading-room is large, well-warmed, well-lighted, and supplied with 3,000 books of reference, and over 400 periodicals, foreign and domestic. Young men expressly should be encouraged to read books, and to make this a place of resort. It is peculiarly their institution, yet it provides for all. Clerks are charged \$3, a year; others \$5, a year.

JUSTUS VON LIEBIG, the celebrated German chemist, recently told a friend that, during the last ten years, he had received seven calls from American universities, and that twice he felt strongly tempted to go to the United States and accept there a professorship. We trust that Liebig will visit this country and give our people the benefit of his varied stores of information; but we cannot advise him to cover up his light under the bushel of a college professorship. If the Baron wishes to make his name and fame conspicuously useful he had better accept a position upon the editorial staff of the SCIENTIFIC AMERICAN, through whose columns he could reach and educate a hundred thousand minds each week.

SAN FRANCISCO is to be supplied with ice from the summit of the Sierra Nevada, in a very novel way. A party of speculators have constructed an ice-house, capable of holding eight hundred or nine hundred tuns of ice, near the Pacific Railroad track. From a stream on the hillside above, a flume has been run to the top of the ice-house, where the water is allowed to fall in small jets or spray into the building below. In this manner they expect to gradually form a mass of solid ice which will fill the entire building.

BRIGHAM YOUNG is said to have a telegraph wire leading to his office and connecting with every hamlet in Utah—a line of 500 miles long. Every settlement of half a dozen houses has a telegraph office with female Saint operators, and in charge of a Bishop of the Mormon church, who can report at any time all that takes place to Young. From his private office in Salt Lake City, like the watchman in the fire telegraph, Brigham may give an order or ring an alarm from Idaho to New Mexico.

A RECENT number of the *Comptes Rendus* states that according to Herr Fritsche, tin exposed to a temperature of 40° below zero was converted into a semi-crystalline mass containing cavities like basalt. In masses of tin weighing from 55 to 60 lbs. these cavities had in some cases, a volume of nearly 24 cubic inches. According to M. Dumas, facts of this kind are not new in Russia; for instance, in one case, the pipes of a church organ were so altered by cold as to be no longer sonorous.

AN EXCHANGE congratulates itself upon an invention just out in Paris which should earn for its author the gratitude of millions. It consists of an apparatus, which, applied to any piano, will deaden the sound emitted. There are few persons who have not been sometimes distracted by the practicing of some too persevering player, and who would have paid any price for such a "mute" as that described.

THE FRENCH ACADEMY has received a report from M Duchartre on certain plants which vegetate without roots. In South America people suspend such plants from a balcony by a thread, without their being in contact with anything else, and yet they grow and blossom in this strange position. Duchartre tried several experiments to find out how they lived, and decided that they existed by the absorption of water.

A PHYSICIAN writes to the Dublin *Journal of Medicine* in support of the old notion that people sleep much better with their heads to the north. He has tried the experiment in the case of sick persons with marked effect, and insists that there are known to exist great electrical currents, always crossing in one direction around the earth, and that our nervous systems are in some mysterious way connected with this electrical agent. Let the beds all head towards the north pole.

THE WORK on the artesian well at St. Louis which has been going down for so many years is approaching its close, and a few weeks will determine whether the undertaking is to prove a success or an expensive failure. The drills are now in what is called the pink sandstone, under which lies granite rock. Should the latter be reached without finding water, further attempts will be hopeless.

ARTIFICIAL ICE BLOCKS.—M. Toselli says that large blocks of ice can be obtained in a few minutes, by producing small pieces of ice at a temperature some degrees lower than zero. These small pieces will then adhere together as soon at they are placed in contact, and blocks of immense thickness can be thus obtained.

A NEW engineering feat is talked of at Chicago. It is proposed to cut off the river several miles above the city, and conduct its entire volume of water to the lake by a canal, and convert the channel into a system of railroads, where all the lines converging in the city might meet in one grand central station.

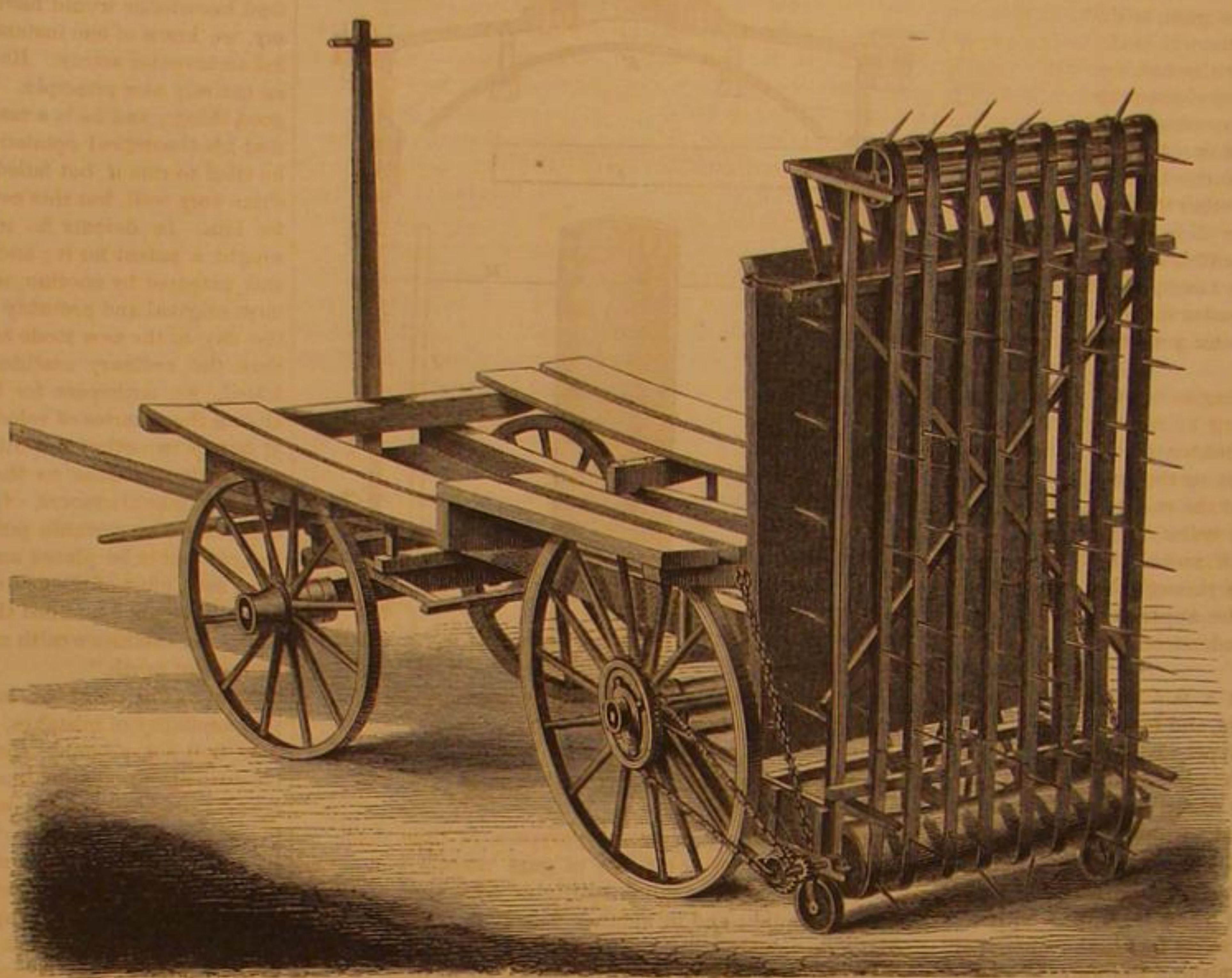
THE merchants of Bremen have resolved to fit out another Arctic expedition, and place it under the charge of Captain Koldewey, of the *Germania*. They are to furnish a steamer and defray expenses.

Automatic Hay Loader.

The object of the contrivance shown in the engraving is to gather the crop of hay, already heaped into windrows, without the expense of manual labor in pitching it on the wagon, the only hand work required being that of arranging the hay on the wagon and making up the load.

At the rear of the wagon is attached a frame consisting of a solid apron of boards, at the top of which is a reel extending across the width of the wagon and at a hight sufficient to discharge the hay to make a good load. From this reel extend downward a series of belts armed with rake teeth the belts passing around a cylinder that receives its rotary motion from the hind wheels of the wagon, by means of a machine chain on each wheel running from a suitable chain pulley on the outside of the wheel, secured thereto, and on to a smaller pulley or wheel connecting by gears with the lower cylinder. All this can be understood by reference to the engraving. The shaft of the lower cylinder is furnished with clutches to prevent its twisting when one of the rear, or driving wheels, turns faster than the other, as in rounding a curve. Sheet iron circular plates are also secured to the boxes of the shaft to prevent the hay from winding around it when the machine is in operation. Under the rear end of the upright frame are small wheels or trucks to keep the lower or driving cylinder from impinging upon the ground when the wheels of the wagon pass into a depression in the surface of the field.

In operation it will be seen that, as the vehicle is drawn along a windrow of hay, the rotating lifting rake is driven so that the hay is swept from the ground inward toward the upright apron, or guard, and discharged by the belts and teeth passing between inclined slats at the top. The gathering frame is properly strengthened by braces, and is so connected with the wagon as to be attached and detached in a moment. The device has received the approval of gentlemen interested officially in the development of agricultural interests and also of practical farmers.



DOUGLAS' PATENT HAY LOADER.

Patented through the Scientific American Patent Agency June 30, 1868, by N. B. Douglas, of Cornwall, Vt. The entire right may be purchased. Address as above.

CHEMICAL CLEANLINESS.

From Chambers' Journal.

One of the most active-minded and ingenious experimentalists in physics, Mr. Charles Tomlinson, has recently called attention to the importance of a chemically clean surface in the performance of many experiments, and to the influence of dirt in modifying their results. His views were discussed in the Chemical Section of the British Association, at the late Norwich meeting, and led to an amusing conversation as to what *dirt* really is; and the conclusion the philosophers arrived at was, that they could not do better than indorse Lord Palmerston's petty and comprehensive definition, that "Dirt is matter in the wrong place." Butter, for example, as one of our leading chemists observed, is matter, and very good matter too, in its proper place—namely, a piece of bread; but butter at the end of one's beard is matter in the wrong place, and consequently falls under the category of dirt. In his most recent article on this subject, Mr. Tomlinson defines a chemically unclean surface as "anything that is exposed to the products of respiration, or of combustion, or to the touch, or to the motes and dust of the air, and so becomes covered with a film more or less organic." One of the most important discoveries is, that the supersaturated solutions of a number of salts contained in chemically clean vessels can be kept for a long time without crystallizing, and even be reduced to temperatures much below the freezing point of water, provided they are protected from the motes and dust of the air and other chemically unclean bodies, by closing the mouth of the vessel with cotton wool, which filters the air. Any of our readers can easily repeat this experiment with sulphate of magnesia (Epsom salts), sulphate of soda, or phosphate of ammonia.

The extreme facility with which a chemically clean glass on a water surface may become chemically unclean, is illustrated by the following experiment with the camphor test, which may be thus described: If a few fragments of camphor be scraped from a fresh cut surface, and be allowed to fall upon water, they rotate with extreme velocity, and sweep over the surface, if the water be chemically clean; but if not, the fragments lie perfectly motionless. On a bright and sunny morning, with a dry air, "conditions highly favorable to the camphor motions, which depend as much on evaporation as on solution," Mr. Tomlinson filled four shallow, clean vessels, A, B, C, D, with water from the cistern tap. Camphor was very active on all four surfaces. He put his finger into A, and his tongue into B. Fresh fragments were motionless on A, but as active as before on B—showing that the finger was unclean, and that the tongue, instead of depositing a film, absorbed water and any possible film with it. The water was emptied from C, which was refilled from a so-called clean jug from the kitchen, filled from the same cistern tap; but the camphor fragments thrown on C were now motionless, showing that the jug had imparted an impurity to the water now in C. The water from D was also thrown away, and the glass rubbed and polished with a so-called clean glass-cloth. On again filling D from the tap, and throwing in fragments of camphor, there was no motion, the cloth having imparted a film to the water.

After these appalling revelations regarding the universal presence of dirt in apparently the cleanest of the vessels from which we eat and drink, it is with great satisfaction that we learn that some liquids (as ether and absolute alcohol) carry with them certain purifying influences of their own, and impart them to the water and the vessel; and strong wine (in consequence of the alcohol and vinic ether which it contains) thus possesses the property of making the wineglass into which it is poured chemically clean. If we take off about a third of the wine, the part of the glass between the original and the reduced levels remains completely wetted, and the phenomenon known as "weeping of the wine," or "tears in the cup," may be observed, which, as our author thinks, was referred to by the wisest of men when he wrote of the wine that "moveth itself aright" in the cup. The supply of liquid in the glass between the two levels is kept up for a considerable time by a twofold action, which Mr. Tomlinson describes as follows: In the spaces between the tears will be seen an ascending wavy current of liquid, which rises (1) by the adhesive action of capillarity (there being strong capillary action between the reduced level and the plane of liquid left in the glass), and (2) by the formation of a back current, in consequence of the downward flow of the tears, just as a back-water is formed at a place where two currents of a river meet; and this action in a glass of wine will be rendered more apparent if there are any specks or floating particles moving on the surface to show its direction.

In some cases, Mr. Tomlinson finds that tears are due to the evaporation and condensation of the liquid in the glass. This effect may be shown by filling a long tube with spirits of wine, and then nearly emptying it, so as to clean the surface. If the tube be now fixed vertically, and the flame of a spirit lamp applied below for a short time, tears will form at different hights.

Another phenomenon connected, with a glass of wine is readily explained by the doctrine of chemically clean surfaces; but in this case we must take a sparkling wine, supersaturated with gas—champagne, for example. (Soda water will do, if champagne is not at hand.) If a sparkling wine or other fluid supersaturated with gas, "be poured into a chemically clean glass, no bubbles of gas will form on the sides, because the adhesion between the sides and the solution is perfect, and the sides may be regarded as a continuation of the liquid itself." If a clean glass rod is immersed in the glass of wine, no bubbles will form around it, for it merely acts as an additional portion of clean side would do. If, however, the rod be dirty, "there will be little or no adhesion between the water of the solution and the dirty surface; but there will be an adhesion between the gas of the solution and the unclean surface, and hence there will be a liberation of gas." Here we have the explanation of the well known fact, that by dropping a bit of bread into a glass of champagne that has ceased to effervesce, we excite a fresh evolution of gas. All bodies that have been exposed to the touch of what society would deem clean fingers, become chemically unclean, as has been shown by the camphor experiments which we have already described. They become covered with an organic film, and act as nuclei in liberating gas, like, and for the same reason as, the dirt on the unclean glass rod.

The importance of the presence of solid nuclei of some sort or other (even a speck of dust will suffice) in setting up the process of crystallization in saline solutions, is known to every smatterer in school-room chemistry. In connection with this subject, Mr. Tomlinson was told the curious fact, that in crystallizing saline solutions on a large scale in chemical manufactories, the workmen stretch clean white strings across the large vessels into which the solution is to be poured; and they find practically that the strings act best as nuclei when they draw them through their hands, which, as he was informed, "are *not particularly clean.*" How little do we think, in admiring a splendid mass of gorgeously tinted crystals, that so magnificent a structure may have been started into existence by a pair of extra-dirty hands!

Mr. Tomlinson has shown us that we and all our surroundings are unclean; that our fingers, on whose cleanliness we relied, are so dirty as to defile the water they come in contact with, and our snow-white table linen is as "filthy rags." Has so great a philosopher no concluding words of consolation? He has told us of our impurities; cannot he also tell us how to become clean? Alas, no! If we were "flasks or other apparatus," which we don't suppose we are, although old Buchan, in his *Domestic Medicine*, tells us that "a young baby is a bundle of delicate pipes," our surfaces might be chemically cleaned by washing them "with strong sulphuric acid, or with a strong solution of caustic potash, and then rinsing with water." This, we are told, "is generally sufficient." Should any of our readers, over-enthusiastic in the cause of cleanliness, venture to try these appliances on their own surfaces, they would find them more than "sufficient." The sulphuric acid would convert the skin into a black charred matter, while the potash would be scarcely less destructive.

How the French Fatten their Poultry.

Any of our countrymen who, from rheumatic gout, or any other ailment, may be sent to Vichy, would do well, as soon as they have sufficiently recovered the use of their legs, to pay a visit to the Villa Belvedere, where a very singular mode of fattening poultry has been for some time successfully pursued. A large circular building, admirably ventilated, and with the light partially excluded, is fitted up with circular cages, in tiers rotating on a central axis, and capable of being elevated, depressed, or rotated, which are so arranged that each bird has as it were, a separate stall, containing a perch. The birds are placed with their tails converging to a common center, while the head of each may be brought in front by a simple rotary movement of the central axis. Each bird is fastened to its cell by leathern fetters, which prevent movement, except of the head and wings, without occasioning pain. When the feeding time comes, the bird is enveloped in a wooden case, from which the head and neck alone appear, and which is popularly known as its "paletot," by which means all unnecessary struggling is avoided. The attendant (a young girl) siezes the head in her left hand, and gently presses the beak, in order to open it; then, with her right, she introduces into the gullet a tin tube about the size of a finger. This tube is united to a flexible pipe, which communicates with the dish in which the food has been placed, and from which the desired quantity is instantaneously injected into the stomach. The feeding process is so short that two hundred birds can be fed by one person in an hour. The food is a liquid paste, composed of Indian corn and barley saturated with milk. It is administered three times a day, in quantities varying according to the condition of each bird. The food seems to be very satisfactory, for if any chances to fall they devour it all as soon as they are released from their paletots. The poultry house is well ventilated; but, of course, it is impossible for any place where six hundred fowls are confined to be entirely free from smell. It takes about a fortnight to fatten a bird by this method. Before being killed the birds are left in a dark but well ventilated chamber for twenty-four hours without food. Each fowl is then taken up by its feet, is wrapped up so as to prevent all struggling, and then bled so adroitly in the throat that its death seems instantaneous. The blood is then allowed to flow from it, and finally, after being plucked, washed, and cleaned, it is wrapped in a damp cloth and is ready for sale. From forty to fifty fowls are thus killed and sold daily.

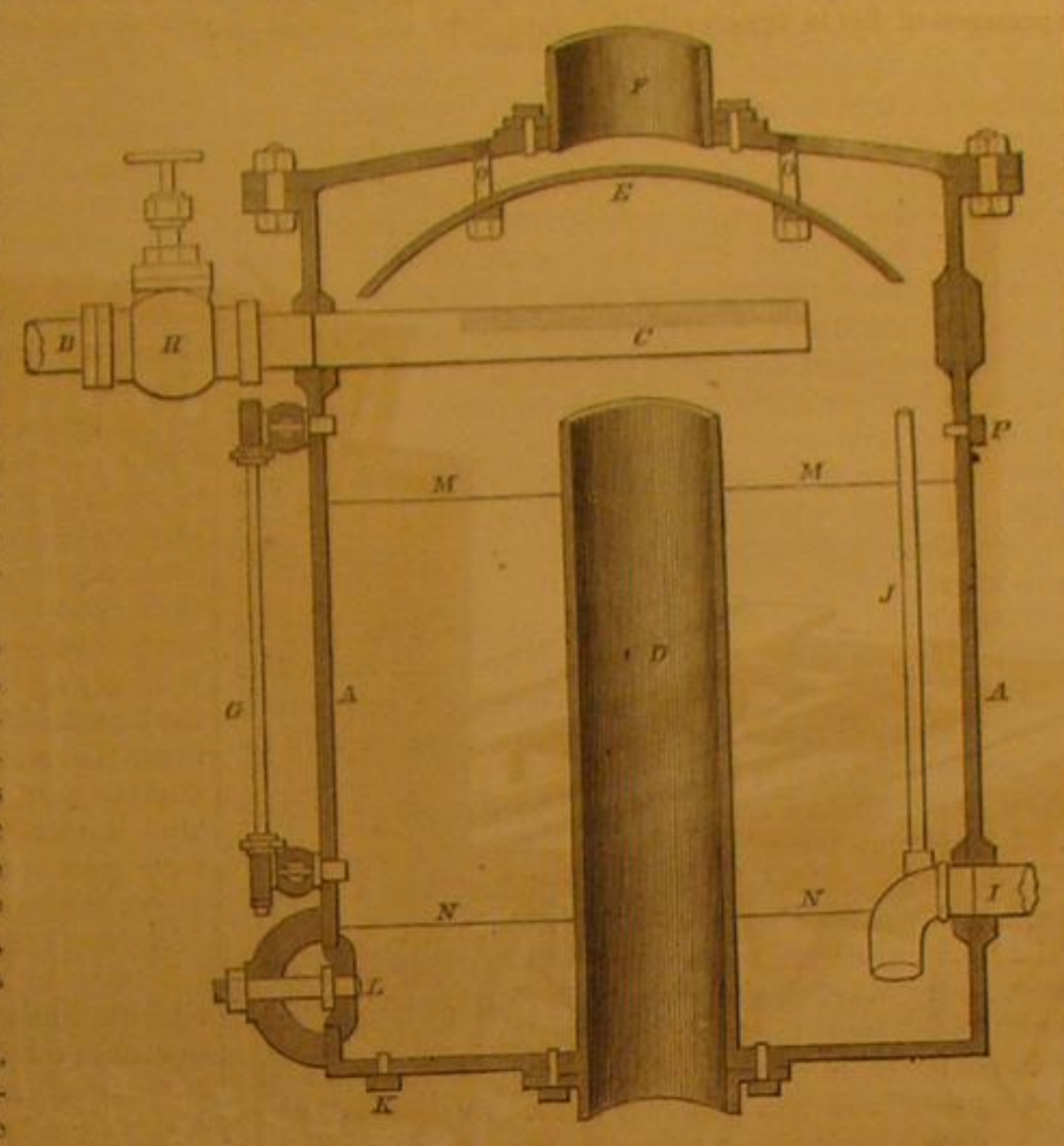
A NEW steam stone crusher now at work upon the new Capitol grounds at Albany, is said to be a success. It crushes large stones with ease into a size suitable to be used in making concrete for the foundation of the new Capitol.

Improved Device for Heating Feed Water for Boilers.

Among the many devices designed for heating the water before being thrown into the boiler, and for condensing the exhaust and depositing the salts held in solution by the water, the one herewith shown in section is among the simplest. A reference by letters to the engraving will be a sufficient description of the apparatus.

A is a cast iron or plate iron reservoir for the water, either circular or of any other form desired. B is the water supply pipe, perforated at C, on the top, through which perforations the water is forced by its head, or a pump, in fine jets. D is the pipe through which the exhaust steam from the engine enters. E is a concave plate, circular, or conforming to the form of the reservoir, against which the jets of water are thrown and from which they are deflected. F is the exhaust pipe for the escape of the surplus steam. G is the glass gage to denote the hight of water in the heater. H is the gate by which the supply of water through the pipe, B, is regulated. I is the pipe connecting with the pump. J is an air pipe connecting with the feed pipe, I, for arresting the flow of water to the boiler pump when reduced to the line, N, thereby preventing oil, tallow, or other floating substances from entering the boiler. K is a plug for carrying off sediment or for drawing off the water to prevent freezing. L is a handhole for cleaning; M, the highest point of water line; N, lowest point. O are bolts for detaching deflector, E, and P plug for overflow.

The exhaust steam from the engine enters through t e pipe, D, and, coming in contact with the cold spray from the sprinkler, C, instantly heats it to the boiling point, or the temperature of the steam. A portion of the steam is condensed and forms part of the boiler water supply, while the surplus passes off around the edges of the deflector and escapes through the pipe, F. The other portions of the apparatus, with their operation, are readily understood by a reference to the engraving.



WATERS' FEED-WATER HEATER.

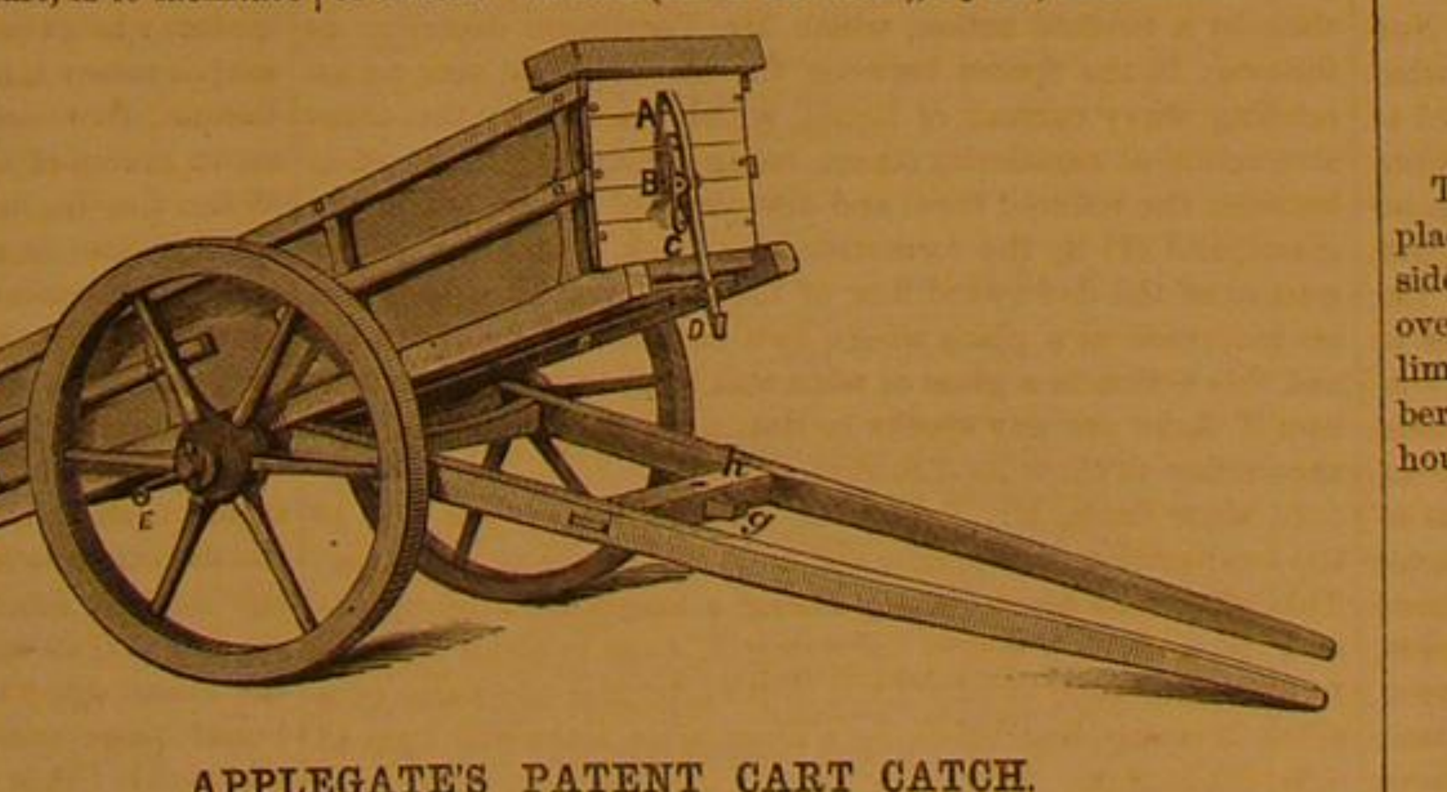
The patentees, having given it a fair trial, under many varying circumstances, and in connection with boilers of various types, believe that it furnishes the boiler with a full and steady supply of thoroughly heated water, raised to 212 deg. by means of the exhaust, without producing any back pressure on the engine; that it prevents incrustation in the boiler by separating lime or other impurity from the water and retaining it in the heater, from which it can be readily removed through the hand-hole, L; saves fuel to the amount of from ten to twenty per cent by furnishing the water at a boiling heat or nearly so, relieving the engine of back pressure, and supplying water to the boiler pure and free from sediment, a bad conductor of heat; beneficial to the boiler for the causes above mentioned and because preventing unequal expansion of the iron by differences in the temperatures of the water. It is evident that the objects, if attained, will serve also, as a safeguard against explosions. Engineers and owners of boilers would do well to examine this heater

Patented April 5, 1864, and Feb. 18, 1868. All communications should be addressed to the Waters' Patent Heater Co., 41 Trumbull st., Hartford, Conn., or to the office of the company, 116 Nassau st., N. Y. city See advertisement on another page.

Improved Device for Tipping Carts.

The design of the simple device shown in the accompanying engraving as attached to a common cart, is to facilitate the tipping of a cart and the dumping of its load, being operated either at the front or rear by the simplest mechanism, not liable to get out of order and always at hand to perform its work.

A, in the engraving, is a catch lever pivoted at B to the front of the cart, having a spring, C, to hold it to its work, and terminating in a pawl or latch at D, that engages with a staple, *g*, secured to the cross bar or brace, *h*. To the lower end of the lever, A, is connected a rod passing under the cart and terminating at E, by which the catch may be worked by the driver when at the back of the cart.


APPLEGATE'S PATENT CART CATCH.

Attached to the lever or catch in front, and just above the latch, D, is an L-shaped slide, or rather a slide forming three sides of a square that serves to keep the catch, D, disengaged from the staple, *g*, after the catch has been unlatched, and locks it when in contact with the staple, it sliding freely, by its own weight, on the lever. This is not shown in the engraving. In operation the catch may be disengaged at the front by pressing upon the lower part of the lever catch, or by pulling the rod at the rear. The advantages of this device are apparent, and its simplicity is such that any country blacksmith can make, attach, or repair it readily.

Patented by Joseph H. C. Applegate, Dec. 29, 1868. Orders for state and county rights may be addressed as above, or to Garrison & Woodruff, P. O. Box 338, Bridgeton, N. J.

Cement for Glass and Metals.

This article, so much esteemed for uniting pieces of broken glass, for repairing precious stones, and for cementing them to watch-cases and other ornaments, is made by soaking isinglass in water until it becomes quite soft, and then mixing it with spirit in which a little gum mastic and ammoniacum have been dissolved.

The jewelers of Turkey, who are mostly Armenians, have a singular method of ornamenting watch-cases, etc., with diamonds and other precious stones, by simply glueing or cementing them on. The stone is set in silver or gold, and the lower part of the metal made flat, or to correspond with the part to which it is to be fixed; it is then warmed gently, and has the glue applied, which is so very strong that the parts thus cemented never separate. This glue, which will strongly unite bits of glass, and even polished steel, and may be applied to a variety of useful purposes, is thus made in Turkey: Dissolve five or six bits of gum mastic, each of the size of a large pea, in as much spirits of wine as will suffice to render it liquid; and in another vessel, dissolve as much isinglass, previously a little softened in water (though none of the water must be used), in French brandy or good rum, as will make a two ounce vial of very strong glue, adding two small bits of gum galbanum, or ammoniacum, which must be rubbed or ground till they are dissolved. Then mix the whole with a sufficient heat. Keep the glue in a vial closely stopped, and when it is to be used, set the vial in boiling water. Some persons have sold a composition under the name of Armenian cement, in England; but this composition is badly made; it is much too thin, and the quantity of mastic is much too small.

The following are good proportions; isinglass soaked in water and dissolved in spirit, 2 oz. (thick); dissolve in this 10 grains of very pale gum ammoniac (in tears), by rubbing them together; then add 6 large tears of gum mastic, dissolved in the least possible quantity of rectified spirit.

Isinglass dissolved in proof spirit, as above, 3 oz.; bottoms of mastic varnish (thick but clear), 1½ oz.; mix well.

When carefully made, this cement resists moisture, and dries colorless. As usually met with, it is only of very bad quality, but sold at exorbitant prices.—*Cooley's Receipts.*

A Civil Engineer on the Pacific Railroad writes that he has seen a remarkable curiosity—a natural hot spring—up in Nevada, which he describes as situated in a crater one hundred and fifty feet long in one direction and seventy-five in the other—a mammoth bath tub in shape. The depth of the water is unknown, no lines brought here having been long enough to reach the bottom. In one part the water is just hot enough to enable the hand to be held in it, and the remainder varies from this to lukewarmness. The walls are nearly vertical, and you can imagine the luxury of a plunge into it, with no fear of striking bottom. Just think, too, of swimming about on a cold November day, with the rising steam deposited in frost upon the rocks, in water which is of a temperature perfectly luxurious. The water tastes slightly of sulphur, iron, and lime

NOTES ON THE VELOCIPEDE.

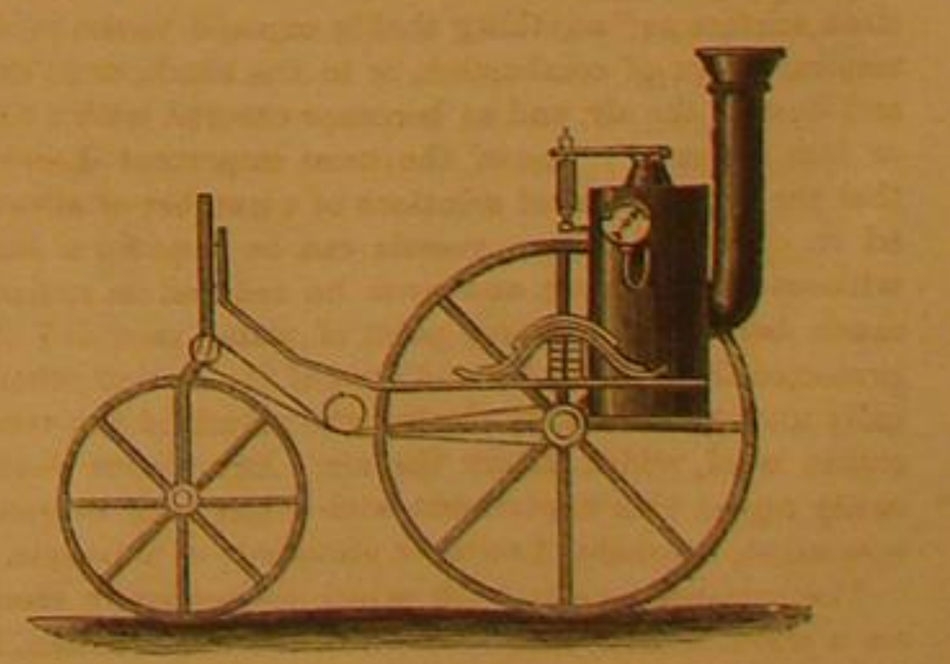
Thus far, the two-wheeled velocipedes maintain their ground sturdily against all rivals. While allowing the as yet superior grace and speed of this style of machine, we still are compelled to believe that *the* velocipede, destined to become a fixed fact as much as locomotives and steamboats, is not yet born. Our inventors are striving hard to bring forth this ideal vehicle, and from the combined efforts they are putting forth, it will be strange if they do not at last hit upon it.

Our enterprising neighbor, the *Sun*, is, as Sam Weller would say, "rather sewere" upon some of the new devices, it says:

"Before inventing a new velocipede, it would be advisable to become expert in riding those now in existence. Generally, our inventors have proceeded upon abstract principles, and have fallen into absurdities from which a little previous practical knowledge would have saved them. And yet, strange to say, we know of one instance in which practical knowledge led an inventor astray. He devised and built a velocipede on an entirely new principle. Theoretically he saw that it was a good thing; and he is a man of science as well as of sense, so that his theoretical opinion is of value. Having got it done, he tried to ride it, but failed. He could ride the ordinary machine very well, but this new-fangled apparatus was too much for him. In despair he took it to pieces, and never even sought a patent for it; and yet the same machine, invented and patented by another, is now regarded by experts as the most original and probably the most valuable contribution of the day to the new mode of locomotion. It is harder to learn than the ordinary machine; but though it is not yet fully tested, we anticipate for it a long and brilliant popularity among the votaries of velocipedestrian science. We hear also of one or two other novelties that are not without promise, and little additions to the comfort of riders are constantly made by manufacturers. One of the most valuable of these is the triangular movable pedal of Pickering, with which the feet can never be placed amiss upon the cranks. But, as we have said, most of the new contrivances are nonsense; though, as we have not examined those of Indiana, we still hope that so great a commonwealth may produce something of real and permanent worth."

Now, as our neighbor, in the above extract acknowledges the possibility of mistakes, even by theoretical and practical men, is it not probable that many of the devices which now meet its disapprobation, may turn out to be just the thing after all? It criticizes the one-wheeled velocipede, an English invention, an engraving of which we present below, as being liable to give its riders broken noses, but we might remind it of the feats of balancing performed on equally as unstable a basis as this contrivance appears. Would it be more difficult to keep upright upon such a wheel, than to sit in a chair balanced upon two legs, resting upon the rather uncertain substratum of a slack rope?

The engraving needs little explanation. The feet are placed on short stilts connected with the cranks, one on either side of the rim, while the rider sits upon a steel spring saddle over the center of the whole wheel. The inventor modestly limits the diameter of the wheel to twelve feet, and the number of revolutions at fifty per minute. Twenty-five miles per hour is the speed expected to be reached.



We also give an engraving of a steam velocipede. The cylinders and their attachments to the two driving wheels are not shown. They are placed vertically in front of the boiler, between it and the seat, and connect with cranks on the shaft of the driving wheels. The engraving shows the position of the boiler relatively to the other parts of the machine. The engine is a direct-acting compound engine of two cylinders, each cylinder 2½ inches diameter, and 5 inches stroke. The steering gear consists of an endless chain over a grooved wheel on the engine shaft, and passing over a corresponding wheel, fixed between the forked shaft just over the front wheel. The latter grooved wheel is a wide one, and over it passes another chain. This latter chain works round the boss of the front wheel. This arrangement gives power to the front wheel, so that in turning a corner, this wheel takes a wider sweep than the two driving-wheels, which go first. In traveling on a straight road (backwards) the machine is turned to either side by turning the steering wheel to the opposite side. The boiler is a vertical one, with four tubes 1¼in. internal diameter, hanging down by the side of the firebox. The firegrate is cast with four holes in it to receive the bottom ends of the tubes, so as to help to hold them firmly. Hight of boiler, 2ft. 6in.; hight of firebox, 15in.; diameter of firebox, 11in.; diameter of boiler, 14in. The firebox and tubes are copper, pressure 200lb., but 25lb. of steam will be equal to a velocipede propelled by the feet. Great speed is expected from this velocipede.

Our attention has been called to the fact that notices of infringement are being served by the proprietors of a patent granted by the United States, in 1866, to Pierre Lallement, Paris, France, assignor to himself and James Carroll, of New Haven, Conn., upon various velocipede manufacturers throughout the country.

We herewith give the claim of this inventor and an engraving of the velocipede, taken from the report of the Commissioner of Patents.

VELOCIPEDE.—Pierre Lallement, Paris, France, assignor to himself and James Carroll, New Haven, Conn.—Dated Nov. 20, 1866.—The fore-wheel is axled in the jaws of a depending bar, which is pivoted in the frame, and turned by a horizontal lever bar. This wheel is revolved by a treadle-crank.

Claim.—The combination and arrangement of the two wheels, A and B, provided with the treadles, F, and the guiding arms, D, so as to operate substantially as and for the purpose herein set forth.

The inventor of this velocipede being an alien, proof that a velocipede similarly constructed had been introduced into this country previous to the date of application would render the patent void.

Proof that the patentee had neglected to put and continue the invention on sale within eighteen months after the date of the patent would also render it null.

The above patent does not cover the idea of making two-wheeled velocipedes, nor of applying the propelling power directly to the front wheel, nor of pivoting the wheels. It remains to be seen whether the use of foot-cranks, which appears to be the novel point, can be sustained.

Two-wheeled velocipedes, having the front wheel pivoted in the frame, and guided by a horizontal bar, were in use forty years ago, of which we will give an engraving in our next. These vehicles had no foot cranks, but were propelled by the hands by means of a toothed lever acting on the front wheel, also by pressure of the rider's feet upon the ground; either method separately, or both combined could be employed in propulsion, and a very high speed attained.

It is by no means certain that the "coming" velocipede is to be a two-wheeled vehicle. What is very much needed is a velocipede which shall be light, graceful, easy to mount, and easy of propulsion—something, in short, which everybody, young or old, can use with satisfaction, and without the constant fear of capsizing.

We lately saw on Broadway a very successful four-wheeled velocipede; the wheels were about as high as an ordinary buggy, and the rider moved it about with the greatest ease and rapidity.

There is a very wide field for study and improvement of the velocipede. The demand is far greater than the ability of makers to supply.

So far as we can ascertain, the following is a correct list of the patents granted in the United States for velocipedes up to January 1, 1869:

NAME.	RESIDENCE.	DATE.	No.
W. K. Clarkson	New York city	June 26, 1819	—
G. Parker	Providence, R. I.	November 21, 1825	—
L. Kelner	Brooklyn, N. Y.	January 12, 1858	19,092
S. W. Barr	Mansfield, Ohio	October 2, 1860	30,192
H. Boyd	Watertown, Wis	June 17, 1862	35,583
A. Longett	New York city	August 12, 1862	36,160
P. W. Mackenzie	Jersey City, N. J	January 19, 1864	41,310
J. Goodman	London, Eng	September 13, 1864	44,256
H. A. Reynolds	New York city	March 7, 1865	46,705
W. Quinn	Philadelphia, Pa	April 11, 1865	47,220
J. G. Wilkinson	Quincy, Ohio	March 13, 1866	53,209
H. A. Reynolds	New York city	April 24, 1866	54,307
P. Lallement	Paris, France	November 20, 1866	59,915
F. G. Hoeppner	New York city	May 7, 1867	64,416
C. A. Way	Charleston, N. H	November 26, 1867	71,561
"	"	"	71,562
M. Newman	Unadilla, N. J	January 7, 1868	73,029
L. Deroyier	New York city	February 4, 1868	74,058
W. G. Crossley	Cambridge, Eng	March 17, 1868	75,531
O. F. Gleason	Farmington, Me	May 5, 1868	77,478
B. P. Crandall	New York city	July 7, 1868	79,553
Hanlon Brothers	"	July 7, 1868	79,654
H. A. Reynolds	Brooklyn, N. Y	July 28, 1868	80,425
A. Christian	New York city	September 1, 1868	81,606
D. Hunt, Jr.	Worcester, Mass	September 22, 1868	82,319
C. K. Bradford	Lynnfield, Mass	October 13, 1868	83,035
C. N. Cutter	Worcester, Mass	November 3, 1868	83,696
E. H. W. Blake	Chicago, Ill	November 17, 1868	84,163
S. M. Skidmore	Brooklyn, N. Y	December 29, 1868	85,277
S. A. Wood	Manitoc, Wis	December 29, 1868	85,501

The *Times*, of this city, has been taking a velocipede census, and announces that there are five thousand pupils in various stages of advancement in this city. The rooms of the numerous velocipede schools are open almost, like the restaurants, "at all hours," but still disappointed applicants for admission have to be turned away. The greatest difficulty is, however, to get the velocipedes, the demand being far ahead of the supply.

Philadelphia has recently produced a velocipede of an entirely new style. There are but two wheels, the seat sitting quite low between them. The novelty consists in a cog attached to the guiding-post, by means of which the rear wheel is made to follow directly in the track of the forward wheel. No matter how short the turn, both wheels make it at the same time, and the seat always remains parallel with the driving-wheel. In other machines there is no guide to the rear wheel, and consequently the machine cannot be turned so readily when a collision is threatened. The new machine, which is called the "Keystone," in honor of its native State, is substantially built, and so far as it has been tested in the riding school, is pronounced a success. How it will operate on the roads and in the parks, remains to be seen.

A correspondent of the *Evening Post* says:

"The velocipede fever continues to create excitement in Chicago. Two riding schools for instruction in the art of balancing upon these vehicles, have been established, and the machines are kept for sale at various places. Its perfectly level streets—many of them paved with wooden blocks—are admirably adapted to this species of propulsion, and several of its business men, living two or three miles from their offices, make their daily trips with two-wheeled vehicles, quickly leaving the discomfited horse-car men in the distance. The demand for velocipedes greatly exceeds the supply, and the smaller cities around are taking the contagion and sending in their orders. The lucky manufacturers must be reaping a rich harvest, and ought to reduce the present extortionate price of $100 and $125, as they doubtless will have to do eventually. Meantime Chicago hails any invention of a *fast* nature, and the velocipede is likely to become a practical institution there."

Hoosick Falls, N. Y., claims to have produced the first velocipede. It was built in 1821 by David Ball and Jason Burrill, and was an undoubted success. It was in existence as late as 1866, when it was destroyed by fire, together with the building in which it was kept.

New Bedford had a velocipede race for a silver cup recently. A large number were present and there was much excitement. The distance to be accomplished was a quarter mile, which was ten times around the rink.

The "velocipede mania" has also broken out in Rome.

Rev. Henry Ward Beecher, in a recent lecture on "Rational Amusements," made the following remarks:

"One of the great questions of the day was in relation to the "coming man" and how he was to come. He thought he was coming on a velocipede—a new machine that was bound to play a prominent part in the category of amusements—a toy to some, an instrument of pleasure and great use to others. He had purchased two for his own boys and there was every probability of him riding on one himself. He was not too old to learn, but he hoped it would not be said that the velocipede was his hobby. His auditors were not too old to learn, and he would not at all be surprised to see, in a short time hence, a thousand velocipedists wheeling their machines to Plymouth church."

A riding school for ladies hasbeen started in this city, on Fifth avenue corner of Fourteenth street, at what is known as the Somerville Art Gallery, which has two fine halls, each with an area of over 3,000 square feet. One of these halls will be set apart for beginners and the other for those more advanced. An exchange says:

"With a proper teacher of their own sex, and with suitable dresses for the preliminary practice, ladies can obtain such a command over the velocipede in one week's practice, of an hour daily, that they can ride side-saddle-wise with the utmost ease."

From the New York Sun.

HANS BREITMANN'S SHTORY APOUT SCHNITZERL'S PHILOSOPEDE.

Herr Schnitzerl make a philosopede
  Von of de newest kind;
It vent mitout a vheel in front,
  And hadn't none pehind.
Von vheel was in de mittel, dough,
  And it vent as sure as ecks,
For he shtraddled on de axel dree
  Mit der vheel petween his lecks.

Und ven he vant to shtart id off
  He paddlet mit his veet,
Und soon he cot to go so vast
  Dat avery dings he peat.
He run her out on Broader shtreet,
  He shkeeted like de vind,
Hei! how he bassed de vancy-craps,
  And lef dem all pehind!

De vellers mit de trotting nags
  Pooled oop to see him bass;
De Deutschers all erstaunished saidt:
  "*Potztausend! Was ist das?*"
Boot vaster shtill der Schnitzerl flewed
  On—mit a gashtly smile:
He tidn't tooch de dirt, py shings!
  Not vonce in half a mile.

Oh, vot ish all dis eartly pliss?
  Oh, vot ish man's soocksess?
Oh, vot ish various kinds of dings?
  Und vot ish hobbiness?
Ve find a pank note in de shtreedt,
  Next dings der pank ish preak;
Ve folls, und knocks our outsides in,
  Ven ve a ten shtrike make.

So vas it mit der Schnitzerlein
  On his philosopede;
His feet both shlipped outsideward shoost
  Vhen at his extra shpede.
He felled oopon der vheel of coorse;
  De vheel like blitzen flew;
Und Schnitzerl he vos schnitz in vact
  For id shlished him grod in two

Und as for his philosopede,
  Id cot so shkared, men say,
It pounded onward till it vent
  Ganz teufelwards afay.
Boot vhere ish now der Schnitzerl's soul?
  Vhere does his shpirit pide?
In Himmel troo de endless plue,
  It takes a medeor ride.

CHAS. G. LELAND.

A MUSEUM OF THE ELEMENTS OF MACHINERY.

The Massachusetts Institute of Technology, having successfully organized its Society of Arts and its School of Applied Science, is now about to organize and establish the third department of the Institute, namely, a Museum of Arts. The Society of Arts has been in successful operation for six years; the School opened in 1865, has already twenty teachers and one hundred and seventy-five students, and is the largest scientific or technological school in the country. The creation of the Museum of Arts, contemplated from the beginning, is just now taken in hand. The whole scope and range of usefulness of such a Museum is by no means to be foreseen at its start. It must be developed gradually; and its best growth will not be favored by too rigid plans at the outset.

But in the mechanical department of the Museum, using the term "mechanical" in its most comprehensive sense, a general plan of a certain novelty and of much interest to inventors, has already been adopted and promulgated by the Curator of the Museum, Mr. S. P. Ruggles, of Boston, a gentleman well-known to many of our readers as a successful inventor.

Mr. Ruggles and the Committee of the Institute upon the Museum do not propose to copy the unwieldy collections of models of complete machines, which have elsewhere been made at such cost of time and money, and with such feeble results in facilitating new invention. Machines are incessantly superseded in whole or in part; the models of to-day are not the working patterns of to-morrow; most machines, if not in work, deteriorate rapidly. To keep a printing press in order requires the constant attention of a skillful workman. A model of a locomotive, or of a sea-going steamer, just finished, is next year only a bit of history. An inventor who wants to study the best machine in any department of industry, will not go to see it at a museum where it is not in operation; he will visit the shop, mill, or forge where the newest machine of the kind is most successfully working. Moreover, such collections soon outgrow all reasonable limits of space, and the proper care of them drains the deepest purse.

The Institute of Technology, therefore, proposes to make a collection of the elements of machinery, and the simple combinations of those elements. Machines consist of infinitely various combinations of simpler parts which repeat themselves in different proportions or modifications. Mr. Ruggles wishes to make a tangible encyclopedia of these elements of machinery. He proposes to collect and make working models of all the elements, of all the varieties of reciprocating motions, for example, of all the devices for converting a reciprocating into a rotatory motion, or a rotatory into a reciprocating, of all the varieties of cam motions, of quick and slow screws, so combined as to give both speed and power, of eccentric gear combinations, of reversing movements, of contrivances for pressing by means of screws, toggle-joints, cams, and levers, of the different escapement arrangements for watches and clocks, of universal joints like the gimbal and ball and socket joints, and of all other primary mechanical devices by which force and motion are transmitted, directed, or modified. These models are to be classified by subject, catalogued with precision, and placed in cabinets in the order of subjects.

The singular advantages of this plan for a Museum of Machinery are apparent at a glance. In the first place, it would be of manageable bulk. Secondly, it would never grow old. The elements of machinery are worked over and over again into new machines, just as the words of a language are constantly run into new sentences. The writers change; style and usage are insensibly modified from generation to generation; but the roots of the language remains for centuries. Thirdly, such a collection can always be added to with ease; as is the case with a card catalogue in a great library, additions, from time to time, as new inventions of elements were made, would make it more comprehensive without rendering the older material less accessible or less useful. Lastly, a collection of models of the elementary parts of machines would be more profitable for study than a collection of models or pictures of complete machines. The simpler should go before the more complex. The real object is far more intelligible than a drawing or a description. The students of the school, inventors, and the public generally would get more genuine instruction from such an analytical museum than from a much larger and more costly collection of actual machinery. A machine can rarely be fully seen and comprehended by persons not experts without being taken apart; in very many machines the really peculiar and significant parts are overlaid with less instructive appendages; the characteristic idea is hidden under a mass of commoner stuff. Yet it is the characteristic invention in each machine which is its most instructive portion.

The proposed classification of models of the elements of machinery would be of especial service to inventors. A mechanical invention consists generally in a new combination of mechanical elements, so as to produce a machine having some new capacity or functions; but the inventor is too often unacquainted with the known elements and simple combinations of machinery. No collection contains them in an accessible form; no catalogue or index directs him to the movements which he needs in his new design. The elements of machinery are not in every day use among all people, like the elements of language in common speech and familiar writings, but are hidden away in the machinery of scattered shops and factories. The inventor too often has to re-invent, at great expense of thought and money, elements or combinations which have long been in use, but which he has never seen. Even then he may not devise as good methods of producing the desired effects as have been previously invented and are at his disposition if he only knew of them. The work of the inventor, like that of the author, is emphatically brain-work. But inventors have no such aids in their labor as literary men have. The proposed museum, with its catalogues and indexes would aid inventors somewhat as libraries, dictionaries, and gazetteers help authors. An inventor, meditating upon his design, sees that he has need of some peculiar movement; but he knows no means of producing that movement. He consults Mr. Ruggles' classified collection of elementary movements, and sees at once among the various screw movements, for example, that a combination of quick and slow screws is capable of producing the particular movement which he has need of. He is thus saved the labor of inventing for his purpose. This is not an imaginary problem, but one which often actually occurs. Many simple and familiar contrivances are constantly re-invented. Examples will occur to all inventors. Who can tell how often the Archimedean screw has been discovered? Even the cam is constantly invented anew. Inventors have hitherto been too much left to their own unaided mental resources. Dictionaries and glossaries do not replace genius, nor make one talent go as far as ten; but they are important aids to genius, and they enable common men to do much accurate and useful work. So the collection of elementary models, which Mr. Ruggles proposes to bring together, will not diminish the field for inventive genius; but it will instruct inventors as a class in what has already been done, and it may be expected to prevent in some measure the waste of time and strength involved in re-invention.

People believe in a vague way that inventors are an important class in the community; but few fully realize the importance of lending them every possible aid in their civilizing work. The American community is made possible by American and foreign invention. The crops of the West could neither be harvested nor brought to their distant markets without the mechanical reapers, rakes, threshers, hullers, elevators, and cheap railways by which they are handled. The American dwelling-house is full of devices, great and small, to promote the comfort or luxury of its inmates. Education and liberty owe much to the inventors of power printing-presses. By the telegraph, the railways, and the swift steamers, this continental republic is made practically smaller than little England was fifty years ago. One man, with the aid of coal and the mechanical appliances which inventors have created, can do more work, or produce more wealth in a day than a thousand could without these aids.

The Massachusetts Institute of Technology is therefore undertaking an important work in establishing this Museum of Arts. It appeals with confidence to inventors, and constructors of machinery for working drawings, not of entire machines, but of the *characteristic parts* of their inventions or constructions; and it asks all men who are interested in promoting the progress of the mechanic arts for such aid, in money or influence, as they can give.

Inventors, constructors, and all persons interested, are earnestly requested to contribute to this Museum detailed drawings of the peculiar elementary features of such inventions as are within their knowledge, accompanied by the necessary descriptions. If working drawings cannot be furnished, sketches with full descriptions will be available substitutes.

THE HADROSAURUS ON THE STAGE.

From the New York Evening Post.

At the lecture of Professor Waterhouse Hawkins, before the American Institute, on the evening of January 27th, the audience were taken completely by surprise by the unveiling of the restored skeleton of a huge reptile called the "Hadrosaurus." The restored monster, supported by strong iron braces, was fourteen feet eight inches high, entire length along the back twenty-five feet, and length of tail alone, twelve feet. He had been skilfully concealed behind curtains, which, covered with diagrams, left no suspicion of anything behind them. At the proper moment, the curtains were dropped and the animal stood out in full view.

The Hadrosaurus was described and named by Joseph Leidy, of Philadelphia, who gives the following account of its discovery:

"Attention was first called to the discovery of the remains of the Hadrosaurus in the autumn of 1858, by W. Parker Foulke, of Philadelphia, member of the Academy of Natural Sciences, a gentleman who has always displayed a great interest in the advancement of the objects of the latter institution. While passing the season at Haddonfield, Camden county, New Jersey, Mr. Foulke learned from one of his neighbors, John E. Hopkins, that in digging marl upon his farm twenty years back, there had been found a number of large bones. These were said to have consisted mainly of vertebræ, and had been gradually distributed among visitors who were curious in such objects, so that none remained in the possession of Mr. Hopkins. In the hope of finding additional portions of the skeleton, with the permission of the latter gentleman, Mr. Foulke employed men to search in the place of the old excavation. This was situated in a narrow ravine, through which a brook flowed eastwardly into the south branch of Cooper's Creek. At the depth of nine feet from the surface the men were successful in finding numerous bones. These were imbedded in a stratum of tenacious bluish black micaceous clay, in association with a multitude of shells, an echinoderm, several small teeth and vertebræ of fishes, acoprolite, and some fossilized coniferous wood.

After a careful examination of the osseous remains, Leidy came to the conclusion that the Hadrosaurus Foulkii was a reptile of huge proportions, and of the same habits of life as the great Iguanodon of the wealden and cretaceous deposits of Europe. A study of the teeth showed it to be a vegetable feeding reptile, one which masticated its food like the herbivorous mammalia.

The few scattered bones of the fossil were preserved in the Museum of Natural History in Philadelphia, and after careful measurements during the past summer, a labor requiring nearly six months of the closest study, Mr. Hawkins has been able to restore the animal in the exact size and proportions of life. It is doubtful whether any other living man could have accomplished this remarkable feat, but Mr. Hawkins brings to bear the experience acquired in the restoration of thirty-six extinct animals for the gardens of the Crystal Palace at Sydenham, and we can place entire confidence in the accuracy of the work. The Commissioners of the Central Park propose to erect a grand geological saloon, in which are to be placed the restored figures of the animals found in our own country. Upon the walls of the saloon, or building, will be fresco paintings illustrating the vegetation of the period during which the animals lived, and along the sides will be placed the actual geological specimens and fossil remains found with the skeleton.

A stuffed specimen of the nearest living representative of the genus will also be preserved in the museum of the Park. The Commissioners are worthy of the highest praise for the conception of a plan so fraught with instruction and amusement to the citizens of New York, and they are to be congratulated upon having secured the services of an artist, naturalist, and mechanic, so capable as Mr. Hawkins of carrying their wishes into execution.

The other animals to be restored are two specimens of Laelaps and the Elasmosaurus platyarus—all of them very comfortable to look at in a defunct state, but very inconvenient to have about if clothed in flesh and blood. We hope that the work, when completed, will give such an impulse to the study of geology and the natural sciences in our city as to arouse our citizens to a consciousness of the fact that there is no public museum of any sort in New York in which studies of this kind can be carried on, and that whoever now wishes for information upon such subjects is obliged to seek for it in Boston or Philadelphia. When our citizens fairly comprehend the disgrace of such a condition of scientific destitution, we may hope for steps to be taken to remove it, and the labors of the Central Park Commissioners will greatly aid the good work.

Mr. Hawkins' style of lecturing, combined with his graphic illustrations on the blackboard, added very greatly to the interest of the occasion. Without interrupting the flow of ideas, and while explaining the unity of plan in creation, and the anatomy of reptiles, he would, with a few strokes of his pencil, make each bone and joint grow under his hand, simultaneously with the description, so that when the story was ended the restored animal was completely delineated upon the canvas. The marvelous skill with the crayon, combined with the profound scientific knowledge of the lecturer, fixed the attention of the audience and frequently elicited spontaneous bursts of applause. The lecture was full of valuable information, and was one of the most interesting of the course.

The appearance of the Hadrosaurus upon a New York stage must be pronounced a great success, and we congratulate our neighbors of New Jersey upon being well rid of such specimens of natural history.

Curiosities of Minute Handicraft.

Sometime ago, there dwelt not far from Lambeth Palace, in London, an ingenious mechanic named Thomas Smith, since dead, who devoted a large portion of his valuable life to the production of machines and models of almost microscopic dimensions. A writer in the *Gentleman's Magazine* visited Smith's workshop and furnishes the following interesting account of what he saw:

Beginning with the larger of his productions, the first object to which he directs our attention is a small steam-pumping engine for working a table fountain. All the adjuncts that pertain to a great pumping engine are to be found in this diminutive model. There was even the gage glass on the front of the boiler, as slender as a good sized needle, and fitted with taps at each end, in the nozzles of which a pin could hardly be inserted. The whole thing worked to perfection, without rattling or any escape of steam from the engine or water from the pumps, and will throw a small jet of water in a distant part of the room to a height of twelve feet. The majority of working models of small dimensions are usually clumsy affairs, whose parts are made more according to the convenience of the workman than with reference to the work they have to do, and the strength that is expected in them; but to the credit of our micro-mechanic, be it said, that he scorns this rule of thumb style business. Some of his screws are not more than the eighteenth part of an inch thick, and these are furnished with hexagon-headed heads, and nuts perfectly shaped. Mr. Smith's powers enable an inventor to exhibit to his patrons the real working machine on a small scale.

At the time of our visit a number of diminutive garden pumps, small enough to be carried in the waistcoat pocket, are scattered over the work benches in various stages of completion. These are for the use of agents and commercial travellers trading with such articles. But the above-described curiosities are huge compared with those next set before us. We are introduced to a model of the famous Great Britain, made to a scale of 1-40th of an inch to the foot, so that the length of the model is about eight inches, and breadth about $1\frac{1}{4}$ inch. It is full-rigged, with six masts and their accompanying spars, and all the hatchways and deck fittings. The deck of this tiny vessel is lifted off and a magnifier is handed to us; this resolves a little heap of metal scraps into an accurate model of the original engines with which the Great Britain was fitted. So small is this model that it stands upon less space than the area of a shilling. The idea of such a model working seems preposterous, and we hesitate about asking whether it does or not. We are not long left in doubt. An annular trough of water is produced, and the ship is launched into the watery circuit. A tap is turned, and compressed air rushes through a tube and off goes the tiny ship to circumnavigate its little sea. There is no illusion, no trickery in this exhibition, the diminutive engines as really and truly work and drive the boat as do those of any steamer on the seas. The total weight of the boat, with deck and rigging, engines, boiler, and all entire, is less than a troy ounce! The actual weight of the working part of the engines—that is all excepting the boiler—is just that of a sovereign.

Having examined some other "practical models," one of which, the writer says, was "enshrined in a small pill-box," he proceeds to give "a few details concerning the microscopic edition of the Warrior's engines. "This tiniest working model in the world is now in the possession of John Penn (of Greenwich), the eminent maker of the great engines of which it is the infinitely reduced counterpart. It will stand on a threepenny-piece; it really covers less space, for its base-plate measures only 3-8th of an inch by about 3-10th. The engines are of the trunk form introduced by Penn; the cylinders measure 1-8th of an inch diameter, and the trunk 1-20th. The length of stroke is 3-40th of an inch. They are fitted with reversing gear, and are generally similar in design to the great machines with which ships of the Warrior class are equipped. From the extreme smallness of this model a few minutiæ—such, for instance, as the air pumps—have necessarily been omitted; there is a limit beyond which human skill and minuteness cannot pass. Still, so small are some of the parts that they require a powerful magnifying glass to see their form. The screws which hold the members together are only 1-80th of an inch diameter, and these are all duly furnished with hexagonal nuts, which can be loosened and tightened by a Lilliputian spanner. The whole weight of the model is less than a threepenny-piece. It works admirably, and when working its crank-shaft performs from twenty to thirty thousand revolutions in a minute. It was made at a time when Mr. Smith, who suffers from a trying disease, was unable to move from a sitting posture; and the time spent upon it is reckoned at about three months ordinary labor. For such works as the above what must the tools be? We are shown drills and files of his own manufacture; our wonder is how any but a fairy's hand can wield them. The digits of our micro-mechanic are flat and large, and those of a workman usually are. We have heard a dancer described as a being with brains in his toes. Mr. Smith albeit has plenty of brains in his head, and must have, in addition, a very large proportion in his finger ends."

More Room for the Interior Department.

Mr. Fessenden, from the Committee on Public Buildings and Grounds, reported to the Senate a joint resolution authorizing the Secretary of the Interior to so change and alter that part of the Interior Department building known as the north wing thereof, on the floor occupied for the storage and exhibition of patent models, as to convert the same into rooms for use of the officers and clerks of the said Department; and appropriates $50,000 for such purpose, to be expended under the direction of the Secretary and the Architect of the Capitol extension, upon plans and estimates to be furnished by said architect and approved by the said Secretary. The second section authorizes the Secretary of the Interior to lease for a period not exceeding one year, with the privilege of continuing the same from year to year for five years, at a yearly rent not exceeding $10,000, the fire-proof building on G street, for the use of the Department of the Interior, and appropriates $10,000 for that purpose. Section third authorizes the Secretary of the Interior to remove from the floor of the said Department building now occupied for the storage and exhibition of models, whenever, in his judgment, the accumulation of such models may render the same expedient, all such models as relate to applications of patents not granted, and all such as may be or may have been in said Department for a longer period than seventeen years; and to store such as may be deemed worth preserving in such parts of said Department building as may not be wanted for other purposes, and to dispose of the residue as he may think best, by sale or otherwise.

Enameling of Iron Vessels.

The enameling of saucepans and other articles in wrought or cast iron has long been practiced, a very fusible enamel reduced to powder being sprinkled over the surface of the iron when heated to redness; but as the mixtures employed consist of highly alkaline silicates, the enamel is not very durable, and will not withstand acids or even salt liquids. An improved process has been introduced in France. The metallic surface is brought in contact with the ingredients of ordinary white glass, and heated to vitrification; the iron is said to to oxidize by combination with silicic acid, and the glass thus forms one compact body with the metal. The coating of enamel may be laid on as thinly or as thickly as desired, but a thin coating is better as regards the effect of expansion or dilatation. Experiments are being made in coating the armor plates for ships in the manner above indicated.

AT the recent meeting of the Royal Dublin Society, in Ireland, the subject of introducing beet root sugar manufacture in Ireland was discussed in a very able paper read by Sir Robert Kane. He showed that it could be raised there in such quantities as to supply Great Britain and other countries with sugar. With the great advantages that Ireland possessed for the growth of root crops, he had been assured by many leading agriculturists that the prices paid on the Continent would be remunerative in that country, the soil and climate being preëminently favorable.

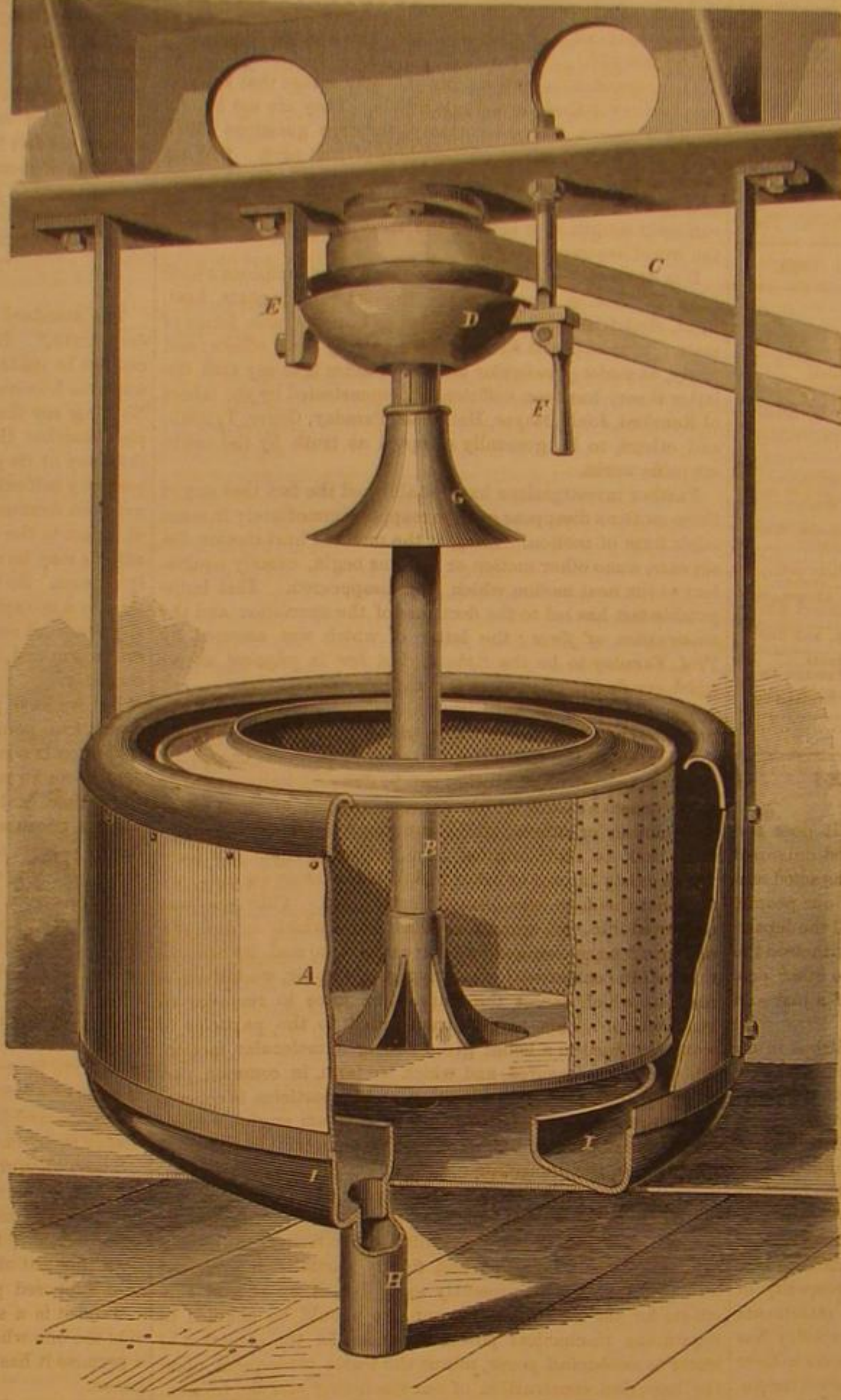
Improvement in Centrifugal Machines.

On page 9, No. 1, of Vol. XIX, Scientific American, we made some statements in regard to centrifugal machines designed for separating the molasses or sirup from sugar, and for other purposes, and gave some facts showing the advantages of Weston's improved machine over those in common use. These machines are used not only for graining sugar, but for drying clothes in laundries, for drying wool after being washed and colored, for bleaching, extracting tannin from spent bark, and for many other similar purposes, and are known as "Hydro-Extractors." The published article to which we refer gives a very good idea of the machine and its advantages. The accompanying engraving gives a view of Weston's improved machine.

Inside the suspended case, A, is hung a cylinder composed outwardly of sheet cast steel, perforated, as seen, and inwardly of brass-wire gauze. This cylinder is suspended by the spindle, B, which is hollow and receives an interior fixed spindle around which it revolves. The fixed spindle has a bearing near its lower end consisting of a series of convex washers of hardened steel filling the area of the inside diameter of the revolving hollow spindle, and diminishing friction by its distribution through their number. At its top this spindle is headed, the head bearing on a sleeve of india rubber held in an iron socket or bracket. This gives a chance for vibration of the cylinder in its revolutions. A pulley at the top of the spindle driven by a belt, C, gives rapid motion directly to the cylinder, and under it, and revolving with it, is a bowl-shaped casting turning inside a similar bowl, D, that is lined with wood or leather and fixed to a stud, E. At its opposite side is a snug resting on a hand lever, F, by which the dishing piece, D, may be brought in contact with that inside it, operating as a brake to stop the machine when a charge is to be removed. This removal is effected simply by dumping the sugar through openings in the center of the cylinder, which, when the machine is in operation, are covered by the cone, G, seen in the engraving raised and held by a spring catch. The outer case, A, is suspended by bars bolted either to beams or iron girders overhead. As the molasses or sirup is thrown off from the sugar, it is forced by centrifugal motion through the interstices of the net or gauze, and the holes in the steel casing, and discharged through the spout, H, to which the inclined bottom, I, of the shell leads.

The elasticity of the rubber allows a certain amount of gyration to the suspended cylinder due to the unequal distribution of the load when the machine first starts. This gyration or eccentric motion soon ceases, and the machine finds its own center, and runs without jar. The friction, inseparable from the old style of machine, is greatly reduced, and also the amount of power necessary to drive it.

This improvement was patented by D. M. Weston, and the machines are manufactured by Merrick & Sons, 430 Washington avenue, Philadelphia, Pa., to whom, or to their agent, George Birkbeck, 62 Broadway, New York, all orders should be addressed.



WESTON'S PATENT IMPROVED CENTRIFUGAL.

Manufacture of the French Atlantic Cable.

The manufacture of the telegraphic cable, which it is proposed to submerge between France and America next summer, proceeds with satisfactory rapidity. The cable is to start from the French coast at or near Brest, and to be laid across the Atlantic to the French island of St. Pierre, off the American continent, a distance of 2,325 miles. Communication with the main land will be effected by means of an additional line, which will be laid from the island to probably some point in the State of New York. This will represent a further distance of about 722 miles, so that the whole length of two sections of the system will be about 3,047 nautical miles. These figures, however, only indicate the length in miles as it would be calculated without reference to submergence. A certain amount of slack cable will be necessary for the process of "paying out," and also a provision against such an accident as that which caused the failure of the Cuba and Florida expedition. With the addition of slack line, then, the deep-sea cable—the longer section—will be about 2,788 miles, including 145 miles for shore ends, and the auxiliary line, 776 miles, so that, altogether, a total length of 3,564 nautical miles of line will be manufactured for the purposes of the proposed expedition. The consistence of the deep-sea cable will be similar to that of the Atlantic lines already submerged. The insulated core is strengthened with "a serving" of tanned jute, and is protected with ten galvanized homogeneous iron wires, served helically round the core, each iron wire being first strengthened with strands of Manilla hemp saturated with tar. The shore ends attached to the deep-sea cable will be of different weights, an intermediate section next the main line weighing about six tuns, and the heavy end of the shore about twenty tuns. The heavy shore end will be of great strength, as it will have an ordinary sheathing served with hemp, and another with stranded wires, servings of hemp and asphalt forming an additional protection. An ordinary wire sheathing of ten galvanized iron wires will be used in the construction of the section which will connect the island of St. Pierre with the continent of America. This covering will be also protected with servings of hemp and asphalt. In the construction of the cable the greatest care is observed that all the materials employed in its manufacture be of unquestionable excellence. The copper wire received at the gutta-percha works, where the insulated core is being made, is first tested that its quality and conducitivity may be ascertained. When it has passed the necessary tests, it is forthwith prepared for forming the conductor, which consists of a strand of seven wires. In this part of the manufacture, the center wire is passed through a bath containing a mixture of tar and gutta-percha, known as "Chatterton's compound," before it receives any of the remaining six wires, which are subsequently woven round it—the object of this process being to prevent water permeating through the strands of the conductor. The stranded conductor then receives alternate coats of Chatterton's compound and gutta-percha until it assumes the required consistence. The core for the deep-sea cable is to be of the following weight: conductor, 400 pounds; insulator, 400 pounds; total, 800 pounds per mile; for the shallower section, conductor, 107 pounds; insulator, 150 pounds; total, 257 pounds per mile. It may be incidentally remarked that the insulated core is larger than that of any other cable hitherto reconstructed, if the old Malta and Alexandria line be alone excepted. When the core has been insulated it is kept for twenty-four hours in water at a temperature of 75 deg. Fah., and is then subjected to a series of electrical tests. Having passed this examination, it is wound round drums and forwarded to the works, where the final sheathing is put on, and it is then coiled away in tanks until its removal to the ship from which it is to be "paid out." Most favorable reports of the progress of the manufacture have, we understand, been given by the electricians who have tested the portion of the cable already constructed. Joints in the core have frequently presented serious difficulties to engineers, and others engaged in the extension of submarine telegraphy; in the case of the new line it is probable that these difficulties will be almost entirely obviated, for, of 320 joints examined, only one has been found in any degree defective. About 600 miles of the deep-sea cable have been already manufactured, at the rate of about eighty-five miles a week. The *Great Eastern* is being fitted up with tanks for the reception of the cable. These will be three in number, of which the largest will be 75 feet in diameter and 16½ feet high. The cable will be conveyed to the "big ship" in hulks filled with water-tight tanks.—*New York Tribune.*

Proposed Tunnel Under Dover Straits.

The project of tunneling a passage from England to France is still discussed in England, and plans have been submitted to the Emperor Napoleon for his approval. Probably the success with which the Mount Cenis tunnel has been worked through the solid backbone of the Alps has attracted new attention to a scheme which, on the face of it, seems far from being impracticable. It must be remembered, however, that the difficulties to be encountered in tunneling beneath the Straits of Dover are of a totally different character from those which the French engineers have had to meet with in tunneling through the Alps. The soil to be traversed in the former instance would probably be the "second chalk formation," which may be assumed to extend in an unbroken course from the place of its uprising in England to the place in which it makes its appearance in France. It need hardly be said that the difficulty of perforating this soil would be very much less than of perforating the hard and complicated material which has been encountered by the French engineers. On the other hand, however, there are dangers and difficulties in tunneling under the Straits which more than make up for the comparative ease with which the mere process of perforation could be pursued. It needs but a slight acquaintance with the history of the construction of the Thames tunnel to enable one to recognize the fact that the workers in the suggested tunnel beneath the Straits would be exposed to enormous risks from the effect of the pressure of the sea upon the stratum through which they would have to work. Again and again the water burst into the Thames tunnel, and drove the workmen out. Brunel himself nearly lost his life during one of these irruptions. Now if this happened beneath the Thames, what might be looked for from the effects of the enormous pressure of sea—to say nothing of the increased danger during heavy storms? And then the workmen in the Thames tunnel had but a comparatively short distance to run, when they were threatened with an irruption of water. If such an event threatened workmen engaged nine or ten miles from either outlet of the suggested tunnel, escape would be hopeless. In a short time the whole length of the tunnel would be filled with the waters of the sea, and the labors of years would be rendered useless.

We urge these considerations, however, not as deprecating the suggested attempt. Doubtless the dangers which we have pointed out may be surmounted by a judicious choice of the stratum to be worked through and by cautious progress—defences being continually prepared around every fresh portion tunneled. The experience gained during the tunneling of the Thames shows that much can be done in that way; and we also have every reason to believe that once a tunnel was constructed it would be as safe as the Thames tunnel now is. There are difficulties in the way of ventilation, but such difficulties as these have to be dealt with (and have been most successfully dealt with) in the construction of the Mount Cenis tunnel. Three eminent engineers, Messrs. Hawshaw, Brunlees, and Lowe, have pronounced the plan to be feasible; and the estimated cost—nine millions sterling—though large, is still reasonable when the value of the tunnel is considered.

Certainly the idea is at once a bold and an attractive one. Nature's barriers are being, one after another, overcome. Now a mountain is tunneled, then an isthmus is cut through, next the Falls of Niagara are spanned by a railway bridge. Hitherto, however, sea straits have not been successfully attacked, except where—as in the case of the Menai Straits—they are of very moderate extent. When voyagers can pass to France without encountering the terrors of sea-sickness, a veritable triumph will have been achieved over nature.

Bleaching Wood Pulp.

A process of bleaching wood pulp has been made known by M. Orioli. He has recognized that chloride of lime however little in excess, has a tendency to produce a yellow tint; that all the strong acids turn the paste red under the action of the sun, or in some time without sunlight, in the presence of moisture; that the slightest trace of iron is sufficient to blacken the paste in a very short time. These objectionable results are obviated by the following mixture: For 100 kilogrammes of wood pulp 800 grammes of oxalic are employed, this serving the double purpose of bleaching the coloring matter already oxidized and of neutralizing the alkaline principles favorable to oxidation; 2 kilogrammes of sulphate of alumina, perfectly free from iron, are added. The principal agent in this new process is the oxalic acid, the energetic action of which on vegetable matters is well known. The sulphate of alumina added does not bleach of itself, but it forms with the coloring matter of the wood a nearly colorless lake, which enables the brilliancy of the product to be heightened.

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(Illustrated articles are marked with an asterisk.)

IS OUR PATENT SYSTEM DEFECTIVE?

The American patent system, recognizing as it does the rightful claim of the first inventor, has challenged universal admiration. Since its re-organization in 1836, it has acted as a great stimulator of the latent inventive power of our people, and the influence of this system has been felt in all the departments of art and industry. No other nation has witnessed the same degree of rapid material development, and no other people have more signally experienced the benefits of a just and generous protection of the claims of inventors.

Commissioner Foote, in his valuable report published in our last number, in speaking of the rapid advance of improvement, says: "New fields for exploration have been constantly opening, and so far from reaching any limit of invention, we seem but on the way to other advances and improvements beyond our present comprehension," a statement which is undoubtedly true, and forces the Commissioner to declare that the business of the Patent Office has outgrown the several acts creating it. He urges upon Congress the necessity of several much needed reforms to enable the office to meet the requirements of its rapidly augmenting business. In alluding to the prosperity of the Patent Office, the Commissioner qualifies his statements by the declaration, that much of the apparent prosperity has arisen from the allowance of patents that ought never to have been granted, and proceeds to give his reasons for such irregularities, which doubtless have more or less contributed to bring about the evils of which he complains.

It appears to us that the time has come when our patent system should be made the subject of a careful investigation with the view to determine what reforms are necessary, and more especially to inquire whether the present practice of examining applications is not productive of more evil than good, and whether we may not safely adopt the systems now prevailing in England, France, and other European nations, which allow patents to issue without previous examination. Commissioner Foote says worthless patents are now issued in large numbers, thus virtually acknowledging the failure of the attempt to carry out a rigid system of examination, a complication which is growing more and more serious every day.

Patentees do not thoroughly understand this matter; they take it too much for granted that, when their patents are issued—especially after a supposed careful examination by an expert, the validity thereof is fully established, and therefore they can confront all infringers with the perfect assurance that the patent will be sustained, some going even so far as to believe that Government is bound to warrant and defend the patent. The official machinery of examination, as at present organized, is cumbrous and expensive, and as results show, is far from being satisfactory; beside the present system tends to corrupt practices, especially when practitioners before the office make their professional services contingent upon success. Shall this system be continued? This subject is one of so much importance that we urge Congress to institute a searching inquiry into the whole question.

Inventors have a right to demand all the safeguards which law can provide to protect their patented interests, but in view of what Commissioner Foote asserts, it appears to be mockery and injustice to compel them to pay for an examination which often amounts to nothing. They would infinitely prefer to rely upon an experienced attorney, who is competent to make the investigation and to prepare such claims as in his judgment will stand the test of law.

CAN HEAT EXIST AS HEAT, AND AT THE SAME TIME PERFORM WORK?

A correspondent asks the question, "Can heat exist as heat at the same time it performs work?" In others words, "Can I use the same heat that drives my steam engine for warming the building in which it stands? I do not mean now the surplus heat which passes out of the smoke pipe, nor that radiated from the boiler, cylinder, etc., but the heat which is in the steam that drives the engine and the machinery. I wish to know what becomes of this heat after the work is performed." Another correspondent asks us "What becomes of the light in a room when all the apertures, windows, and doors are suddenly closed?"

These questions are so similar in their nature that we propose to answer them in a single article. They are not by any means frivolous. On the contrary, they are questions which have puzzled the wisest philosophers of past ages. "What becomes of force after it has performed work?" was the general form of the inquiry, the answer to which was long and earnestly sought by a host of the most philosophical minds the world has ever produced.

It is unnecessary to review here the different opinions which have obtained in regard to the imponderable agents, heat, light, electricity, etc., first regarded as imponderable forms of matter, next as occult forces, known only by their effects; and lastly, *as modes of molecular motion*. Suffice it to say that the latter theory has been sufficiently demonstrated by the labors of Rumford, Joulé, Mayer, Helmholz, Faraday, Grove, Tyndall, and others, to be generally accepted as truth by the entire scientific world.

Further investigations have established the fact that any of these motions disappear only to reappear immediately in some other form of motion. Thus, at the moment heat-motion disappears, some other motion or motions begin, exactly equivalent to the heat motion which has disappeared. This indisputable fact has led to the doctrines of the *correlation* and the *conservation of force;* the latter of which was asserted by Prof. Faraday to be the "*the highest law in physical science which our faculties permit us to perceive.*"

We start then in answering the above inquiries from the broad basis, that nothing can be added to, or substracted from the sum of all the forces (motions) in the universe, except by creative power. And all that can be done by finite power is to set causes at work which will convert one or more forces into another or others, which can be reconverted again in turn back to their original form. Tracing then, the force which exists in coal or other fuel, back as far as we may, we find that this force was formerly solar heat. This heat was converted into the organic or vital forces which formed the *sigillaria*,* since changed by other causes into coal. By heating this coal in contact with the oxygen of the air, we initiate a reaction which causes the imprisoned force to reappear as heat-motion. This motion transmitted to the particles of water confined in a boiler gives rise to a molecular motion, which can be measured, and which we term, in common parlance, temperature. The motion of the particles is concentrated upon the area of the piston of a steam engine forcing it along backward and forward, and this motion is transmitted through the connecting rod to the crank. The crank converts this rectilinear motion into a rotary one without changing its character as mass-motion, and so on to the lathes, planers, etc. It is in many cases difficult to reconvert the motion thus so often transferred, and finally partially reconverted into heat, as we shall presently see. But if we should substitute for the lathes, etc., a pump, we should be enabled to regain the mechanical power expended in the elevation of water *as mechanical power*, minus the waste consequent upon the imperfect construction of our machinery and the friction.

Friction produces heat, and must therefore be always understood to imply the production of heat. In the above case, therefore, we have the heat from our fuel again, partly as heat, and partly as mechanical work. If we now expend the mechanical work generated by the fall of the water raised by the pump in the production of friction by revolving disks or otherwise, we shall find that the heat produced by friction through the whole combination, added to that lost by radiation from boilers, pipes, etc., will exactly equal the heat derived from the coal. We have lost or gained nothing. In the case of the lathes, planes, etc., we have the friction of the tools and bearings which actually does convert the mass-motion partially back again into molecular motion or heat. This heat, if it could be collected and employed to warm the air of a room, would of course elevate its temperature, but it is usually expended in the expansion of the metals upon which work is done, in overcoming cohesion and in many other subtle ways. In the case where water is raised by the power of steam, the heat-motion is plainly seen to be converted into mechanical power. This power will, in its expenditure, give heat or other mechanical power, minus a certain amount of friction (heat). But it must be now evident to our correspondent that so long as it remains mechanical power it is not heat.

In dealing with light, we have to do with a still more subtle motion than heat; one not so easily traced in its various forms. Yet science has given us even here solid ground to stand upon

Bodies either absorb or reflect light, yet in every reflection there is more or less absorbed. Absorption of light is not the soaking it up as a sponge soaks water, it is the conversion of light motion into other modes of motion, precisely as we have seen that heat is convertible into mass-motion. Both these forces may be converted into electricity, chemical affinity, or they may be converted each into the other. So suppose the walls of a room to be composed of the best reflectors known, and a flood of light to be admitted, and then all ingress or egress of light to be suddenly cut off. A series of reflections would take place. The light would pass back and forth from side to side of the room; a portion being absorbed, that is, converted into other motion each time, until finally entirely absorbed. When the enormous velocity of light is taken into consideration, it will be easy to see how this phenomena would appear instantaneous in any apartment, unless its walls were so wide apart as to require a sensible time for the passing to and fro of the reflected rays.

We have thus endeavored to explain a subject, which to undisciplined minds is beset with difficulties. Its thorough comprehension is, however, a necessity to any who aspire to the mastery of the mechanical applications of either heat or light. "You cannot eat your cake and have it too." The sooner this fact is thoroughly understood, the sooner will the attention of men be turned from the delusive search after perpetual motions and like impossibilities, and directed to the only practical control man can ever have over the forces of nature—their conversion into different forms of motion.

* Sigillaria, or Seal-tree, one of those most abundant in the swamps of the carboniferous period. See Prof. Dawson's lecture on "The Primeval Flora," page 34, current volume of SCIENTIFIC AMERICAN.

WHAT IS AN AXIOM.

The standard acceptation of the word axiom is "a self-evident truth." If any proposition is self-evident, certainly it can not be made more evident by any amount of proof. There are some however that affirm an axiom to be an impossibility. Nothing say these philosophers is self-evident. As an example, examine the geometrical axiom "the whole is greater than any of its parts." To the majority of minds this seems perfectly self-evident, but would it seem so, if the fact had not been demonstrated in experience by the direct application of a part to the whole of a magnitude? Perhaps all so-called axioms may be susceptible of proof, and therefore not properly axioms. Be this as it may (and it is not our intention to go into a metaphysical discussion), it must be admitted that in any course of reasoning something must be taken in the outset for granted, if nothing more than the power of reasoning correctly.

But we have promised not to be metaphysical, and there is a practical point to which we wish to call special attention. Invention is a reasoning process. A result reached by accident is not an invention but a discovery. The patent laws of the United States and other countries do not make this distinction because such a distinction is impossible in the granting of patents to people, many of whom would be unable to say whether they were strictly inventors or only discoverers. It is however a real distinction.

Now admitting that an axiom is that which is to be considered as evident without proof, and that in every course of reasoning something must be taken as granted at the outset, it will at once be seen that great care is necessary on the part of inventors not to accept as an axiom that which is not entitled to be so considered. It is much better to err on the other side if errors must be made, and to accept nothing as true until a full demonstration of its truth is made. "Prove all things and hold fast to that which is good," is a maxim as useful in invention as in theology.

These thoughts were suggested by a case that has just come under our observation, where an inventor has spent a large sum of money in completing a machine, that is utterly worthless now that it is completed, and never would have been thought of had he not, as he said to us, accepted a certain supposed principle as an axiom.

True it is a subtle point and has misled many others beside the one whose mistake we now allude to, but accepted as a premise it has in this case led to much useless labor and expense.

It is important therefore that inventors should test every proposition, whether found in books or out of books, if the circumstances of the case permit such test, before applying it to any particular device. Works on hydraulic engineering abound; but every hydraulic engineer meets with phenomena seemingly exceptional to general principles contained in books.

Let us illustrate this by an example. Most are familiar with the Tantalus cup experiment described in nearly all elementary works on physics; the principle upon which it is based being that of a siphon which once filled continues to flow until the cup is emptied. If the siphon tube be small it will act, no matter how gradually the cup may be inclined; accepting this to be a principle applicable to siphons, an inventor of our acquaintance, made a machine to alternately fill and discharge by inclining it so that the water would flow over the bend of the curve. The tube in this case was a large one, and utterly refused to act as a siphon when the vessel containing the water was inclined slowly, and only acted when it was precipitately thrown from the perpendicular. But as anything like precipitate movement was under the requirements of the case inadmissible the invention came to nought. The failure in this case arose from supposing that siphons of all sizes act precisely alike, the effect of capillary attraction in small tubes being overlooked. Much money and time would have been saved in this instance if experiments with siphons of different caliber had preceded the construction of the machine itself. The fault committed in this case is one of common occurrence. It was the assumption of a general principle from a particular application of a principle.

Such blunders can only be avoided by considering nothing as axiomatic, or as demonstrated, until it is decided by actual test. When this can not be attained, a risk must sometimes be taken, but no risk is necessary under most ordinary circumstances.

SEAWEED CHARCOAL is now used as a substitute for animal charcoal, it is said, with good results.

HAIR OF MEN AND ANIMALS---WHY NOT GROW OUR OWN HAIR?

Among the kindest provisions of Nature is the clothing she has supplied to animals. Having given to man superior reasoning powers and that wonder of delicate machinery the human hand, she left him to provide for his own needs in this respect. But lest he might lack for material, she gave to some species of animals a large surplus, from which man constantly draws to supply his necessities. Annually the meek and submissive sheep yields his coat that man may be clothed, and although the last century has developed a very extensive use of vegetable fabrics; we still depend in temperate climates very largely upon woolen textures, to unable us to withstand the extremes of cold we are forced to encounter.

But the sheep, although the most important of animals from which we derive clothing, is by no means the only animal who doffs his coat for man's use. The ox furnishes us with hair to stuff cushions and mattresses. The horse also contributes long, shining threads from tail and mane to be woven into various textures, of which the well-known hair cloth is chief. Even the hog supplies us with material for brushes. The lowly goose submits to cruel pangs and pluckings, her protestations and complaints being smothered by a stocking ruthlessly drawn over her head, that unthankful man may be luxuriously pillowed. Beside these, thousands of animals annually are deluded into relentless traps, or receive the fatal bullet, that their beautiful furs may contribute to the comfort and luxury of man.

There is a delightful sensation derived from the touch of soft fur, and to this, as well as its beauty of color and its pleasant warmth, it owes the esteem in which it has always been held. Savages who know nothing of weaving, instinctively resort to the furred skins of animals for clothing, while kings and potentates array themselves in the rare and costly ermine. In all lands and in all times, furs have been valued as articles of comfort and ornament. Not only the furs of animals and the feathers of birds have been applied to articles of dress and ornament for man, but human hair itself has for a long period been an article of commerce. Wigmakers are an ancient craft. Of late years many articles of real taste and beauty have been made of human hair, and a distinct art—hair jewelry—has arisen. The latest application of human hair to the adornment of heads incapable of supplying their own demand is the "waterfall;" but why *waterfall* has, we confess, always been a matter of profound mystery to us.

The result of the enormous demand for waterfalls has been to exhaust the natural supply of hair, and consequently the hair of animals, imitations of hair made from vegetable fiber and even the exhumation of mummies to rifle their dead scalps for the benefit of live ones, have been resorted to in order to meet the demand. The supply is notwithstanding still so limited that a little hair is made to become a large waterfall by plunging it over submerged reefs of sawdust in silk bags, and sundry other mysterious devices which only female genius could invent, and female fortitude endure.

The attention of the country has been called to the questions, "Why not grow our own silk?" "Why not grow our own sugar?" We now ask the attention of individuals to the question, "Why not grow our own hair?"

Hair may be likened to vegetable growth, and "each particular hair" to a plant, the skin being the soil from which it derives its substance. A hair is a hollow tube containing in its cavity an oil which gives it color. The only conditions necessary for its perfect and luxuriant growth, is that the soil be good and the growth of the crop be kept unmolested by untoward circumstances.

It the soil is bad or has been deteriorated by disease, it must be renovated before good crops can reasonably be expected; but you might as well expect to improve the quality of land by carting stones upon it, as to renovate the scalp by the use of oils and pomatums. These compounds contain nothing to nourish the hair while they obstruct the action of the skin, upon the healthy condition of which, more than anything else, a full luxuriant growth of hair depends. The least harmful of oils, if any must be resorted to, is castor oil diluted with two parts alcohol and scented to suit the taste; but even this should be very sparingly used. A good healthy head of hair should supply its own oil. A preparation of alcohol one pint, pure glycerin two ounces, and water one half pint, scented with rose geranium, lemon grass, or any other essential oil suitable for the purpose, is an admirable dressing for the hair, and one that exerts a healthful influence upon the skin. A solution of borax is better for cleansing the hair than the bicarbonate of potash in common use by hair dressers for the purpose. The latter may be used to advantage, however, in warm weather, when acidity is apt to be generated by perspiration. Either of these will be rarely required if the hair and scalp are washed every morning in pure water, which is not only of great benefit to the hair, but the very best preventive of colds in the head. After such ablution the hair should be wiped nearly dry and then dressed, but exposure to cold winds before the hair is well dried is not advisable.

Another excellent detergent for the scalp is the white of egg. Two eggs will be sufficient for a cleansing of the hair, as ordinarily worn by men, but women who wear their hair as long as it will grow, will need four or more. The yolks should be carefully removed, and the albuminous portion rubbed into the roots of the hair very thoroughly for some time, when a thorough rinsing with water and drying with towels will leave the hair a beautiful luster and silky softness. Fine toothed combs are only to be tolerated under conditions which are happily rare in this country, and therefore unnecessary to mention. Brushing is good, if not carried so far as to irritate the skin.

A gardener places blankets or other covering over plants to protect them from the effects of cold, but should he cover them in this way for the greater part of the time he would not expect them to thrive. Precisely analogous to this is the wearing of hats to protect the head from cold. Better never wear a hat than to wear it indiscriminately in-doors and out, as is the habit of many, who sit in offices or work in shops. It is perhaps a matter of doubt whether the head, covered by its natural clothing, requires any further protection whatever, and we are confident that the principal part of the baldness met with in civilized countries is to be charged to the heavy hats and caps in vogue. That there is some foundation for this belief is obvious from the fact that savages, who wear nothing on their heads, and women of civilized lands, who wear next to nothing, are rarely bald, except the temporary baldness resulting from sickness.

There is no element of beauty more important than beautiful hair, and it is absurd to suppose that any alteration that can be made in its color by dyes, adds to the general effect. The hair is one of the elements of complexion, and the thin delicate skins that look pure and healthy, with the adjunct of very light-colored hair, would become ghastly if contrasted with very dark hair. No matter what color the hair may be, it will be beautiful if it is of full growth and in a healthy condition.

A healthy condition of the hair also depends very much upon the general health. The skin and the internal organs are very intimately connected in their action. Many eruptions upon the scalp result from improper diet and imperfect digestion, and it is true of the hair as of the teeth, and all the other components of beauty, that it never can reach perfection without due attention to diet, exercise, regular habits, and all the requisites to perfect health.

STUCCO WORK.

The method of finishing the outside of buildings in stucco, still prevails to some extent in this country, notwithstanding that in the Northern States the severe frosts of winter make sad havoc with it, unless, as is rarely the case, it be of the first quality in composition and workmanship. We are in receipt of inquiries from the Southern States as to its adaptability to the wants of that section, and the method by which it is applied.

With regard to the first point, we have little doubt that stucco will endure longer at the South than at the North, especially if it be of inferior quality. A stucco in common use is a compound of the grout or putty made of stone lime or burnt shells mixed with sharp grit sand. Its long exposure to the air has, however, a tendency to render it crumbly, and it is not an unfrequent occurrence to see it cleaving off in large scales, giving the building to which it is applied a most dilapidated appearance.

Much of this is to be attributed, as we have already said, to climate, but a great deal is to be charged to unskillful application and composition. The mortar should be most thoroughly beaten and worked before it is applied to the walls, and the strength of the lime should be well ascertained before the sand can be properly proportioned. Good rules for ordinary use in the mixing of this grout can not be given. Experience only can be relied upon as a guide for its composition. The lime may, however, be tested by slaking in the usual way. If fat it should slack rapidly and swell up from two to three and one-half times its original bulk, the rapidity of the slacking, and the bulk after being slacked, being an index of the strength or fatness. The fatter it is the more sand will be required.

The best sand for stucco work is drift sand, and it is advantageous to dry it on iron plates, being careful not to push the heat so far as to discolor it. The grout being mixed should be parceled out into small portions and allowed to mellow for some days. It should then be thoroughly mixed into a soft putty and spread thick upon the walls without any previous preparatory coat. It should also be thoroughly troweled down, as its durability depends very much upon the faithfulness with which this part of the work is performed. Too much stress can scarcely be given to this point, and thorough work should be insisted upon. Another coat should be put on before the first is dry, and this should also be well worked down. It will add much to the durability of this stucco if a coat of good boiled linseed oil be laid on after it is dry.

Various ingredients are recommended by good authority for the strengthening of stuccos, the basis of which is lime. Among these is sugar water in mixing, the proportions being about one pound of coarse sugar to eight gallons of water used.

There are many other preparations used for stucco work but although some of them are far more durable than the one we have described, they are for the most part too expensive to come into very general use. Among these are the well known Adam's oil cement, and the stucco made by mixing pulverized marble with lime or plaster and working it the same as ordinary plaster. A good cheap cement for stucco work may, however, be made by using good hydraulic cement and clean sand mixed in proper proportions and in such quantities that it may all be laid on before it has time to set. The sand should be dried and mixed in the proportion of one part of cement to two parts of sand by measure. In measuring, the sand should not be packed, but thrown loosely in the measure.

Previous to the application of any stucco, the joints between bricks should be raked out, say from three-eighths to one-half an inch. The surface should then be thoroughly swept to free it from loose dirt, and afterward wet with a hose or other convenient means, and the stucco applied before it dries. If difficulty is experienced in making the stucco adhere to the flat surfaces of bricks or stones, they may be chipped with a hatchet or mill-pick The first coat should not extend so far that a second cannot be laid over it before it dries, and the whole should be shielded from the direct action of the sun's rays while drying.

As soon as dried the surface should be inspected by raps with a very light hammer. The non-adherent spots may be thus detected, and should be immediately torn off and replaced. The most important of all these precautions is, however, the thoroughness in troweling mentioned above, without which any amount of pains in other particulars will prove vain.

THE LONDON UNDERGROUND RAILROAD.

The report of Mr. Calvert Vaux who was sent to London by the directors of New York City Central Underground Railway Company to examine into the construction and management of the Metropolitan Underground Railway of London, has been made public. The report is an interesting one and we gather from it some prominent facts which will interest our readers. The railway communications consist of the Great Western; London and Northwestern; London, Chatham and Dover; London, Brighton and South Coast; and Southeastern, on the south side. The total number of trains run each way, on the above roads, is 1,447, beside ninety trains run each way between Charing Cross and Cannon street. Part of the above trains carry passengers from one part of London to another; but it is estimated that the number of trains conveying residents to and from the suburbs to business is fully one thousand.

The suburban population accommodated by this number of trains on the north side is estimated at 335,000, and on the south side at 280,000.

The Metropolitan Underground Railway was projected about 1853, with the special object of lessening the great traffic through the streets of London, which was then becoming a very serious question, and also with a view to the establishment of a great central station for all the railways, and it was mainly through the exertions of the late Mr. Charles Pearson, a gentleman holding a legal position in connection with the corporation of London, that it was enabled to obtain a footing.

The length of the line from Bishop's Road to Moorgate street is four and a half miles, and from Edgeware Road to Brompton, at present opened, about two and a quarter miles, making six and three-quarter miles. From Brompton to Tower Hill, when finished, the length will be eight miles. From Brompton direct to Moorgate street, the distance is six and two-thirds miles.

Mr. Vaux gives an account of the connections worked by the Metropolitan Railway, by which it appears that a passenger from any station of the connecting roads can proceed to almost any part of London and its suburbs, or to England, Scotland or Wales, without going outside a station, and in many cases, without changing carriages.

About three miles, or two-thirds of the road is constructed underneath the streets, thus saving the purchase of property for that distance. The minimum depth of the rails below the surface of the streets is seventeen feet in covered way, and the maximum about fifty-four feet in tunnel.

There are fifteen stations on the Metropolitan Railway averaging half a mile apart.

As the works of the company are not yet finished; and the land purchases not all effected, the data for arriving at the cost of the Metropolitan Railway are necessarily incomplete; but as near as can be gathered from the half-yearly reports of the company, the cost of the line upon Bishop's road to Farringdon street, including land, works, rolling stock, etc., appears to be about seven and a half million dollars, or two million one hundred and forty thousand dollars a mile for two lines of way and a temporary station. Of this sum, one million a mile was for works of construction. If the company had been obliged to buy land for the entire route, it is estimated that the road would have cost over three millions and a half a mile.

Three hundred and one trains run over this road daily; one train every three minutes during the business part of the day. Each of the sets of trains is worked through from Moorgate street, without change of carriage or engine.

The number of engines employed is 35, and carriages 142. The engines have four coupled driving wheels and a bogie truck, and weigh, in working order, about forty-two tuns thirty tuns being on the driving wheels. This great weight is necessary to enable them to get up steam quickly on leaving a station

The fuel burnt is a coke of a very superior quality. To enable a line with so much tunnel to be worked at all it is absolutely necessary that the engines should not give out any smoke or products of combustion while in the tunnel, and the engines on the Metropolitan Railway have been especially designed to meet this requirement. The steam is got up to 130 or 140 pounds pressure at the starting point, where the line is open, and when the train enters the covered way the damper is closed and combustion is practically prevented. The engine then continues to run on the steam already made so long as it is in the covered way, the pressure being generally lowered to eighty pounds when it emerges again into the open cut. The steam, instead of escaping into the tunnel, is conveyed by pipes to a condensing tank, which is filled with cold water at each end of the journey. Four carriages are usually run in a train. They weigh about fourteen tuns when empty. The speed is usually fifteen miles an hour, including stoppages.

The line is worked by the electric telegraph, so that two trains cannot be on the same line at the same time between any two stations, thus preventing the possibility of collision.

The practical effect of this is proved by the fact that although there are twelve trains at a time between Brompton and Moorgate street, no accident has yet occurred.

The number of passengers carried during the half year ending June 30, 1867, was thirteen millions. Some idea may be obtained of the increasing popularity of the road, when it is stated that in 1863 the number of passengers carried during the same time was only 9,455,175.

IN WHAT DOES A PATENT CONSIST?

The inventor produces a new and useful machine, process, or manufacture, or improvement thereon, and receives from the Government a grant of an exclusive use thereto for a limited term, and with this grant there is created a monopoly by means of which the inventor is enabled to be paid for the labor and ingenuity involved in the origination of the invention. And this grant is made upon the implied condition that the invention is specified so as to enable the community to practice it after the monopoly ceases.

Such then is the consideration received by the community at large for this grant of an exclusive right by the Government.

In the invention itself there is no property, but under certain conditions and within certain limits of time, it can be resolved into such and is then represented by a Patent. Thereby to the public passes a full knowledge of the invention, and to the inventor is granted an exclusive right and control of same for a stated term. There may exist a mere right to property, but it is meant in the sense of the exclusive right to be conferred if application is contemplated or has been made for a Patent.

And when as stated, in Rathburne & Co. *v.* Orr and Hollister 5. Mclean 132, that the invention if valuable is property which may be sold in the market, he, the inventor, undertaking to procure a patent, the contemplated incorporal right is meant. Neither is there any property in the patent papers themselves, as they are only declarations of the nature and extent of this exclusive right.

To know that the property does not exist in the invention itself we have only to learn from the statute that if a public use exists for more than two years without applying for the right to the exclusive use, it cannot be obtained, or if improperly obtained by a concealment of the fact, it cannot be held when such concealment comes to the knowledge of the community and the courts. We have only to refer to another section of the statute to perceive that the patent itself is not property, as it cannot confer any rights by its being delivered from person to person like chattel personal or articles in common use, but there must be a writing which dedicates in law, not the patent itself but the exclusive privileges therein mentioned, *i. e.*, the right therein referred to. It is true some of these privileges can be conferred without written evidence thereof, as a license to do or perform that which would otherwise be unlawful; but these are rights of user of the invention in some limited and specific form.

Again, this exclusive and incorporal right thus obtained is of an arbitrary nature. It can be divided and subdivided in various ways and may be mortgaged. It can be divided into two or more parts, and if called undivided interests with no agreement between the parties, it then gives each owner an equal power over the exclusive right without accountability to the other owners, thereby making it only exclusive as to the community outside of the two or more owners. All the owners are equal as to each other in their privileges granted by the exclusive right, no matter how unequally they are represented by the fractional division; and could such a case be supposed to exist as enlarging the exclusive right until it includes the whole community, then it would cease to be exclusive and become in the nature of a case of abandonment or surrender of the privilege to the public. But so long as one person in the country is left out it is exclusive as to him and cannot be considered as an abandoned right.

Again, so peculiar is the nature of this exclusive right that, if instead of being transferred by undivided interest in the patent it is subdivided as to territorial interests, then such interests if made exclusive are independent of each other and as distinct as if a patent had been issued for each division of territory; and these territorial divisions may be unlimited in number.

The right to make, use, and sell to others to be used, under the exclusive right, may be restricted as it may suit the interest of the owner, but within certain limits; such limits in some cases determined by the courts, if it is attempted to bind others than the contracting parties which matters will be discussed hereafter.

Many of the attributes of an exclusive right are again varied as they enter into and combine with other rights, such as general and ordinary contracts, agreements and copartnership interests, and present sometimes peculiar and complicated questions as to the rights of parties involved. And oftentimes it is found that general propositions of law already adjudicated upon are unsafe guides when the facts of the cases compared materially vary.

Inventors and parties who contract with each other are consequently misled when they attempt to apply to their own cases and business affairs, without the aid of good counsel, decisions reported as made in Patent cases.

It is proposed to discuss again and more at length the nature and extent of the exclusive right as secured by a Patent.

GLYCERIN---ITS USES AND ABUSES.

BY PROF. C. A. JOY, OF COLUMBIA COLLEGE.

A few years ago glycerin was only known to scientific men; now it is so extensively employed as to be familiar to everybody. Scientifically, it appears to be a species of alcohol; popularly, it is the sweet principle of oil. For many years it was thrown away, but now it is saved and converted to numerous uses. Few chemical compounds have increased so rapidly in public estimation as this. From being regarded as a waste product, it has grown to be as valuable as its former proud associates, and appears destined to take a most prominent place in the arts. It exists in oils and fats, and as it was not essential in the process of making soap and candles, and no use could be invented for it, it was either destroyed or allowed to flow away. We are sorry to say that at the present time a great quantity annually flows down the throats of a long suffering and much deceived wine-drinking public, instead of passing through the spout of the soap and candle maker. We do not propose to go into a long account of the way glycerin is manufactured, because any one curious upon that point can easily turn to an encyclopedia for information, but we know that it will interest our readers to learn something of the recent applications of this substance.

Housekeepers will be glad to know that if tubs and pails are saturated with glycerin they will not shrink and dry up, the hoops will not fall off, and there will be no necessity of keeping these articles soaked. Butter tubs keep fresh and sweet, and can be used a second time. Leather treated with it also remains moist, and is not liable to crack and break.

For the extraction of perfume from rose leaves, from scented woods, from bark, from gums, there appears to be nothing better than glycerin, and this use of it is constantly on the increase, as the most delicate odors are perfectly preserved in it.

A soft soap, in which glycerin enters as a constituent, is highly prized in cold weather where the hands become chapped, and can be used for washing in hard water.

For wounds and sores, and bites of venomous insects, glycerin is found to be a most valuable substance, as it either prevents the mortification of the parts, or it can be used to carry the remedies to counteract the effects of poison.

To preserve animal substances from decay, glycerin is now substituted for alcohol in collections of natural history, and it is employed to keep many articles of food from undergoing decomposition.

As it requires an intense cold to freeze it, even when mixed with its own bulk of water, it is largely employed to fill the wet gas meters.

Some kinds of candy, chocolate, confectionary, and fruit, which are preserved in tinfoil, are kept moist by a small quantity of glycerin.

Delicate chronometers, clocks, and watches, are lubricated with it. Copying paper and wall paper, for taking fancy colors, are also kept moist by a small amount of glycerin used in this manufacture.

In pharmacy for the preservation of pills, to mix with many substances, in compounding prescriptions, and in more ways than can be remembered, glycerin now plays an important part.

In the arts it finds its way as the best wash for the interior of molds in the casting of plaster figures, to prevent the gypsum from adhering to the sides of the mold.

In dyeing with some of our beautiful organic colors, glycerin is extensively employed with the best effect.

In chemistry it is used to prevent the precipitation of the heavy metals by the alkalies, and is thus a re-agent in analysis.

For making an extract of malt to improve or spoil, as the case may be, the beer manufactured in the usual way, glycerin has recently attracted a great deal of attention, and been the object of extensive speculations, if not of impositions, upon the public.

In the preparation of *liqueurs* it has been found to be admirably adapted for preserving the characteristic flavors of those compounds, and it has consequently become the great favorite of this class of manufacturers.

As glycerin is a remarkably stable compound, it is adapted to the preservation of wines, and this legitimate use of it has suggested to the adulterators of liquors an extensive fraud upon the community. Vast quantities of glycerin are annually manufactured, and as the known uses of it will not account for the consumption of more than a small fraction of what is made, it is difficult to explain the disappearance of the remainder. What takes place in the dark champagne vaults and cool subterranean wine cellars, evidently will not bear the light of day, and hence we neither see nor hear what becomes of the great stream of glycerin that is known to flow into them. Fortunately, it is not a poisonous substance, and its use for adulteration is consequently attended with less detriment to our stomachs than to our pockets. Whether the "coming man" will drink pure glycerin instead of wine must be left for future consideration.

It has been discovered that glycerin can be fermented into alcohol with chalk and cheese, and it may be possible hereafter to manufacture alcohol in this way. The discovery is an important one, and may suggest some improved and cheap method for obtaining alcoholic and acetic acid.

The last use of glycerin that we shall mention is, perhaps, the most important of all, its extensive application in the manufacture of nitro-glycerin. The explosive oil is made by treating glycerin with nitric and sulphuric acids in a peculiar manner. It has been known to chemists for some years, but it is only recently that a Swedish engineer has had the hardihood to propose it as a substitute for blasting powder. Its introduction has been attended with fatal consequences to many of the pioneer and earliest adventurers who have experimented upon its properties, but it is making rapid progress to public favor, and in a few years, will, beyond question, displace the old fashioned blasting powder and reign in its stead. By mixing the oil with sand, a solid explosive agent has been made, which is called dynamite. This is much less dangerous than the oil, and nearly as destructive in its effects, as it contains seventy-six per cent of nitro-glycerin. A patent percussion cap and safety fuse is required for the explosion of dynamite, and, according to all accounts, it appears to be less dangerous than gunpowder.

The glycerin, which has come into notice within a few years, has become an article of great importance, and as its conquests are daily extending, we may expect to become very familiar with it, and to learn to appreciate it as another valuable contribution of chemical science to the ordinary wants of man.—*Frank Leslie's New World.*

Our Bird Friends and Insect Enemies.

In 1862, at the great Exhibition at Paris, the French naturalist, M. Florent-Prevost, exhibited a large collection of the stomachs of birds, with their contents, spread out on sheets of paper, each accompanied with a written description. This display attracted the attention of the English naturalist, Mr. Edward Wilson, who, together with M. Florent-Prevost, afterwards prepared what is considered a complete list of articles of diet used by a great number of birds during each month of the year. We here append the bill of fare of such birds, or those very nearly allied to them, as we notice are found in this country, viz.:

LONG-EARED OWL.—January, February, and March, mice; April, cockchafers; May, rats, squirrels, and cockchafers; June, mealworm, beetles, and shrew mice; July, mice, and ground and other beetles; August, shrew and other mice; September, October, and November, mice.

SHORT-EARED OWL.—January, mice; February, harvest mice; March, mice; April, crickets and harvest mice; May, shrew mice and cockchafers; June, beetles; July, field mice and birds; August, field and shrew mice; September and October, field mice and beetles; November, common and field mice; December, mice, spiders, and wood-lice.

BARN OWL.—January and February, mice; March, April, May, and June, field mice; July and August, mice; September and October, field and shrew mice; November, mice and the black rat; December, mice.

SPARROW.—Only lives near the habitations of man. It varies its food according to circumstances. In a wood it lives on insects and seeds; in a village it feeds on seeds, grain, and larvæ of butterflies, etc.; in a city it lives on all kinds of debris; but it prefers cockchafers and some other insects to all other food.

GREAT TITMOUSE.—January, beetles and eggs of insects; February, grubs; March, winter snails, beetles, and grubs; April, cockchafers, beetles, and bees; June, cockchafers, flies, and other insects; July, the same; August, insects and fruits; September, seeds, grasshoppers, and crickets; October, berries; and November, seeds.

BLACKBIRD.—January and February, seeds, spiders, and chrysalids; March, worms, grubs, and buds of trees; April, insects, worms, and grubs; May, the same and cockchafers; June, the same and fruit; July, August, and September, all sorts of worms and fruit; October, grubs of butterflies and worms; November and December, seeds and chrysalids.

JAY.—January, grubs of cockchafers, acorns, and berries, February, chrysalids and different grains and seeds: March; grubs, insects, wheat, and barley; April, grubs of beetles and snails; May, cockchafers and locusts; June, eggs of birds, cockchafers, and beetles; July, young birds, flies, and beetles; August, the same, acorns, grubs, and dragon flies; September, the same and fruits; October and November, beetles, slugs, snails, and grain; December, the same, haws, hips, etc.

GOLDEN ORIOLE.—January, various chrysalids; February, chrysalids and worms; March, grubs and beetles; April, ground beetles and weevels; May, beetles, moths, butterflies, and grubs: June, grubs, grasshoppers, bees, and cherries; July, cherries and beetles; August, weevels, chrysalids, fruits, and worms; September, beetles, grubs, worms, and fruits; October, grubs, herbs, chrysalids, berries, and barley; November, ants and worms.

WOODPECKER.—January, ants; February, worms and grubs of ants; March, slugs, beetles, and grubs of ants; April, ants and worms; May, red ants and grubs of wasps; June, bees and ants; July, red ants; August, red ants and worms; September, ants and worms; October, grubs and ants; November, grubs of ants and bees; and December, ants.

THRUSH.—March, grubs and insects; April, aquatic grubs; May, grubs of house and dragon flies; June, worms, grubs, flies, and May flies; July, beetles and dragon flies; August, worms, eggs of insects, and beetles; and September, aquatic insects.

AN INVENTION made by M. Jenssen in France and Mr. Lockyer in England enables spectroscopic observations of the protuberances which appear during a total eclipse of the sun to be observed at any time, that is, they can produce the effect of a total solar eclipse, at will; and the experiment has already been sufficiently tested to show that the "protuberances" (conjectured to be masses of hydrogen gas) are constantly changing in form.

KNOWLEDGE of American geography is limited in France. A new work on the subject, used in many French schools, speaks of Toronto as one of the eastern cities of the United States, of Portland as the capital of New England, says the Germans constitute a large part of the population of Missouri, and declares that the Territory of the Rocky Mountains was conquered by the American troops under Gen. Fremont.

IT is stated that Dr. Siemens, the director of the great telegraphic establishment in Berlin, is in Circassia, making arrangements for the building of an overland telegraph line to India, the route to be through Asia Minor, Armenia, Persia, and Beloochistan.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

GOLD MINING IN GEORGIA.—The *Dahlonega Signal* reports that gold min ing operations are generally at a standstill, awaiting the movements of northern capitalists, and that these are mostly inactive; that the Chestatee Company has suspended, and the Wood Mine is worked but little if any. About twenty-five hands are at work at Ive's mill, one mile east of Dahlonega, with great success; and small companies, composed of two to five in a group, are working about on the branches, making from fifty cents to two dollars per day to the hand, and more often fifty cents than two dollars. So numerous are these little parties, that the *Signal* believes the Dahlonega merchants are buying more gold now than they did when all the companies were in successful operation.

The Senate has passed a bill imposing on all copper imported in the form of ores, three cents on each pound of fine copper contained therein; on all regulus of copper, four cents on each pound of fine copper contained therein; on all old copper, fit only for re-manufacture, four cents per pound; on all copper in plates, bars, ingots, pigs, and in other forms not manufactured or herein enumerated five cents per pound.

The *New York Herald* gives the following schedule of the property be-onging to the Erie Railroad Company: "Erie Railroad, main line; six old branch roads; one city railroad; two steamboat lines; one line of freight barges; one ferry; one opera house; one French opera company; one ballet company; lot of old wardrobe; twelve lawsuits."

Professor Budde has taken a singular geological formation from the old silver mines in Middletown, Connecticut. It consists of a large piece of the rock found in that section, imbedded in one surface of which is an almost perfect cross formed of mica. The upright is about four and ¾ inches n length, and the crosspiece four inches. The rock being white and the mica of a dark color, the cross is very distinct. It is a handsome specimen of nature's handiwork.

Mr. Fell, the English engineer, has offered to the Swiss Federal Council to undertake the construction of three railroads over the Alps for a guarantee of interest of 600,000 francs annually. He estimates the cost of that over the Simplon at from eleven to thirteen millions; of the St. Gothard, at from thirteen to fourteen, and at fifteen to eighteen for the Luckmanier.

There is a cotton mill at Macon, Georgia, which cost $160,000, and which paid last year 16 per cent in dividends. It gives employment to 125 hands, whose wages vary from $15 to $35 per week, consumes 2,000 pounds of cotton, and turns out 5,000 yards of cotton per day.

One silkworm nursery in Nevada already contains one million worms and has shelf-room enough for making two million cocoons. The capacity is to be still further increased.

One of the accompaniments of the Central Pacific construction party is a blacksmith shop on a wagon, which has to be pushed along three times a day to keep up with the tracklayers.

Gold to the value of about three million dollars was shipped from the New South Wales mines during the quarter ending with September last. The product of the Auckland gold fields in the same time increased two hundred thousand dollars.

Iron ore has been discovered in Saugatuck, Connecticut, in a vein said to be very rich. The ore is of the same class as the Salisbury ore.

he Cotton Company at Collinsville has fitted up the third story of its new building for a reading-room for its operatives.

Copper mining in Michigan employs a capital of fifty million dollars and about forty thousand workmen.

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; beside, 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 advertisemets at $1 00 a line, under the head of "Business and Personal."

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

A. M., of Ind.—Oil of sassafras is obtained by distilling sassafras root with water in the same way that other essential oils are obtained

H. A. L., of N. C.—Theoretically the cost of running different engines should be directly as the work they perform, but owing to various causes, large engines are, proportionally to the work performed, more economical, when worked nearly up to their capacity, than small ones.

C. K., of——It is quite common to raise sunken vessels by bags inflated with air. The collapsed bags are attached at the required places upon the vessel and then inflated by means of air-pumps located on boats at the surface of the water.

H. O., of N. Y.—Glucose, made from starch by the action of sulphuric acid is not unwholesome, when taken into the stomach, unless it is contaminated with acid or other impurities. We do not recommend the use of the reagents you mention for the purpose specified.

J. N., of N. Y.—The fact that alkalies and their solutions act upon aluminum, renders that metal unfit for many purposes. On the contrary some acids attack it either not at all or at best but slowly, which renders it valuable for other purposes. Could it be very cheaply produced there is no doubt that it would be largely used in the arts.

O. S., of Md.—There are no metals with which we are acquainted that are luminous in the dark unless heated. Diamonds, white marble, fluor spar, and some other minerals are said to acquire phosphorescence by friction or long exposure to the sun, but they quickly lose it. Phosphorus and compounds containing free phosphorus, are luminous in the dark, but the atmosphere, soon converts the phosphorus into a non-luminous oxide.

S. A., of Ky.—Small brass articles like those you mention may be conveniently finished by dipping them first in dilute nitric acid to clean them, then into a solution of carbonate of soda to neutralize the acid, rinsing in running water, and drying in sawdust. As soon as dry they should be laquered in the usual way.

H. M. B., of Ill.—The composition for sky-rockets and Roman candles varies to some extent with manufacturers, and also with the diameter of the bore. For required information, consult Dr. Ure's dictionary of Arts, Manufactures, and Mines. No better electro-motor has probably been made than Page's Electro Magnetic Engine. We do not think a combination of a magic-lantern with a camera-obscura desirable. Your last query is not clearly put.

H. B. M., of N. Y.—To tin iron, clean by immersion in dilute sulphuric acid and scratch-brushing, or by any other convenient method, and immerse in melted tin. If sulphuric acid is used for cleaning, the castings, after being scratch-brushed, should be dipped in a bath of hot limewater to neutralize the acid and then dried. They will take tin better by being first dipped in melted tallow free from salt. The tin should also have melted tallow on its surface while the dipping is going on.

D. S., of Ohio.—"If I force air into a vessel through which water is passing from a hydrant, in order to raise the water to a certain elevation, will that compressed air remain as a power to elevate the water, or pass out through (with?) the water? In other words, if I measure water from a hydrant, will once filling my meter with compressed air be sufficient to force the water upward, after measuring to the required hight?" The compressed air will gradually pass out with the water. You get no permanent reservoir of power from it.

B. C., of N. H.—We cannot better answer your letter and accompanying diagrams, in regard to setting boilers, than to reply affirmatively to your question whether we approve of the plan in the illustrated article published in No. 9, Vol, XVII, SCIENTIFIC AMERICAN. We have received several letters from parties who followed the directions there given with success, cordially approving of the plan. Try it, following the proportions, and you will be satisfied of its utility.

G. W. M., of N. Y.—We know of no "bronzing acid for giving a dark blue color to brass like dark blue steel." A lacquer might answer your purpose. What this correspondent means by his question "how to find the magnifying power of a compound microscope," we do not comprehend. A compound microscope may be used from a low to a very high power. If the design of the interrogatory is to ascertain the focal distance of a lens this is simply a subject for ordinary mathematical calculation, or can be determined by experiment.

S. Y. O., of Iowa, asks how steel can be "laid" or welded on cast iron. "Can shears or scissors be manufactured in that way?" Certainly. Our best tailors' shears, household scissors, and smiths' anvils are made of cast iron and steel. We cannot describe the process in full in these columns, but the molten iron is poured upon the steel in a mold, until the steel is brought to the proper heat—that of welding or fusion, the surplus metal being allowed to escape—when the union is effected and the iron fills the mold. It is a process partaking of the weld by compression or percussion, and of a union formed by the fusion of metals.

J. T. S., of Ohio.—A good black paint for use on show cards may be made of ivory black, or lamp black separated from its oil by heating to a red heat in a closed vessel, and shellac varnish—shellac dissolved in alcohol. We do not recollect the published recipe to which you refer.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, an Extra Charge will be made.

Recent American and Foreign Patents.

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

CULTIVATOR.—George W. Van Brunt, Horicon, Wis.—This invention relates to the mode of attaching cultivator teeth to the beams or drag bars, and consists in the employment of two screw bolts and nuts, in connection with a clamping plate and a locking device, the whole being used with a pivoted cultivator tooth having a curved arm which is held in position by the locking device.

FIRE BOARD.—G. W. and W. H. Metcalf, Baltimore, Md.—The object of this invention is to construct a simple, cheap, and neat fire board which can readily be extended or contracted in length and width, to adjust it to fireplaces of different sizes.

MORTISING TOOL.—Thomas and J. H. Burdick, Albany, N. Y.—This invention relates to that class of mortising machine, which has its cutter so arranged that it can cut straight on both ends of a mortise, so that neat workmanship can be produced by very simple means.

ANCHOR.—Charles F. Brown, Warren, R. I.—This invention relates to a new anchor, which is provided with jointer flukes which adjust themselves automatically to the position of the anchor, and to the nature of the ground, so as to securely hold the anchor to the ground.

TURBINE WATER WHEEL.—James Martin, Florence, Ala.—This invention relates to a new and useful improvement in turbine water wheels, and has for its object the obtaining, in a more perfect manner than hitherto, of power from the percussive and reactive force of the water.

LOCKING DEVICE FOR CAR AXLE BOX COVERS.—Wm. R. Hunter, Erie, Pa, —The object of this invention is to provide a means for readily locking the covers of car axle boxes.

SELF-LUBRICATING CROSSHEADS.—I. H. Congdon, Omaha, Neb.—This invention relates to improvements in crossheads for steam engines whereby it is designed to provide an improved means of lubricating them.

CARDING MACHINE.—Edwin C. Cleveland and Joseph M. Bassett, Worcester, Mass.—This invention relates to improvements in carding machines whereby it is designed to provide a more improved arrangement of means for setting the feed rollers into or out of action.

COMPOUND FOR DESTROYING WORMS.—F. Sidney Townsend, South Seaville, N. J.—The object of this invention is to provide means for protecting fruit trees, and other trees and shrubs, from damage and destruction from worms and insects.

QUILTING FRAME AND CLOTHES DRYER.—M. Simpkins, East Florence, N Y.—This invention relates to a new quilting frame, which is provided with expansion arms, that are pivoted to stationary supports so that they can be swung up if desired to economize room, or to convert the apparatus into an effective clothes dryer.

COMBINED DOOR BOLT AND WEATHER STRIP.—A. Newcomb, Shipman, Ill. —The object of this invention is to provide a weather strip that may be actuated to open or close by the action of a common door bolt, when the same is moved to fasten or unfasten the door.

WASHING AND RINSING MACHINE.—Martin R. Lemman, Wesson, Miss.—This invention relates to a new washing machine, in which the clothes to be washed are not in the least injured, and in which they are well tossed and agitated so as to be quickly washed. The invention also consists of an endless slat band, suspended from a roller which is hung eccentrically, so that the clothes which are placed into the band are well turned and tossed, not only by the eccentric motion of the roller, but also by the slats which are of different thicknesses.

CARPET STRETCHER.—Charles Ruckert, New York city.—This invention relates to a new device for stretching carpets while the same are being put down, and it consists in the use of a jointed lever, which swings on a bifurcated support, and which carries a toothed tool, by means of which the carpet can be grasped. The support is forced into the ground and then the lever is caused to take hold of the carpet with its teeth, and is then swung downward, whereby the toothed part is moved forward to stretch the carpet.

TRUNK.—S. Ullman, Norfolk, Va.—This invention consists in substituting for the straps commonly used, metallic strips jointed at one end to the body of the trunk and at the other to the cover, and having a rule joint in the center, so arranged that they will hold the cover rigidly when open, and fold down compactly when the cover is closed down.

WASHING MACHINE.—John Ringen, St. Louis, Mo.—This invention has for its object to furnish an improved washing machine, simple in construction, easily operated, and effective in operation, which will do its work quickly and thoroughly, turning the clothes, pressing and rubbing them, and without the least injury even to the most delicate fabrics.

ATTACHMENT FOR PLOWS.—Adelbert Osborn and Edward Wulzen, Streator, Ill.—This invention has for its object to furnish an improved attachment for plows by means of which cornstalks, weeds, grass, etc., may be brought into such positions that they may be covered by the soil turned over by the plow.

GRADING PLOW OR SCRAPER.—A. P. Hopkins, Bentleyville, Pa.—This invention has for its object to furnish an improved machine for moving dirt, snow, and other substances, from place to place, as in grading roads, etc., clearing off snow or dirt from roads, pavements, yards, etc., and for similar uses.

MELODY ATTACHMENT FOR KEY-BOARD INSTRUMENTS.—Carl Fogelberg New York city.—This invention has for its object to furnish an improved attachment for pianos and other key-board instruments by means of which a flute solo or other melody, either with or without accompaniment may be played upon the instrument by means of the same keys by which ordinary music is played upon said instrument.

APPARATUS FOR DISTILLING VOLATILE HYDRO-CARBONS.—C. M. James, New York city.—This invention has for its object to furnish an improved apparatus designed especially for the distillation of volatile hydro-carbons, but equally applicable for other substances, by the use of which the desired distillate may be obtained of a uniform density or gravity in a continuous process until the whole or nearly the whole of the substance being operated upon has been distilled.

CULTIVATOR.—Wm. R. Blanchard, Hertford, N. C.—This invention has for its object to furnish an improved implement for cultivating corn and other crops planted in rows, and which shall be so constructed as to be easily and quickly adjusted for the different purposes for which it may be used and so as to do its work well.

VOLTAIC PILES.—John Jacob Geiger, Chicago, Ill.—The object of this invention is to provide a portable and convenient voltaic pile, and consists in the construction and arrangement of the parts of the same whereby cups or cells for the voltaic fluid are dispensed with and the said fluid held between the plates by capilary attraction.

PUMP VALVES.—Joseph C. Couldrey, N. Y. city, and Thomas Couldrey, Liverpool, Eng.—This invention has for its object to furnish an improved pump valve, designed especially for ship pumps, but which shall be equally adapted for use in other situations, and which shall be so constructed and arranged as to avoid the liability to become choked or clogged by substances that may find their way into the wells.

HOLLOW STOPPLE FOR TANKS, BINS, ETC.—John A. Livingston, New York city.—This invention has for its object to furnish an improved device, by means of which sugar and sirups in sugar houses, and other similar substances, may be passed from an upper to a lower floor through tanks or bins filled with dry or liquid substances without becoming intermingled with the contents of said bins or tanks.

HOT AIR FURNACE.—James Martin, Florence, Ala.—This invention relates to an improved apparatus for heating air for warming buildings, and it consists in the combination and arrangement of tin horizontal cylinders provided with suitable openings for the admission and discharge of the air

THILL COUPLING.—James L. Cole, Columbus City, Iowa.—This invention has for its object to furnish an improved coupling for connecting the thills or tongue of a buggy or other carriage to the forward axle, which shall be simple in construction, reliable in operation, not liable to get out of order, or to become accidentally uncoupled, and which may be easily detached, when required, without its being necessary to unscrew nuts or remove bolts.

CENTRIFUGAL AND SCREW PUMP.—John H. White, of Lima, Peru, South America, and William S. Henson, of Newark, N. J.—This invention relates to a new and improved construction for pumps for raising water and other liquids, and it consists in revolving a conical screw in a properly constructed shell, and in the arrangement of the supply valves in combination therewith, whereby the water is raised by the combined force of the revolving screw and centrifugal motion.

GRAIN FEEDING AND SCOURING APPARATUS.—John W. Ardinger, Mount Pulaski, Ill.—The object of this invention is to provide a simple and effective apparatus for scouring grain, which will also serve as a feed regulator, either for grain or ground stuffs, such as middlings, etc.

TRUSS.—J. R. Blake, Dyer Station, Tenn.—This invention consists in the application or use of an under strap of india-rubber or other suitable elastic substance, whereby the truss may be worn with greater ease and comfort and all the advantages of the improved truss retained.

GLOBE HOLDER.—Thos. Hay, Newark, N. J.—This invention relates to improvements in apparatus for holding glass globes upon gas burners and chimneys upon lamps, and consists in the arrangement of a coiled spring in a circle upon the top of the circular bases which support the said globes or chimneys, in a manner to spring over the flanges at the bases of the globes or chimneys when they are placed thereon, and close down upon them above the said flanges, forming a secure holder.

PIANAOFORTE TREBLE VIBRATION CHECK.—A. V. T. Barberie, Brooklyn, E. D., N.Y.—This invention consists in applying the weight of a lead bar, or pressure by any desired means, upon the treble edge of rest plank bridge, thereby producing a clear and brilliant tone free from any metallic quality.

NEW AND USEFUL ADJUSTABLE SOCKET FOR DOOR BOLTS.—G. W. Davis, Brooklyn, N. Y.—The object of this invention is to provide for the shrinking and settling of doors in the arrangement of door bolts, and to consequently so construct the socket for the bolt that, whatever be the displacement of the door, the socket can always be brought in line with the bolt.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,746.—STEAM LAND LOCOMOTIVE TRACTION ENGINE AND ATTACHMENTS.—Henry Cowing, New Orleans, La. September 7, 1868.

3,881.—MANUFACTURE OF CARPETS AND OTHER FIGURED FABRICS, AND WEAVING MACHINERY EMPLOYED THEREIN.—H. G. Thompson, New York city. December 21, 1868.

3,923.—MANUFACTURE OF CUT PILE CARPETS AND OTHER FIGURED FABRICS.—H. G. Thompson, New York city. December 23, 1868.

3,924.—PLATES FOR HOLDING ARTIFICIAL TEETH.—E. B. Goodall, Portsmouth, N. H. December 23, 1868.

3,928.—RENDERING COD LIVER OIL AND OTHER OILY OR FATTY MATTERS PALATABLE.—T. Hyatt, New York city. December 23, 1868.

3,952.—APPARATUS AND MANUFACTURE OF WROUGHT METAL PIPES.—J. B. Clow, Allegeny, Penn. December 29, 1868.

3,976.—APPARATUS FOR DRYING AND GROWING MALT AND ALL OTHER GRAINS, FRUITS, OR VEGETABLES.—Joseph Gecmen, Chicago, Ill. December 31, 1868.

37.—LAWN MOWERS—A. M. Hills, East Hartford, Conn. January 5, 1869.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING JANUARY 26, 1869.

Reported Officially for the Scientific American.

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Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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86,119.—CATTLE TIE.—Wm. Allport, New Britain, Conn.
86,120.—SPRING BED BOTTOM.—J. H. Almond, Louisville, Ky.
86,121.—MACHINE FOR MENDING STOCKINGS.—Benj. Arnold, East Greenwich, R. I.
86,122.—MACHINE FOR MENDING STOCKINGS.—Benj. Arnold, East Greenwich, R. I.
86,123.—JOINING OR SPLICING BELTS.—John Ashworth (assignor to himself, John B. Cotton, and R. C. Reynolds), Lewiston, Me.
86,124.—SASH LOCK.—M. L. Ballard and R. B. Killin (assignors to R. B. Killin and Ballard, Fast, and Company), Canton, Ohio.
86,125.—LOW WATER DETECTOR FOR STEAM BOILERS.—E. S. Bennett (assignor to himself and Justus Smith), New York city. Antedated January 13, 1869.
86,126.—SAFETY VALVE.—E. S. Bennett (assignor to himself and Justus Smith), New York city. Antedated January 21, 1869.
86,127.—LIFE PRESERVER.—E. S. Bennett (assignor to himself and Justus Smith), New York city. Antedated Jan. 11, 1869.
86,128.—BEEHIVE.—Wm. Black, Harrisburgh, Penn.
86,129.—CAR COUPLING.—A. J. Braley, Berlin, Vt.
86,130.—AX HANDLE SHIELD.—Beauman Butler, St. Johnsbury Center, Vt.
86,131.—SHAFT FOR SLEIGHS.—C. H. Butterfield, Westborough, Mass.
86,132.—APPARATUS FOR PRINTING SKIRTS.—Thomas Byrne, Brooklyn, and T. Henry, New York city. Antedated January 11, 1869.
86,133.—FARM FENCE.—V. Calkins (assignor to himself and J. W. Johnson), Varysburg, N. Y.
86,134.—GALVANIC BATTERY.—Chas. T. Chester, Englewood, N. J. Antedated January 18, 1869.
86,135.—METHOD OF ATTACHING TEETH TO DENTAL PLATES.—A. Clark, Galesburg, Ill.
86,136.—SAW-MILL DOG.—J. Cobleigh, Morristown, Vt.
86,137.—HAMES FASTENER.—E. A. Cooper, Buffalo, N. Y.
86,138.—PIPE WRENCH AND CUTTER.—R. A. Copeland, Baltimore, Md., assignor to Justus Smith and E. S. Bennett, New York city. Antedated January 9, 1869.
86,139.—CLOTHES LINE STRETCHER.—S. Crowell, Philadelphia, Penn. Antedated January 4, 1869.
86,140.—CLOTHES FRAME.—J. Danner, Canton, Ohio.
86,141.—SEAT FOR CHAIRS, CARS, ETC.—B. M. Darling, Woonsocket, R. I. Antedated January 11, 1869.
86,142.—MANUFACTURE OF CARBONATE OF AMMONIA.—S. R. Divine, New York city.
86,143.—MACHINE FOR TRIMMING WALL PAPER.—S. Elder, Buffalo, N. Y.
86,144.—FLASK FOR MOLDING PIPE.—J. Farrar, Providence, R. I., and L. F. Whiting, Boston, Mass.
86,145.—LINING FOR MOLDS FOR CASTING METALS.—John Farrar, Providence, R. I., and L. F. Whiting, Boston, Mass.
86,146.—PRESSING OR EXPELLING THE WATER FROM CLOTHES.—T. Fowler, Seymour, Conn.
86,147.—MODE OF CONSTUCTING THE LEGS OF STOVES.—John Gibson, Jr., Albany, N. Y.
86,148.—CLAY MACHINERY.—G. D. Goodrich, Chicago, Ill.
86,149.—TRACE FASTENING.—C. Graham, New York city.
86,150.—CARRIAGE COUPLING.—L. Grim, Fort Branch, Ind.
86,151.—MODE OF CONSTRUCTING LIGHTNING RODS.—G. B. Hamilton, Wellington, and J. S. Stevenes, Cleveland, Ohio. Antedated July 27, 1868.
86,152.—INJECTOR FOR BOILERS.—John T. Hancock, Jamaica Plain, Mass.
86,153.—VELOCIPEDE.—J. E. Hawkins, Lansingburgh, N. Y.
86,154.—FISH HOOK.—M. Hiltz (assignor to himself and L. A. Burnham), Gloucester, Mass.
86,155.—GASOMETER.—J. E. Hobbs, North Berwick, Me.
86,156.—SELF-ACTING SPINNING MACHINE.—Henry Holcroft, F. R. Pearson, and R. Shore, Philadelphia, Penn.
86,157.—FOLDING FRUIT BOX.—J. H. Hollingsworth, Philadelphia, Pa. Antedated January 11th, 1869.
86,158.—NOZZLE FILTER.—H. Houston, Pittsburgh, Pa. Antedated January 11, 1869.
86,159.—FOLDING TUB.—C. H. Hudson, New York city. Antedated January 11, 1869.
86,160.—CULTIVATOR.—J. Huff, Young America, Ill.
86,161.—CAR COUPLING.—O. Z. Hurd and John W. Ardinger, Mount Pulaski, Ill.
86,162.—DIE FOR CUTTING OUT PAPER COLLARS.—E. Jeffers, Boston, Mass.
86,163.—SEWING MACHINE.—John T. Jones (assignor to the Singer Manufacturing Company), New York city.
86,164.—SEWING MACHINE.—John T. Jones (assignor to the Singer Manufacturing Company), New York city.
86,165.—COMBINED BOOT JACK AND BLACKING CABINET.—L. P. Keach, Baltimore, Md. Antedated January 11, 1869.
86,166.—MACHINERY FOR CLINCHING HORSE SHOE NAILS.—David Kirk, Orleans, N. Y.
86,167.—PROCESS AND APPARATUS FOR SEPARATING MAGNETIC FROM NON-MAGNETIC SUBSTANCES.—Francois Alexandre Hubert La Rue and Octave Audet (assignors to F. A. H. La Rue and C. E. Panet), Quebec, Canada.
86,168.—STEAM SAFETY VALVE.—W. H. Low, New York city.
86,169.—SPRING BED BOTTOM.—D. Manuel (assignor to J. S. Paine), Boston, Mass.
86,170.—CULTIVATOR.—T. J. Martin, Willow Hill, Ill.
86,171.—MANUFACTURE OF SPITTOONS FROM RUBBER, GUTTA-PERCHA, ETC.—T. J. Mayall, Roxbury, Mass.
86,172.—TONIC BEVERAGE.—Dr. J. Mayer, Cleveland, Ohio.
86,173.—BALL AND SOCKET JOINT.—Edward Maynard, Washington, D. C.
86,174.—LUBRICATOR.—F. P. McCullon, Philadelphia, and W. Woodcock, Scranton, Pa.
86,175.—ANIMAL TRAP.—G. W. Merritt and H. S. Gibbs, Norwalk, Conn.
86,176.—BORING AND MORTISING MACHINE.—A. O. Neal, Hyde Park, Mass.
86,177.—WRITING SLATE.—Daniel W. Niles, Cambridgeport, Mass.
86,178.—HARVESTER RAKE.—H. F. Phillips, Auburn, N. Y.
86,179.—HAY ELEVATOR AND CONVEYOR.—Thomas I. Powell, Naples, N. Y.
86,180.—COLLAR.—Cyrus W. Saladee, Circleville, Ohio.
86,181.—WRENCH.—Pierre Augustin Samuel, Paris, France.
86,182.—MACHINE FOR SPINNING TAPERING TUBES OF SHEET METAL.—Frederick I. Seymour (assignor to himself and E. Miller & Co.), Meriden, Conn.
86,183.—FASTENING FOR CORSETS.—H. N. Sherman, Beloit, Wis. Antedated January 22, 1869.
86,184.—FARM GATE.—George Smith, Providence, R. I.
86,185.—CULTIVATOR FOR DIRTING COTTON.—James Scott Smith, Helena, Ark.
86,186.—HANGER FOR SHAFTING.—Henry F. Snyder, Williamsport, Pa.
86,187.—MANUFACTURE OF ILLUMINATING GAS.—Levi Stevens, Washington, D. C.
86,188.—HAMES HOOK AND CLEVIS.—A. Strever, Albany, N. Y.
86,189.—CONSTRUCTION OF SAFES.—T. J. Sullivan, Albany, N. Y.
86,190.—POTATO PLOW.—R. P. Terhune and B. J. Romaine, Hackensack, N. J.
86,191.—SASH HOLDER.—R. M. Thompson, Coshocton, Ohio.
86,192.—GRAIN DRYER.—Hiram Walker, Detroit, Mich.
86,193.—FLOAT FOR LIFE PRESERVERS, ETC.—James W. Weston, New York city.
86,194.—GRAIN CLEANER.—James E. Wheat, Rochester, N. Y.
86,195.—STEAM WHISTLE DRAIN-VALVE DEVICE.—Thomas Windell and John H. Dorst, New Albany, Ind.
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Clement Russell, of Massillon, Stark county, Ohio, having petitioned for the extension of a patent granted him on the 1st day of May, 1855, reissued May 15, 1862, for an improvement in Double-geared Horse Powers, it is ordered that said petition be heard at this office on the 12th day of April next.

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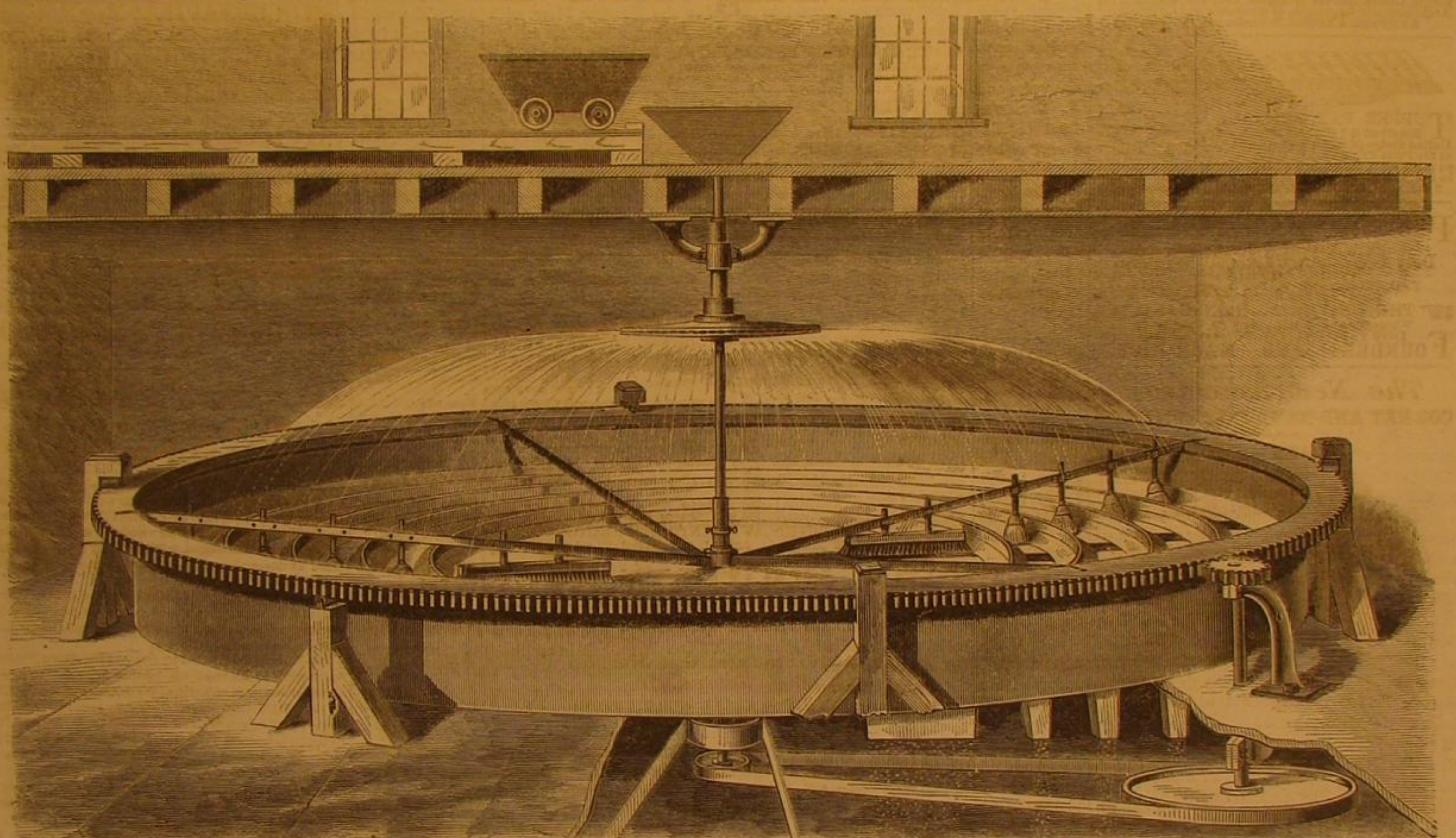
Vol. XX.---No. 9. [NEW SERIES.] | NEW YORK, FEBRUARY 27, 1869 | $3 per Annum. [IN ADVANCE.]

Improvement in Separating and Concentrating Ores, Grains, etc.

The concentration of metallic ores, or their separation from waste and worthless rock, is a process through which all metals used in daily life must pass before they reach the smelter and through him the consumer. It is a fact which may surprise the general reader, but which is well known to those interested, that of all the ores raised from the mine not more than three-fourths, in many cases not over half, goes to the smelter. The residue is either washed away in "water dressing," or else left still mechanically combined with the rock which is thrown aside as "tailings."



PEARCE'S CENTRIFUGAL ORE CONCENTRATOR.

The difficulties which stand in the way of a complete separation of the metals from the rock are mainly these two: Unless the ore is crushed fine (in some cases exceedingly fine), the metallic portions are not entirely detached, and therefore cannot be mechanically separated from the rock. On the other hand, the finer the ore is crushed the greater is the difficulty of washing out the earthy matter without washing away the metal with it. Hence, fine crushing for ordinary ores is, for the most part, eschewed; yet from the friable nature of most of them it is impossible, in any mode of crushing, but that a large proportion of fine dust must be made. Moreover, if fine ores could be separated with as little loss of metal as coarse, fine crushing or more perfect disintegration would be the rule. Therefore a means of concentrating finely crushed ore must obviously be of the first importance.

This object is attained, it is believed, in the highest degree practicable, by the invention represented in the accompanying engraving.

Instead of the employment of currents either of air or water—which in whatever way they are applied must necessarily carry off some valuable matter—the crushed ore is thrown out of a revolving distributor, by the very simple mechanism shown, and by the operation of centrifugal force, alone, is carried into concentric annular receivers, the heaviest particles falling further from and the lighter nearer to the center.

Revolving brushes or scrapers, as shown, keep the machine clear, and cause each quality to be discharged, as it falls, through separate pipes. These scrapers are slowly revolved by means of the outer geared rim, driven by an upright shaft having a pulley on the lower end and a pinion meshing with the teeth of the revolving rim at its upper end. The brushes are attached to radial arms extending from a collar on the central shaft to the rim. The heavier metallic portions in the outer circles, and the waste in the inner one, will run where desired, and the middle portions which may require further crushing or further separation, may fall into an elevator and be carried up either to the crusher or separator, to be run through at a different speed, or with fresh ore.

The machine being of a fixed size, it can be regulated to the various grades of ore with great nicety, by varying the rate of the speed or the hight of the distributor, the tube being made movable for that purpose. The whole operation of dressing ore by centrifugal force is rendered entirely mechanical, and in that respect analogous to the working of an ordinary flouring mill, where there is no loss of the substance treated, nor manual labor employed in it, except for packing and attention to the machinery. While the machine will concentrate perfectly ores which are so fine as to float on water, it is equally applicable to the coarser grades, and beside the metallic ores all other mineral or granular substances can be treated by this process. It also affords a means of grading the particles of homogeneous substances which may require sorting to a size, much more rapidly and effectually than by sifting or bolting. With such articles as cement or plaster,

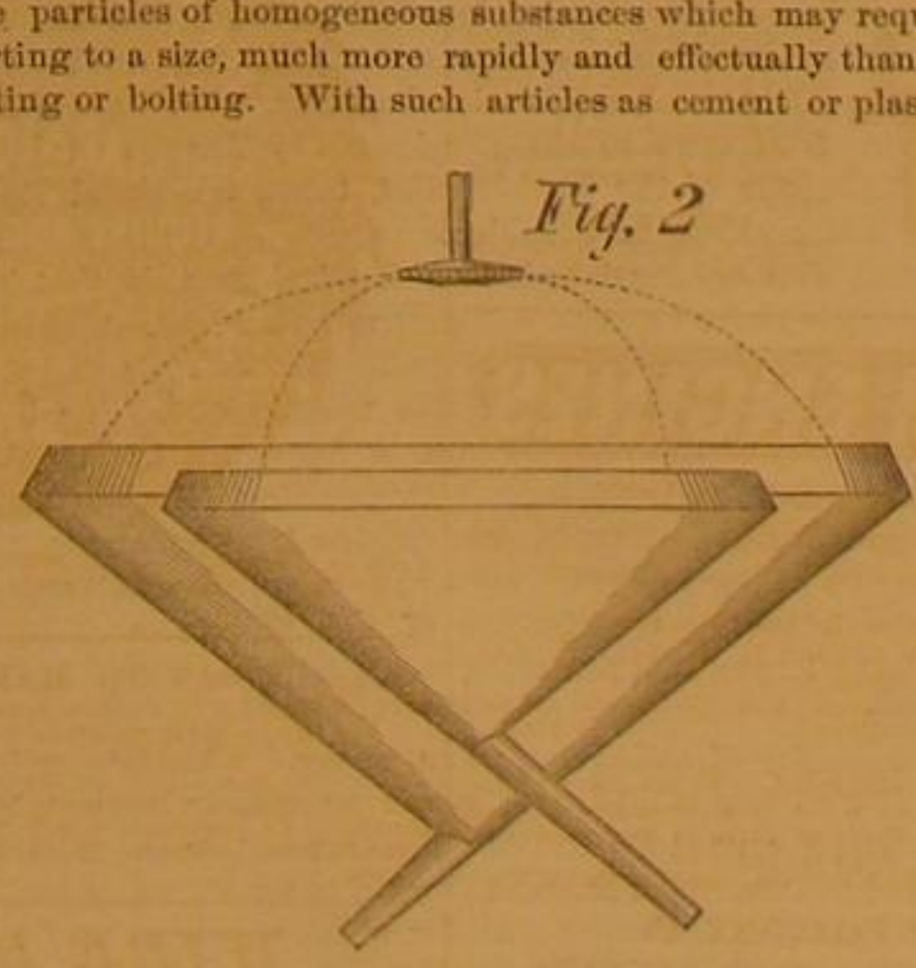


Fig. 2

it is necessary that they should be thoroughly pulverized, and the loss of power in grinding down these substances by one operation is enormous, arising from the necessity of running the stones close, and delivering proportionately slow; but if the stones could be run free and the coarse matter thrown out from the fine and returned, it is manifest that an immense gain in the power and capacity of existing mills would be effected. A form of receiver adapted to such fine substances, where only two grades are required, is shown in Fig. 2. It consists of two funnels suspended one within the other. A pipe from each would carry off the matter which fell into them by means of its gravity alone without any machinery.

Another application of this principle of centrifugal force contemplated by the patentee is the cleansing and sorting of all kinds of seeds, and grains, especially such as may be intended for seeding. It is taken for granted that the heaviest grains or seeds possess the greatest germinating power, and produce the finest plants. By passing any sample of grain or seed through the separator, the heavier or plumper seeds would fall in the outer receiver, and the whole be cleared and classified, almost without cost.

An important feature in the working of this machine is the rapidity of its action. Through a working model now on exhibition at 32 Dey street, in this city, iron ore has been passed with effect at the rate of ten tuns per hour, and it would be perfectly practicable to increase its capacity tenfold, with even greater perfection in the result. The "tailings" from water-dressing now accumulated at working and worked-out mines, contain metal worth many millions of dollars. The value of the invention for working over and recovering this mineral will be at once apparent.

An objection with some who have tried dry ore-dressing, arises from the flying dust which usually accompanies the operation and which is prejudicial both to the health of the workmen and the durability of the machinery. With the centrifugal machine this objection does not arise. The apparatus, as shown in the engraving, is placed in a closed chamber, which need never be entered by workmen while the machine is in operation. The pipe through which the ore is admitted, is fitted with an air-tight stuffing box, which prevents all currents of air from entering, and the air within the chamber will gradually acquire a rotary motion, with the running of the machine, which will not disturb the separation even of the finest dust; each particle of which will obey the laws of centrifugal motion and fall into its proper place. Having witnessed its operation, we think that, from the variety of interests involved in the possible application of the machine, it is well worthy the attention of seedsmen, plaster manufacturers, grain dealers, and others, beside those interested in the extraction of metals from ores.

Patented August 4, 1868, by S. T. Pearce, who may be addressed at 32 Dey st., New York city, where one of the machines having a diameter of twenty feet can be seen in operation.

THERE are twenty-five tobacco factories in Chicago, with an aggregate capital of three millions dollars, the annual product of which is about ten millions dollars.

"MODERN ENGINEERING."--BY THE HON. WM. J. MC-ALPINE.

A large audience assembled in Steinway Hall, 17th February, to hear the last lecture of the course before the American Institute. The lecturer, after a few introductory remarks, said: Engineering is peculiarly the exponent of modern development. Its definition is "the acquisition of that species of knowledge whereby the great sources of power in nature are converted, adapted, and applied for the use and convenience of man," which covers the civil and military engineer, the architect and mechanician, the closet theorist, and the practical workman. The subject covers the locomotive and its railway; the steam engine and its application; the metals and their manipulation; the workshops and their great tools; modern ordnance and armor; naval construction, telegraphy, bridges, canals, water supplies, harbors, etc.; and has been characterized by the various applications of steam, the product and manipulation of metals and telegraphy. Among the most important of the discoveries and appliances on modern engineering is the locomotive. It was invented at the beginning of this century, but was not successfully used until 1829, since which time it has increased from four to forty tuns in weight, and from fourteen to sixty miles per hour in speed. Then grades of fifty feet per mile were the maximum, now those of 440 feet at Mont Cenis and 528 on the Baltimore and Ohio, have been used. Forty years ago Horatio Allen had to mount the foot-board of the first locomotive himself, now 15,000 are daily whirling over 40,000 miles of railways in this country alone. To-day locomotives are passing over the summits of the Rocky Mountains and Sierra Nevada, and before the year closes will go from ocean to ocean. From the days of Noah until those of the locomotive, civilized population was confined to the water lines. This one engine has spread an avalanche of peoples upon our fertile interior, who now form more than one half of our population and sources of prosperity. The Erie Canal, originally built for vessels of 60 tuns, has just been enlarged for those of 250 tuns, and its increasing traffic already demands an enlargement for vessels of 1,000 tuns. Of the traffic of the great West it now carries more than all of the great trunk lines of railway between the St. Lawrence and the Potomac. One canal boat carries more tunnage than a freight train, and the Erie Canal brings daily to tide water more than five times as much tunnage as the New York Central. Its tunnage exceeds that of all the foreign commerce of this city. The materials used in its construction exceed in quantity those required for the 2,000 miles of the Pacific Railway. The Croton Aqueduct exceeds in engineering merit any work of its kind in the world. The American examples of bridges embrace those of every material and form, and many of huge dimensions. The Niagara and Cincinnati wire suspension, by Roebling; the Havre de Grace of wood, by Parker; the Schuylkill bridge of cast iron arches, by Kneass; and the Victoria iron girder by Stephenson, are among the most noted. In submarine works are the piers of the Potomac and Croton Aqueducts, of the Havre de Grace and Harlem Bridges, and the founding of the United States Graving Dock, at Brooklyn. The Aqueducts and Graving Dock were founded by means of coffer dams, the Havre de Grace Bridge by means of iron caissons, and the piers of the Harlem Bridge are composed of large cast-iron columns or hollow piles, driven by the new-discoverod pneumatic process. A mass of metal of a tun weight was unknown before the Christian era. Now those in cast iron up to 150 tuns, in wrought iron to forty tuns, and in steel or bronze to twenty-five tuns, are cast in any desired form, and turned or bored with the most perfect accuracy. Two years ago I saw the largest lathe in England, which swings twenty-two feet, and will take in a shaft forty-five feet long. Six months ago I saw one in this country which swings thirty feet, and will take in a shaft of fifty feet. There are planers which will plane iron fifty feet in length; others of eighteen feet in width; others fourteen feet in hight, taking off metal shavings of two and a half inches in width and a quarter thick. Not long since I witnessed the penetration of a wrought-iron shield of fifteen inches thickness by an elongated cannon shot of twelve inches diameter. The largest European gun is of steel, by Krupp, fourteen inches bore, and will throw a ball of 1,000 pounds, but has never been fired. The next largest European gun, is an Armstrong rifle, which throws a shell of 610 pounds. The 12-inch American Rodman rifle throws an elongated shot of 630 pounds, and the 20-inch smooth-bore, a spherical shot of 1,072 pounds. The "Swamp Angel" is a Parrott rifle, eight inches bore, and threw shot of 150 pounds a distance of five and a half miles into Charleston. Its ancient rival, "Mons. Meg," is twenty inches bore, and threw stone balls of eighteen and a half inches in diameter, but notwithstanding its quaint legend, its range did not exceed a mile and a half.

It is said that telegraphy may be read by each of the five senses, namely, sight, sound, feeling, taste, and even smelling. The method of signaling through the Atlantic Cable is exactly the reverse of that upon the land lines, and is done by alternate currents of positive or negative electricity, but ten per cent of which is allowed to cross the ocean; and, therefore, an almost microscopic receiving instrument is used. Last autumn General Reynolds sent a message ninety-two miles across Lake Superior by means of the heliotrope (or mirror) without the aid of either wire or cable. The works of the ancients are often referred to as excelling, in magnitude, accuracy of workmanship, and beauty of design those of modern times. This view is in part at least quite erroneous. Their works were generally for useless purposes, although there are many exceptions, such as their canals, water works, military roads and bridges, which show that they were occasionally called upon for works of utility. The stones in the temple of Baalbec are the largest save one of any building in the world. They range from 1,200 to 1,275 tuns. The one at St. Petersburg is one-fifth larger. The monoliths of Egypt are from 200 to 300 tuns, and a few of 700 tuns. The obelisk of Luxor, now in Paris, weighs 250 tuns. The "goodly stones" of the temple at Jerusalem weighed 350 tuns each. The speaker then described, from the most trustworthy sources, the probable method of constructing the great Pyramid of Gizeh, including the method of quarrying, transporting, and laying the stone, and stated that, instead of scaffolding, a mound of earth and an inclined causeway were used, and when the structure was completed the earth was removed. This pyramid contained 6,500,000 tuns of stone, and the embankments required 50,000,000 tuns of earth. All of the masonry of the Erie Canal amounts to but one-third of this, and all of the earth moved for the Pacific Railway amounts to but that used instead of scaffolding for this pyramid. It required the labor of 500,000 men for thirty years, and cost $5,000,000,000. A modern engineer would construct such a work for $100,000,000, and use a tithe of the men. The Coliseum of Rome was of but one-third of the size of the London Exhibition building, and but one-sixth of the Paris building. The tunnage of the Ark was 12,000; of the show ships built by Ptolemy somewhat less, and of the Great Eastern, 22,500 tuns. Some of the modern men-of-war have nearly 9,000 tuns displacement, and our passenger ships 3,000 to 5,000 tuns. The largest steam engines in the world were those used in draining the Haerlem Mere, with steam cylinders of twelve feet diameter and fifteen feet stroke, driving eight pumps of sixty-three and seventy-three inches diameter, and ten feet stroke. These three engines were capable of delivering a volume of water six times as great as that of the Croton. The next largest pumps are those of the Graving Dock at Brooklyn, of one-third of the capacity of those at Haerlem Mere. The steam engines next in size are those of the Bristol and Providence steamers, with cylinders of nine feet two inches diameter and twelve feet stroke. The speaker then described the Bessemer steel process, and spoke of the changes which it is destined to produce in engineering structures Seven of the most noted modern engineering works, to contrast with the seven wonders of the ancient world, are the Thames Tunnel, the Great Eastern steamship, the Atlantic Cable, the Britannia and Niagara Bridges, the Erie Canal, modern ordnance, and the Pacific Railway. Among the great projects of the age are those for building canals, railways, tunnels, bridges, and steamers. In canals, we have the project of one around the Falls of Niagara; a re-enlargement of the Erie for vessels of 1,000 tuns; the Suez, nearly completed; one cross the Alleghanies in Virginia; one through the Nicaragua Lake or Panama, and one from Huron to Ontario. In railways, we have the Pacific on the eve of completion; the Mont Cenis in rapid progress; one across the continent from Rio Janeiro begun, and many others of magnitude. Of bridges, we have those in progress across our great Western rivers; one proposed across the East River at New York of 1,600 feet clear span; two over the Hudson, above and below West Point; another across the Straits of Messina, covering the "Scilla and Charybdis with clear spans of 1,000 meters (two-thirds of a mile) each," and with piers of 700 feet high, half in and half out of the sea, and finally the modern "Pons Asinorum," a bridge project across the Straits of Dover, sixteen miles long, in clear spans of two miles each, with piers of 1,000 feet depth in the water. This project is said to be favored by Napoleon. In tunnels we have that of Mont Cenis, eight miles, and of the Hoosic, five miles in length, both in rapid progress; one of wrought iron tubes at London, and another at Chicago, almost completed; tunnels proposed under the East and North Rivers at New York, under the Ganges at Calcutta, and under the Straits of Dover.

IS HYDROGEN GAS A METAL?

It has long been suspected that hydrogen would ultimately prove to be a metal. Our readers will also recollect the announcement that during some recent experiments, a substance had been discovered, supposed to be the metallic base of hydrogen. Still more recent experiments by Thomas Graham, F.R.S., Master of the British Mint, throw additional light upon this most important subject.

It has often been maintained on chemical grounds that hydrogen gas is the vapor of a highly volatile metal. The idea forces itself upon the mind that palladium with its occluded hydrogen is simply an alloy of this volatile metal in which the volatility of the one element is restrained by its union with the other, and which owes its metallic aspect equally to both constituents. How far such a view is borne out by the properties of the compound substance in question will appear by the following examination of the properties of what, assuming its metallic character, would fairly be named hydrogenium

The density of palladium, when charged with 800 or 900 times its volume of hydrogen gas, is perceptibly lowered, but the change cannot be measured accurately by the ordinary method of immersion in water, owing to a continuous evolution of minute hydrogen bubbles which appear to be determined by contact with the liquid. However, the linear dimensions of the charged palladium are altered so considerably that the difference admits of easy measurement, and furnishes the required density by calculation. Palladium, in the form of wire, is readily charged with hydrogen by evolving that gas upon the surface of the metal in a galvanometer containing dilute sulphuric acid, as usual. The length of the wire before and after a charge is found by stretching it on both occasions by the same moderate weight, such as will not produce permanent distention, over the surface of a flat graduated measure. The measure was graduated to hundredths of an inch, and by means of a vernier, the divisions could be read to thousandths. The distance between two fine cross lines marked upon the surface of the wire near each of its extremities was observed.

The wire had been drawn from welded palladium, and was hard and elastic. The diameter of the wire was 0·462 millimeter; its specific gravity was 12·38, as determined with care. The wire was twisted into a loop at each end, and the mark made near each loop. The loops were varnished so as to limit absorption of gas by the wire to the measured length between the two marks. To straighten the wire, the loop was fixed, and the other connected with a string passing over a pulley and loaded with 1·5 kilogrammes, a weight sufficient to straighten the wire without occasioning any undue strain. The wire was charged with hydrogen by making it the negative electrode of a small Bunsen's battery, consisting of two cells, each of half a liter in capacity. The positive electrode was a thick platinum wire placed side by side with the palladium wire, and extending the whole length of the latter, within a tall jar filled with dilute sulphuric acid. The palladium wire had, in consequence, hydrogen carried to its surface for a period of one and a half hours. A longer exposure was found not to add sensibly to the charge of hydrogen acquired by the wire. The wire was again measured and the increase in length noted. Finally, the wire being dried with a cloth, was divided at the marks, and the charged portion heated in a long narrow glass tube kept vacuous by a Sprengel aspirator. The whole occluded hydrogen was thus collected and measured; its volume is reduced by calculation to Bar. 760 m.m., and Therm. 0° C.

The original length of the palladium wire exposed was 609·144 m. m. (23·982 inches), and its weight 1·6832 grm. The wire received a charge of hydrogen amounting to 936 times its volume, measuring 128 c.c., and therefore weighing 0·01147 grm. When the gas was ultimately expelled, the loss as ascertained by direct weighing was 0·01164 grm. The charged wire measured 618·923 m.m., showing an increase in length of 9·779 m.m. (0·385 inch). The increase in linear dimensions is from 100 to 101·605; and in cubic capacity, assuming the expansion to be equal in all directions, from 100 to 104·908. Supposing the two metals united without any change of volume, the alloy may therefore be said to be composed of—

		By volume.
Palladium	100	or 95·32
Hydrogenium	4·908	or 4·68
	104·908	100

The expansion which the palladium undergoes appears enormous if viewed as a change of bulk in the metal only, due to any conceivable physical force, amounting as it does to sixteen times the dilatation of palladium when heated from 0° to 100° C. The density of the charged wire is reduced by calculation from 12·3 to 11·79. Again, as 100 is to 4·91, so the volume of the palladium, 0·1358 c.c is to the volume of the hydrogenium 0·006714 c.c. Finally, dividing the weight of the hydrogenium, 0·01147 grm. by its volume in the alloy, 0·006714 c. c. we find

Density of hydrogenium..........1·708

The density of hydrogenium, then, appears to approach that of magnesium, 1·743, by this first experiment.

Further, the expulsion of hydrogen from the wire, however caused, is attended with an extraordinary contraction of the latter. On expelling the hydrogen by a moderate heat, the wire not only receded to its original length, but fell as much below that zero as it had previously ridden above it. The palladium wire first measuring 609·144 m.m., and which increased 9·77 m.m., was ultimately reduced to 599·444 m.m., and contracted 9·7 m.m. The wire is permanently shortened. The density of the palladium did not increase, but fell slightly at the same time, namely, from 12·38 to 12·12; proving that this contraction of the wire is in length only. The result is the converse of extension by wire-drawing. The retraction of the wire is possibly due to an effect of wire-drawing in leaving the particles of metal in a state of unequal tension, a tension which is excessive in the direction of the length of the wire. The metallic particles would seem to become mobile, and to right themselves in proportion as the hydrogen escapes; and the wire contracts in length, expanding, as appears by its final density, in other directions at the same time.

A wire so charged with hydrogen, if rubbed with the powder of magnesia (to make the flame luminous), burns like a waxed thread when ignited in the flame of a lamp.

Numerous other experiments were also performed, with remarkable unanimity of result; the specific density of hydrogenium being found by calculation from several successive experiments to be, respectively, 1·708, 1·898, 1·977, 1·917, 1·927, 1·930, 2·055, the variations resulting from different volumes being used in the alloy, the highest densities being obtained when small quantities were used.

In these experiments the hydrogen was expelled by exposing the palladium placed within a glass tube to a moderate heat short of redness, and exhausting by means of a Sprengel tube; but the gas was also withdrawn in another way, namely, by making the wire the positive electrode, and thereby evolving oxygen upon its surface. In such circumstances, a slight film of oxide of palladium is formed on the wire, but it appears not to interfere with the extraction and oxidation of the hydrogen. The wire measured—

		Difference.
Before charge	443·25 m.m.	
With hydrogen	449·90 "	+ 6·65 m.m.
After discharge	437·31 "	— 5·94 "

The retraction of the wire, therefore, does not require the concurrence of a high temperature. This experiment further proved that a large charge of hydrogen may be removed in a complete manner by exposure to the positive pole—for four hours in this case; for the wire in its ultimate state gave no hydrogen on being heated *in vacuo*.

Experiments were also made to determine the conducting power of the palladium and hydrogenium wire, and its magnetic properties, the details of which may be hereafter referred to. The record of these experiments, as communicated to the Royal Society, January 14, by Mr. Graham, forms one of the most important contributions to science that has been recently made, and will immediately arrest the attention of the entire scientific world.

VELOCIPEDE NOTES.

Many have expressed doubts as to the real utility of velocipedes and the permanency of their use. Most of these croakers have based their opinions upon the disuse into which the rude machines of former times have fallen and the want of adaptability to the roughly paved roadways of our cities. The first of these objections is answered by the fa t that the seemingly slight differences in the construction of modern velocipedes from the primitive ones, have entirely changed the character of the vehicle. They are no longer draft vehicles, they are locomotives, and are as much superior to the original straddle bar on wheels, as the improved steam locomotive is to the old time stage coach. As to the second point, what will objectors say when it is announced on good authority that the spirited Common Council of Brooklyn propose to bridge the gutters for the accommodation of velocipedestrians. *The Brooklyn Union* says of this project: "Whole streets will no doubt in due time be modified to meet the requirements of the coming vehicle. We are informed that our beneficent Prospect Park Commissioners are already proposing to give the velocipede the benefit of a special course. In view of the existing demand, as well as of the plain prospects of this institution, we take the liberty of suggesting that the gutters of the city be bridged. Whether it be effected with iron or with flagging, it can be done with perfect ease and tolerable economy, and would be viewed by every one as a great convenience. It is a little job which we commend to the paternal mercies of the City Fathers." It adds that if this is long delayed "The whole city will rise in its might to demand little iron bridges over the gutters."

We believe in the *utility* of the velocipede, as well as in its capacity for affording amusement, and shall not be disappointed to see Henry Ward Beecher's prediction fulfilled, and devout worshippers propelling themselves with all due gravity and decorum to church on Sunday.

Velocipede livery stables are the offspring of scant supply and large demand. "Velocipedes To Let" greets our eyes every day on the way to our office. Velocipedes rent at 60 cents an hour in Boston. The same city has adopted the souriquet of "*velocipedagogue*" for those who teach the art of riding them.

A New Orleans paper says that the Crescent City proposes to purchase twenty-five velocipedes for each fire company in the city.

Detroit has caught the complaint, got it badly, so a friend informs us who has just come from that enterprising city.

An expert suggests through the columns of the *Evening Post*, a few improvements much needed in the present style of the two-wheeled velocipede, as well as some cautions to be observed by those who intend to purchase.

Up to the present time the velocipede in this country has been used almost entirely in cities, and but very few have given them a trial on our country roads, though there is no longer any doubt of their utility *in rure*. As yet no machine is provided with protectors to keep the mud and dust from off the back; and this is one of the most important improvements that can be made. For from actual experience it has been found that one's back very soon gets a coating of dust over it, which is thrown up by the hind wheel; while for the front wheel there should also be a protector (fastened to the support of the wheel, to turn with it), to prevent that wheel from rubbing upon the pantaloons, a serious annoyance. The saddle should be as far down between the wheels as possible without coming in contact with them, and the support for the front wheel, to which the handles are attached, should incline backwards, so that the center of the cross bar at the top shall be at least nine inches from a perpendicular drawn through the center of the front wheel. For it is obvious, and experience has proved it to be so, that more force can be exerted and a greater speed more easily attained if the body is thrown well back and the whole frame kept nearly straight, than if the legs are forced up and down in the position that one assumes while sitting in a chair. In this latter position he may press hard enough to raise himself from the seat, but in the former the machine itself must give before he can be moved by pushing. The ingenious arrangement for supporting lanterns on some machines are a waste of time and expense; better some sort of clamps to secure a light umbrella in front when the sun shines hot, or it rains, as well as clamps, or the like, for fastening a traveling bag on the rear, for we must look forward to next summer, when so many excursions and trips into the country will be made on these machines.

Before purchasing any machine, but particularly the cheaper ones, examine them closely yourself, or if not a judge of good mechanical workmanship, ask a friend to do it for you. Many defects are concealed by the coatings of paint, particularly in the castings and forgings; and a machine that is weak in any point is a dangerous one to use in fast riding. Be sure that every bolt is properly secured by nuts that cannot be shaken off; they should be riveted on to the bolt, for they will soon work loose if not so fastened. The crank should never be keyed on to the shaft, but fastened on to a square head.

The manufacturers at present are pocketing immense receipts at the expense of the excited and incautious public. A good machine can be made to order under the direction of almost any good mechanic for a sum much less than is charged for any now in the market.

That the career of the "velocipedestrian" is not one of unalloyed happiness is gently suggested by the following inquiries, propounded by a novice in a Western journal:

"If a fellow goes with his velocipede to call upon a lady, whose house has no front yard, and no back yard, and there is a lot of boys in front of it ready to pounce upon his machine, and the lady is smiling through the window, what is he to do with it?

"If a fellow, riding his velocipede, meets a lady on a particularly rough bit of road, where it requires both hands to steer, is he positively required to let go with one hand to lift his hat; and, if so, what will he do with his machine?

"If a fellow, riding his velocipede, overtakes a lady carrying two bundles and a parcel, what should he do with it?

"If a fellow, riding his machine, meets three ladies walking abreast, opposite a particularly tall curb stone, what ought he to do with it?

"If a lady meets a fellow riding his machine, and asks him to go shopping with her, what can he do with it?

"If the hind wheel of a fellow's machine flings mud just above the saddle, ought he to call on people who do not keep a duplex mirror and a clothes brush in the front hall?

"If a fellow, riding his velocipede, encounters his expected father-in-law, bothering painfully over a bit of slippery sidewalk, what shall he do with it?

"If people, coming suddenly round corners, will run against a fellow's machine, is he bound to stop and apologize, or are they?

"If a fellow is invited to join a funeral procession, ought he to ride his machine?

"And is it proper to ride a velocipede to church; and, if so, what will he do with it when he gets there?"

There should be a "mixed commission" of ladies to decide these questions.

Prof. Sweet, of Providence, R. I., a well-known pedestrian and rope walker, is to commence, on the first day of June next, the unparalleled feat of propelling a velocipede of his own manufacture, a distance of three thousand miles in thirty days, averaging one hundred miles per day, for a wager of $5,000. During the trip, he is to ride the velocipede one hundred and fifty miles in twenty-four hours, and one trial only will be allowed.

A correspondent from Yonkers writes us about the velocipede of 1818. He was at that time a possessor and a rider of one and remembers it with affection, recalling with indignation the prohibition of their use by the action of the New York City Fathers of that date.

The Canton (Ohio) *Republican* proposes to make a velocipede with rimmed wheels, so that it can be run at the rate of a hundred miles an hour on a single rail of a railroad. In case of meeting a lightning train, wouldn't it be very bad for the bicycle?

The New Steel.

The Philadelphia *Ledger* says it is suggested that as other substances beside carbon, tungsten, manganese, chromium, silicon, etc., may enter into composition with iron to form varieties of steel, boron will also enter into composition; and that the new steel recently described in our columns, of which tools were made possessing extraordinary hardness and cutting power are composed of boron steel. This will do for a conjecture, but its real constitution cannot long remain hidden.

Editorial Summary.

A BEAUTIFUL SWORD.—The recent war greatly stimulated the production of military goods in this country, and many improvements in arms and equipments were made the subject of letters patent. Not only were there many more engaged in the business than ever had been previous to 1861, but better workmen were employed, and more artistical designs were executed. The impetus thus given to this department of manufacture and trade, it still continues to feel, although, of course, the close of the war has largely diminished the demand. We were shown, the past week, a beautiful sword, manufactured by Mr. Virgil Price, 144 Greene st., New York city, which does great credit to the manufacturers. It is a Knight Templar's sword, with richly ornamented silver hilt and scabbard, and in style and finish would be hard to beat. Mr. Price is an enterprising inventor, who has long been a valued client of ours, and it gives us pleasure to thus testify to the meritorious character of his workmanship.

SURGICAL OPERATION ON A MULE.—The *New Jersey Enterprise* says: "Dr. Cattell, vetinary surgeon, of Bridgeton, N. J. last week performed a surgical operation on a mule, which had a large lump upon its shoulder blade. Upon opening the excrescence, to the astonishment of all present, a silver ten-cent piece was discovered in the wound. How it got there is a mystery." The mule might have been brought from the South or Southwest in some parts of which it is the practice to insert a small silver coin underneath the skin of a horse or mule, so that in case the animal is stolen, the owner has proof positive of his ownership at hand should he chance to find the animal again. The marked coin is placed in various positions, so that it is difficult to find, except by the one who inserted it.

IT is known to the readers of the SCIENTIFIC AMERICAN that Fell's over-mountain railroad across Mt. Cenis was opened for traffic in June last. Considering that the tunnel under the mountain lacked but two miles of being completed, it required a great deal of boldness to carry forward an enterprise which, according to reports has cost its projectors upwards of $2,500,000, or equal to about $50,000 per mile. The total receipts up to this time have been, in round numbers, about $100,000 which is far from a satisfactory exhibit. *Engineering* estimates that the tunnel will be through in 1871, and that unless the traffic largely increases before that time arrives, the shareholders will have hopelessly lost at least five-sixths of their principal.

A PHYSIOLOGICAL EXPERIMENT.—A most extraordinary experiment was recently made by Professor Dickson, a distinguished physiologist. A few grains of barley were placed before a hungry pigeon, which at once began pecking. During this operation the brain of the pigeon was frozen by means of a spray of ether, and the bird being thus suddenly deprived of consciousness, ceased pecking, and remained for awhile as if deprived of life. At this moment the grains of barley were all cleared away, and the ether spray having ceased, the brain was allowed to thaw; the bird returned in a short time, as it were, to life, and the first thing it did was to continue pecking for awhile, though no grains were present.—*Exchange.*

THE IMPROVED FIRE-ARMS.—An article on the new firearms, published by the *Journal Official*, of Paris, says:—"The results of a comparative trial in the School of Musketry at Spandau, in Prussia, among the breech-loaders adopted by the different armies, were, according to the official report, the following: The Prussian needle gun can fire 12 shots a minute; the Chassepot, 11; the Snider, 10; the Remington (Denmark), 14; the Peabody (Switzerland), 13; the Wœnzl (Austria), 10; the Werndi (same state), 12; and the Winchester repeating rifle (United States), 19."

THE Berliner *Vossische Zeitung* states that the Prussian Government has proposed to the legislature of the North German Confederation that, in future, no patents shall be granted for new inventions in that country. If such a law should be sanctioned, inventors would be robbed of the earnings of many years' work; and the consequence would be that most inventions would not be brought to such perfection as under the the existence of a good patent law, where the inventor has a chance of getting repaid in the end.

CARBOLIC ACID FOR WOUNDS UPON HORSES.—If a wound will heal by the first intention, the less done to it the better. If, on the other hand, suppuration is inevitable, the most beneficial effects follow the use of carbolic acid combined with glycerin or linseed oil, in the proportion of 1 to 20; it may be applied, night and morning, with a feather. Of course, as with all other dressings, the wound must be kept clean and in the case of backs and shoulders, all pressure removed by small pads of curled horse-hair, sown on to the harness, above and below the sore.

ZINC may be given a fine black color, according to Knaffl, by cleaning its surface with sand and sulphuric acid, and immersing for an instant in a solution composed of four parts of sulphate of nickel and ammonia in forty of water, acidulated with one part of sulphuric acid, washing, and drying it. The black coating adheres firmly, and takes a bronze color under the burnisher. Brass may be stained black with a liquid containing two parts arsenious acid, four hydrochloric acid, and one of sulphuric acid in eighty parts of water.

FOURTEEN WEEKS WITHOUT SLEEP.—Dr. Newcomer, of Cleveland, Ohio, in noticing the paragraph, recently published in the SCIENTIFIC AMERICAN, about the experiments made by parties in Berlin who undertook to find out which could longest hold out against sleep, informs us that he had a case in his own practice when the patient had no sleep for fourteen weeks. This is certainly a queer case, and very hard to believe.

TASTE OF TURNIPS IN BUTTER OR MILK.—The flavor of turnips cannot be removed entirely from milk or butter when the cows are fed on them, but much may be done to mitigate it. It is said that a tablespoonful (per gallon of milk) of niter dissolved in as much water as it will take, and put in the pail before milking the cow, and giving no turnips to the cow for two or three hours before milking, will lessen the flavor, as will, also, giving only the center part of the turnip, having the top and bottom cut off.

THE English War Department has thrown aside the Armstrong gun altogether, after expending millions upon it and knighting the inventor. The thing is a failure. The British War Office has issued an order, intimating its purpose to withdraw all the breech-loading rifled guns, and substitute muzzle loaders.

A FOREIGN journal, *Le Strade Ferrati d' Italia*, speaks in high terms of an electrical brake, recently invented, to be applied to a train of cars. The announcement is couched in the ambiguous, pseudo-scientific verbiage, so fashionable nowadays, both at home and abroad, and no definite idea can be obtained from it of the nature or value of the discovery.

QUALITY OF UNGUENTS.—The elevation of temperature produced by the friction of a journal is sometimes used as an experimental test of the quality of unguents. When the velocity of rubbing is about four or five feet per second, the elevation of temperature is said to have been found by some recent experiments to be, with good fatty and soapy unguents, 40° to 50° Fahr.; with good mineral unguents, about 30°.

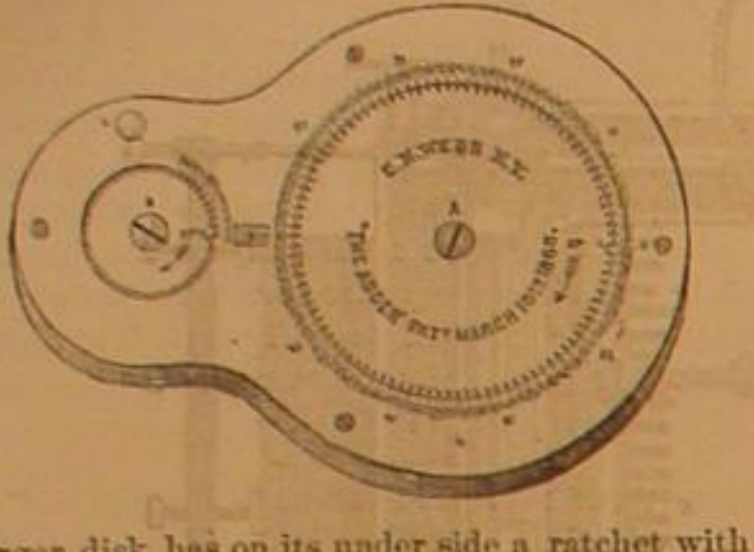
THE Exhibition of machinery and of agricultural products, which is to commence at Santiago, (Chili) on the 1st of April next, will remain open until the 1st of July following, so that opportunity will be afforded for the display of all articles that may be offered for the purpose before the 1st of June.

WE notice street venders of dentrifices that will instantaneously remove tartar and discoloration. Their wares should be shunned—they contain chemicals destructive to the teeth.

A SPACIOUS room has been fitted up by the Collins Company, at Collinsville, Conn., as a library for their employés.

WEBB'S PATENT ADDER AND TALLY BOARD.

We have an innate and hereditary hatred of all of the order *ophidian*, and we much doubted the expediency of receiving Mr. Webb's reptile into our office, but having seen the animal and found it was no "snaik" whose head was to be crushed, but an industrious little device calculated to save head-wear, we welcomed it cordially. Its appearance is similar to the accompanying engraving, the implement, however, being larger, measuring about six and three-quarter inches long by about five inches across the widest place. The form is seen in the engraving. A large disk, A, and a small one, B, both revolving, and both graduated around the circumference and marked with figures in two concentric circles, are seated in a case and and partially covered with a metallic plate, leaving only the inner circle of figures exposed, except at a small opening between the two disks, where one set of figures, on the outer circle of each, is seen through the slot in the plate. The plate around the larger disk is marked from 0 to 99 to correspond with similar numbers on the disk's concentric circles. The smaller disk has 50 numbers, from 0 to 50, with a corresponding segment of numbers (units) from 0 to 9 ranging from the pening in the plate or cover back around a portion of the smaller circle.



The larger disk has on its under side a ratchet with a single tooth and the smaller one a ratchet of fifty teeth. A connection is made between the two by a spring pawl so that one entire revolution of the large disk will move the small one one-fiftieth of its circumference. The operation may be comprehended by the above description of the parts.

The inventor believes that it is a great aid to accountants, substituting a merely mechanical process for mental or brain labor. Certainly if his manipulation of the device, and the opinions of those who have given it a trial are to be considered, the implement should be estimated as a valuable adjunct to the means of summing up wearisome columns of figures. It may be let in flush with the surface of a desk so that the accountant, or clerk, may always have it at his elbow, working it with one hand while keeping his place in the columns of figures with the others. It is neat, handy, and presentable, but although it will add numbers rapidly, it is is doubtful if it will add to a man's fortune or to his family. With this drawback we can indorse the adder.

Orders for the implement or for explanatory circulars should be addressed to the patentee, C. H. Webb, 571 Broadway, New York city.

Geological Survey of Ohio.

The Cleveland *Herald* says:—"A number of years since a partial geological survey of the State was made. A mistaken economy on the part of the State terminated the work when but a small part had been completed, but that which had been done has proved an incalculable benefit in revealing a portion of the mineral wealth of the State, and enabling mining operations to be carried on intelligently.

"Every year has shown the folly of the legislature in stopping the appropriations before the survey was completed; and the feeling in favor of the resumption of the work has been yearly growing stronger. The increasing demand for coal, the tendency to seek out new sources of supply, and the reports from time to time of mineral discoveries in various parts of the State, combine to render desirable a complete survey that shall map out the geological structure of the State and enable projectors of mining enterprise to work intelligently and not sink pits at hap-hazard, or with no better guide than a 'divining rod,' or the revelations of a spiritualistic medium.

"Mr. Lee, of Delaware county, will introduce into the House of Representatives a bill to provide for a thorough geological survey of the State.

"The former survey was made by Colonel Charles Whittlesy, Colonel J. W. Foster, Professor J. P. Kirtland, Dr. C. Briggs, Professor W. W. Mather, Professor John Locke, and Dr. S. P. Hildreth. The last three named of the above are dead."

Harbor Defenses.

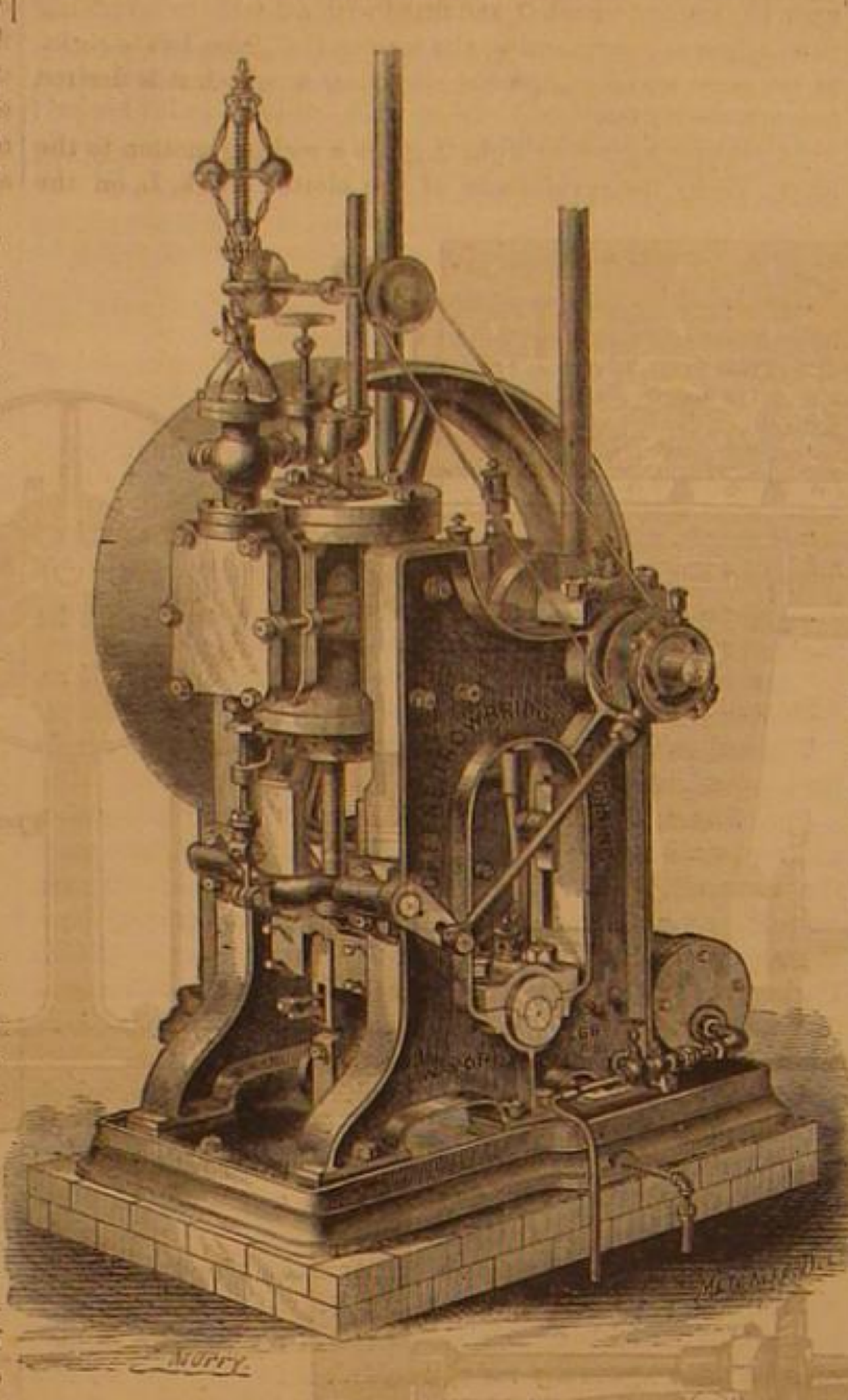
We learn that the joint resolution which passed the Senate last July has been passed in the House, authorizing the General of the Army, and the Admiral or Vice Admiral of the Navy, to inquire into the utility and practicability of the Ryan-Hitchcock mode of marine fortifications, directing them to report the result of their investigations at the next session of Congress. The method of marine defense here referred to, is known as Ryan's revolving iron turret fort, to be used for monitors and for harbor defense. It was illustrated and described in No. 26, Vol. XIX Scientific American. A board, to be composed partly of army and partly of navy officers, will soon be appointed, with instructions to proceed to some suitable point where the value of the invention can be fairly and thoroughly tested.

The germination of seeds can be watched, at every stage of its progress, by laying the seeds between moist towels, and laying them between plates. The towels can be lifted without damage to the tender sprouts.

GREENE'S PORTABLE ENGINE, UNION CHECK VALVE, AND LUBRICATOR.

Compactness in an engine is a very desirable quality, whether for facility in removal from one locality to another, diminution of weight—and consequent friction—or absorption of room. Short pipe connections are also to be considered advantageous.

UPRIGHT BALANCED ENGINE.

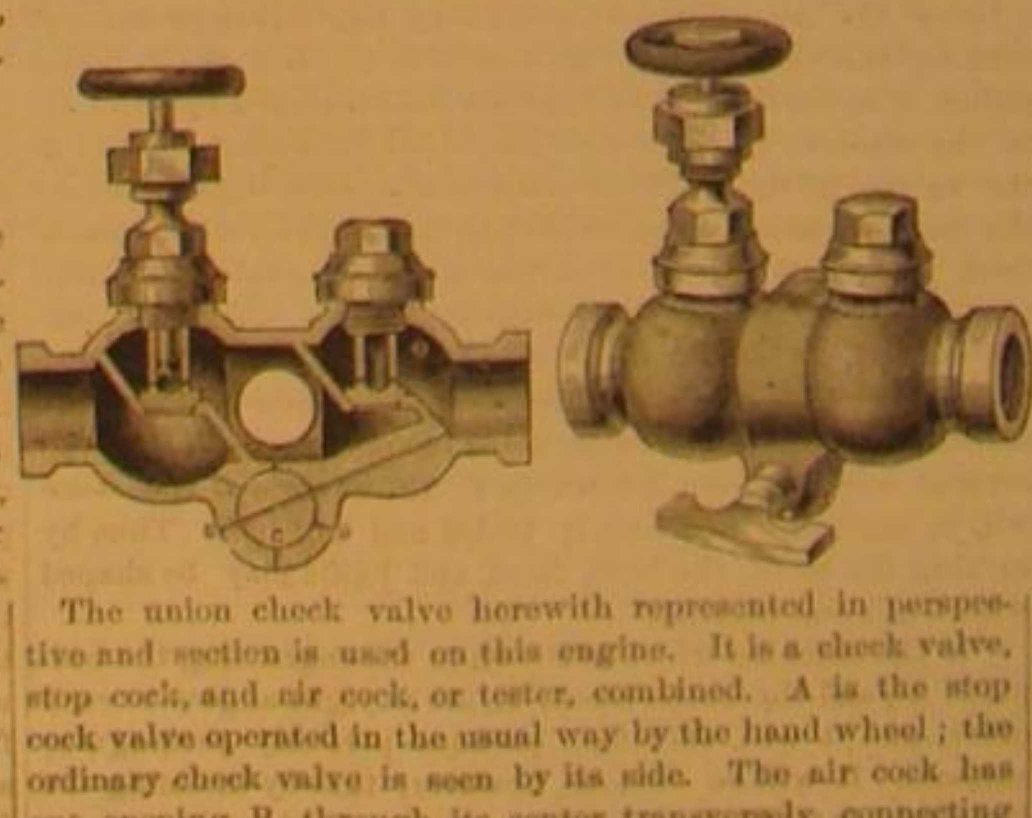


The engine shown in the accompanying illustration is one that better fulfills these requirements than any other of its power with which we are acquainted. Having seen it in operation in a wood sawing and splitting establishment where its capacity and performance were severely taxed, we feel free to say that it is a machine we can honestly commend as very superior. When running at 170 revolutions per minute it made no perceptible jar and worked almost noiselessly. Although occupying but a small space for its power, the parts are so arranged that the engineer experiences no annoyance in reaching every part.

As seen, it is an upright engine, the cylinder and steam chest near the top of the frame, the piston rod connecting with a crosshead, that itself is connected to a walking beam at the bottom of the frame, the other end of the beam connecting with the crank and driving the pump which is inside the frame. The parts are balanced so that the resistance is equal on each end of the beam, and there is no shaking or jar under any circumstances. A double eccentric with link motion can be easily attached to act as a cut-off or for reversing the motion, adapting the machine to hoisting and other purposes. The piston rod, valve, valve stem, and all the connection pins, are of steel; the pump has Greene's Union Check Valve, which we shall presently describe; the heater is in close contiguity with the engine; and the base plate has a rim for receiving all the drippings and the condensation from the steam, thus keeping the engine room neat and clean.

The engine can be built per horse horse power much cheaper than engines of ordinary patterns, and can be transported entire or easily taken to pieces and packed on mules or horses, and as easily put together, making it especially adapted to the mining regions of the country.

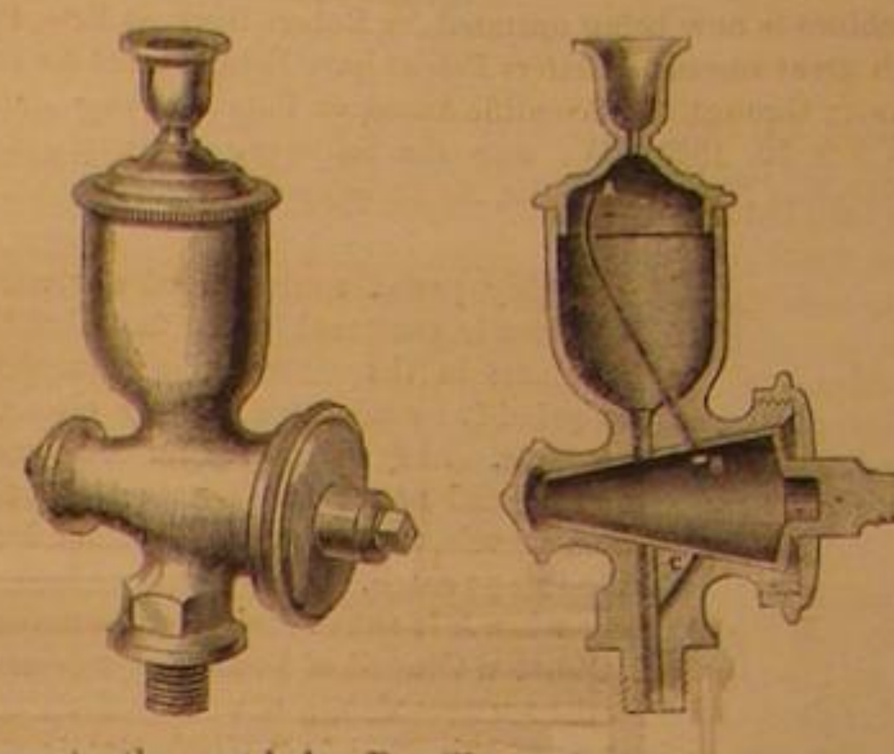
UNION CHECK VALVE.



The union check valve herewith represented in perspective and section is used on this engine. It is a check valve, stop cock, and air cock, or tester, combined. A is the stop cock valve operated in the usual way by the hand wheel; the ordinary check valve is seen by its side. The air cock has one opening, B, through its center transversely, connecting with openings to the top and bottom of each valve and with the openings, C and D. Thus freezing and bursting may be prevented, and the condition and action of pump and valves may be, at all times, determined.

THE UNION LUBRICATOR.

The lubricator seen in the two last engravings—perspective and sectional—is of the simplest imaginable form. It is intended for the valves and pistons of engines. The plug is hollow with an opening at the bottom of the cup, or receiver and three vent holes, one shown, marked B, at the bottom of the tube, A. When the cup is filled the plug is in the position shown in the sectional engraving and its interior is filled at the same time with the reservoir. In turning the plug



to empty, the vent holes, B, will pass the orifice of the vent, C—which is a branch of the main delivery—before the large hole in the plug, directly under the cup or reservoir, meets the main delivery, thus allowing steam from the engine to pass into the plug and assist in the discharge of the oil When the plug is turned back to refill, the vents, B, pass the orifice of the tube, A, through which the steam goes without disturbing the oil in the cup. The three vent holes are for allowing the plug to be turned in either direction, the center one being on a line with the main hole, and always when filling or discharging, aiding the operation by means of the steam. The parts may be easily removed for cleaning.

Orders for this engine and appurtenances should be addressed to Greene, Trowbridge, & Corning, 326 and 328 Delancey street, New York City

Annals of Iowa--The Great Pipestone Quarry.

The first number of the "Annals of Iowa," published quarterly by the State Historical Society at Iowa City, has made its appearance. It is edited by Sanford W. Huff, Corresponding Secretary of the Society, and contains much instructive and entertaining matter. Like the earlier annals of any section of the United States, it also contains many amusing incidents.

As a taste of the flavor of this publication we have condensed from its pages an account of the great pipestone quarry, around which so many legends cluster, and which has been celebrated by Longfellow in the "Song of Hiawatha:"

> On the mountains of the prairie,
> On the great Red Pipestone Quarry,
> Gitche Manito, the mighty,
> He the Master of Life descending
> On the red crags of the quarry
> Stood erect, and called the nations,
> Called the tribes of men together
>
> From the red stone of the quarry
> With his hand he broke a fragment,
> Molded it into a pipe head
> Shaped and fashioned it with figures.

A narrow ledge of rocks in the broad shallow valley of a little prairie creek, lying entirely below the general prairie level, constitutes all there is of the Great Pipestone Quarry. As far as the eye can reach in every direction, no "mountain of the prairie," no grove, no tree, no habitation, no living thing except a few birds, is in sight. The spot is within the State of Minnesota, about thirty miles in a direct line from its south-western corner, and three or four miles from its western boundary. Approaching it, the exposure of rocks appears much greater than it does in the distance when it looks like a mere line of broken rocks in the open prairie, for our view then takes in the whole region for many miles around it.

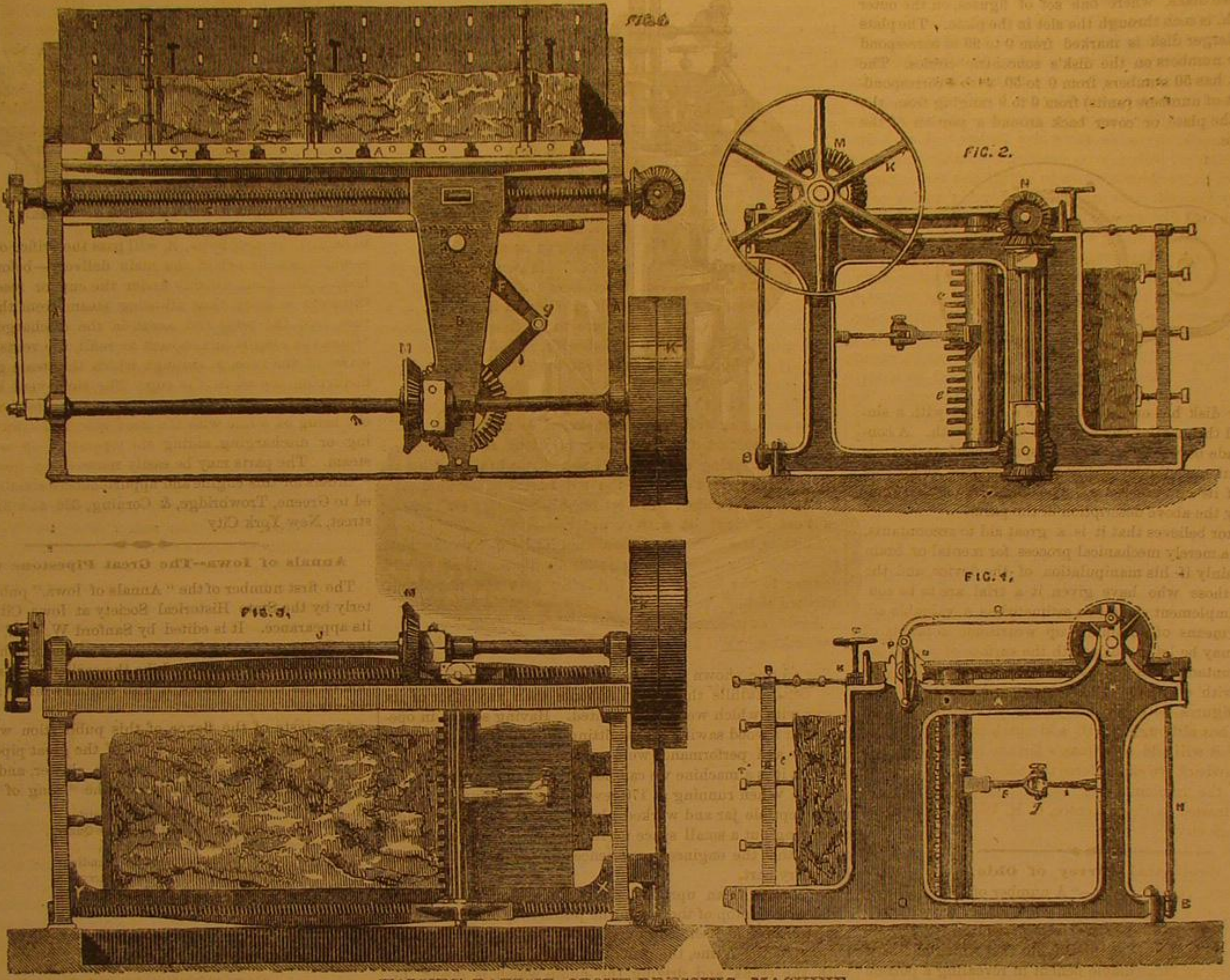
The principal exposure of rocks is about a mile in length from north to south, in both of which directions it becomes gradually lost from view beneath the surface of the prairie, it faces the west and reaches its greatest perpendicular hight about twenty feet, where "Gitche Manito the mighty," is supposed to have stood when he took his wonderful smoke, and where the brook falls over it into the plain below. The pipestone is in somewhat thin and usually shaly layers, and only from eight to twelve inches in aggregate thickness, and is the lowest layer found here. The red quartzite rests immediately upon it, and is four or five feet thick at the ditch, and must be removed to get the pipestone.

This pipestone is chemically a clay—silicate of alumina—colored brick-red with peroxide of iron. It is too heavy for pipes for white men, and is valued by them almost entirely for its legendary interest. It is heavier, harder, and in every respect inferior to meerschaum—silicate of magnesia—yet the finer specimens may be worked without much difficulty with a common saw, file, or knife, and readily takes and retains a considerable polish. Geologically it is a metamorphic clay, as the quartzite is metamorphic sandstone. It was originally a layer of clay intercalated between layers of sandstone and the same metamorphic action that changed the latter to a quartzite, also converted the clay into pipestone.

An old Spanish silver coin of the year 1017 has been found by a gentleman in Bangor, Me. It shows how rude the art of coinage was at that date, being "hammered out."

Dressing Stone by Machinery.

In the machine represented a vertical cutter-head is arranged to slide horizontally along on the side of a platform, on which the stone to be worked is clamped, and to oscillate on its vertical axis to actuate the chisels secured in it. The cutter-head may be adjusted to cut from right to left and *vice versa*, and the platform on which the block of stone is secured can be fixed an any angle required, so as to cut the stone at any slant required. It is in use in England, and one of the machines is now being operated by Robert Gray, at Erie, Pa., with great success. Letters Patent have been secured for this country through the Scientific American Patent Agency, dated January 19, 1869. We copy the following engraving and description from the London *Engineering* :



HOLMES' PATENT STONE-DRESSING MACHINE.

"We illustrate, above, an ingenious yet simple arrangement of stone-dressing machine, designed and patented by Mr. Joseph Ellicot Holmes, of Chester, which appears likely to take a very high position amongst machinery of its class. In designing this machine it has been Mr. Holmes' endeavor to imitate as closely as possible the effect produced by the mallet and chisel in the hands of skilled masons, and the work turned out by the machines already constructed on this plan shows that this end has been well attained. We shall first describe the machine in detail, and then give some account of its performance. Our illustrations comprise a front elevation, two end elevations, and a plan of the machine; and referring to these views, A A is the main framing which comprises the bed-plate, A′, on which the block of stone to be cut is fixed. B B are traveling arms, in which the cutter stock or cross-head (fitted with chisels, picks, and tools) is mounted, and which arms and cutters are made to traverse the main frame, A A, from end to end alternately, or, from left to right, and *vice versa*, by the screws, *c c*. *d d* are eccentric bearings, or plummer-blocks, in which the ends or journals of the cutter-stock or cross-head are centered. These bearings may be turned by a lever or levers, not shown in the engravings, and may be fixed in position by stop-bolts; *e* is the cutter-stock or cross-head, in which the picks, chisels, and tools are fixed. The picks or chisels are shown at *e e*.

"A lever, F, is fixed to the stock or cross-head for giving right and left hand cutting motions to the chisels or tools, as the case may be, this lever being coupled by the connecting rod, I, to the crank of a cranked shaft, G, centered in the heads of the traveling arms, B B, and turned by the miter wheel, H. By taking out the pin, *g*, the connecting rod, I, can be readily uncoupled, and the lever, F, turned so that it inclines in the opposite direction, for the purpose which we shall explain presently.

"J is the main shaft having a driving pulley, K, keyed on it at one end, and a slotted crank, L, also keyed at the other end. M is a second miter wheel mounted upon a short hollow shaft, *m*, which turns in a bearing provided on the head of one of the traveling arms, B. The main shaft, J, has a long groove cut in it to receive a tongue or feather in the hollow of the shaft, *m*, which is thus turned by, and traverses on, the main shaft from end to end, as the arms, B B, are moved backwards and forwards by the screws, C C. The heads of the arms, B B, are connected by the tie, or parallel bar, *h*. Bevel wheels, N, are keyed on to the ends of the screws, C C, and are connected by a shaft carrying other bevel wheels, as shown. O is a ratchet wheel, fixed on the upper screw shaft at the opposite end to the bevel wheel, N; whilst P, a level centered upon the ratchet wheel, O, and fitted with a double or reversing pawl, adjustable for turning the screws, C C, from left to right, or *vice versa*, according to the direction to which it is desired to work the cutter.

"A connecting rod or link, Q, gives a rocking motion to the lever, P, by the revolutions of the slotted crank, L, on the end of the main shaft. The crank pin of this crank works in a hollow screw clamp; and by varying the position of the crank pin, the lever, P, can be made to turn the screws, C, C, more or less at each revolution of the main shaft, J, and thus regulate the feed. R, S, and T are the clamps, screws, and cross bars by which the stone is secured in position while being dressed.

"When operating this machine the stone (unshapen) is placed upon the table or bed-plate, A′, with the side to be dressed towards the cutters, and it is then fixed in position by the clamps, R, S, and the clamping screws, T and T′, aided when necessary by shuts and wedges abutting against the end frames. The cutters having been previously moved to the end, X or Y, as the case may be, and the cutter head or stock with the pointed or narrow chisels, *e*, set to the required angle by attaching the lever, F, to the connecting rod, I, the cutters, *e*, being also adjusted for a greater or less depth of cut by turning the eccentric, O, the power is applied through the pulley, *k*, to the shaft, J, and the required motion will be given to the whole of the moving parts of the machine. Now, if the surface of the block is tolerably quarry-faced, one cut of the narrow chisels, *e*, as the cutter arms traverse the frame from *y* to *x*, will suffice to reduce the surface operated upon to a true and even plane, or nearly so, when by taking out the draw pin, *g*, and reversing the position of the cutter stock, thus bringing the broad chisels or tools to their working position, and causing the cutter arms to traverse the frame the reverse way, or from X towards Y, the surface of the stone will be regularly and evenly tooled and finished. Thus by turning the block, the beds, faces, and joints may be shaped with truth and rapidity.

"In the machine which is shown in the engraving, the bed-plate, A[1], and the cutter stock, E, are at right angles to each other, and it will, therefore, produce perfectly rectangular surfaces. It will be obvious, however, that by inclining the bed-plate or table more or less, any required angle may be given to the surfaces. Hence, when the machine is once set the work produced by it upon any number of blocks will be perfectly uniform, causing their beds and faces, or the angle of their surfaces to each other, to be perfectly true one with another. Thus, the use of square bevels and templates, etc., may be dispensed with, and the time required for setting out and working marginal drafts, as when dressed by hand labor, saved altogether.

"The machine can be fitted with changing stocks for working concave or convex surfaces, and, by giving a rising and falling motion to the bedplate, spiral as well as plain and curved surfaces can be wrought by it. In cases where, from the inequalities of the quarry face, or the nature of the finished work required, it is necessary to give a second or third cut with the chisels before the broad tools are brought to their work, the cutter stocks can be reversed in the bearings, D; so that the chisels will then give a back as well as a forward cut, or, when the stocks are not reversible, the lever, F, can be lowered to clear the chisels, and the arms be run back to their normal position, and thus give a second or third cut from one and the same end of the frame.

"The dimensions of the machines will vary according to the nature of the work for which they are intended. For ordinary purposes Mr. Holmes proposes to make the cutter stock give a cut three feet wide, with a traverse motion of eight feet, or, so as to dress the surfaces of a block of any size up to seven feet in length by three feet in width. For convenience of locomotion, the main frame may be provided with wheels, and, when necessary, a swing or traveling crane may be added to facilitate the operations of moving and turning the blocks of stone to and from, and also upon, the bedplate or table. It will be seen from what we have said that the oscillating movement imparted to the lever, F, will give to the cutters a reciprocating rotary motion of an extent sufficient to enable them at each stroke to remove chips from the stone in a very similar manner to that in which an ordinary mason's chisel acts. To ensure a correct action, the chisels are set at a certain angle in the cutter stock, which Mr. Holmes has found to be the best for the purpose. The tools used are, as we have said, of two kinds, namely, the narrow chisels or picks by which the surface of the stone is first acted upon, and the broader tools employed for the finishing cut.

"Three machines of the kind we have described have been finished and set to work; and it has been found that such machines are capable of dressing the hardest sandstones or millstone grits with an average forward cut of eighteen inches per minute. With stones fairly quarried or scabbled, not more than two cuts are required for the beds and joints, a third cut being taken for finished face work. With stones three feet deep, a rate of advance of eighteen inches per minute gives four and a half square feet dressed per minute, apart from the time occupied in turning and fixing the stones. With stones of fair size, and skilled and efficient handling, Mr. Holmes states that from two hundred to three hundred superficial feet can be wrought per day by one of these machines.

"The work turned out is of excellent quality, and a leading feature in the machine is that it is capable of tongueing and grooving the entire surface of the beds and joints of the stones without additional cost. This is a matter of great importance under many circumstances, as, for instance, in the case of high retaining walls. The grooving also assists the adhesion of the mortar, and prevents the passage of water.

"The machines, we should state, are being made by Mr. Bryan Johnson, of Chester, and Messrs. Ormerod, Grierson, & Co., of the St. George's Iron Works, Manchester, these firms constructing them either in small sizes for working window caps, and sills, etc., in which case they may be worked by hand, or in large sizes for shaping the massive blocks such as are used in the construction of docks and other heavy works." For rights or machines for United States, address Robert Gray, Erie, Pa.

Fifty Pounds of Nitro-glycerin Exploded in an Oil Well.

On the Mason farm a well has been sunk to the depth of over 800 feet, which has hitherto yielded but little oil, with an abundance of gas. The proprietor, Jonathan Watson, determined to try the effect of a heavy charge of nitro-glycerin, and fifty pounds were exploded by Mr. Mowbray and his assistants. Two cartridges were prepared, the one twenty-five inches in length, the other thirty-five inches, and each five inches in diameter. These were connected by a single copper wire, thirty feet in length, so as to adjust the two charges immediately opposite two several mud veins which were known to be that distance apart, the heaviest charge of thirty pounds nitro-glycerin being at the lower vein, 783 feet deep, the lighter charge at the upper vein. Twelve exploders were inserted in the largest cartridge and eight in the other, forming a train of twenty exploders, which, by means of insulated wire, were connected about 250 feet from the well with an electric battery. Everything being arranged the order was given to fire. In an instant the discharge took place, and a report like a cannon fired from a distance, accompanied by a very perceptible vibration of the earth around, was noticed by those present. The operator and an assistant immediately pulled on the wire, thereby endeavoring to prevent entanglement; when about fifty feet of the wire had been drawn out a reaction ensued, dragging the parties who were pulling at the wire towards the well for a distance of ten feet, to their surprise and great wonderment (this arose from the column of water lifted by the explosion, and its return fall); but most certainly the parties thought for an instant Old Scran was hauling them down below, to answer for blasting his oil factory. The result of the explosion on the well cannot be ascertained until the well has been tubed and the water (a column of 720 feet) has been pumped off. The indications are that so heavy an explosion (the bale of the cartridge which was recovered proved the terrible force exerted) must have penetrated the mud veins for a considerable distance.

The operation was entirely satisfactory to all parties, and the ability to safely fire these heavy charges with as much care as fire crackers has been demonstrated.—*Titusville* (Pa.) *Herald.*

Correspondence.

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

Generous Inventors.

MESSRS. EDITORS:—Generosity is a noble virtue, and a supply of the "milk of human kindness is a good thing to have in the house." Your correspondent, A. B. C., seems to have been gushing and running over with both these when he so magnanimously gives to the world a valuable discovery because he is unable to patent it, and advises other poor and unfortunate inventors to go and do likewise. The feeling is certainly commendable, and if the world, which he proposes so generously to benefit, was possessed of an equal amount of the same feeling, the plan would no doubt work admirably. No one having any right to interfere with his self-immolation upon the altar of philanthrophy, if he is so moved—but after he has done his best for this needy and deserving world, and has himself, perhaps, fallen into direful distress, let him appeal to the world to aid him to retrieve a position, and see how the world will respond to him.

I have five or six patentable things which I am unable to patent. Many of them have cost me years to mature, and nearly all of them, I believe (what inventor don't believe this of his bantlings?) to be valuable; but if the dear, deserving, and neglected world wants the benefit of them, it must pay for them, because it is vastly richer and more able to make sacrifices than I am.

Inventors have plenty of examples of the bad policy of giving their ideas to the world, and among the most conspicuous is that of Archer, the discoverer of the "collodion process" in photography, which was one of the most valuable discoveries of the century. This he generously and nobly surrendered to the public—died poor—and an appeal made to the civilized world in behalf of his family, who were in need, procured for them (in all the world) perhaps two thousand dollars (I believe much less than that), certainly in the United States not one thousand, and, I think, only about one-third that sum!

Magnificent and splendid generosity of this same unfortunate and very needy world, for one of the most splendid sacrifices ever made by mortal man. *Sic sunt fata hominum!*

V. M. G.

Peekskill, N. Y.

[Our correspondent is entirely right. An inventor who generously bequeaths his invention to the public is liable, for all the public cares, to die in poverty and neglect, while those who hold on, and succeed in making the public pay, are honored and respected.—EDS.

Lightning Rods.

MESSRS. EDITORS:—In a late No. of the SCIENTIFIC AMERICAN there is a communication on the above subject from Mr. John Wise, of Lancaster? In the spirit of Mr. Wise, I propose to answer some of his questions and propositions, and in so doing, shall state nothing new, but something useful to the owners of those splendid barns in Lancaster county.

1. Lightning rods are conductors in proportion to thickness, "sectional area," and shortness or "inversely in proportion to their length," and to be effective must be connected in the ground to a metallic plate, and this metallic plate must be imbedded in the moist earth. This is the outlet of the bolt of electricity that first reaches the rod, and to be effective must have the capacity to conduct off the rod itself. Not exactly must the plate have the capacity to conduct off the rod, but it must go further; it must spread to dimensions of damp earth until the earth in contact with the plate has the capacity to conduct off the rod itself. Now, how great must this plate be? We will suppose the plate went into a body of water, a large cistern. Pure water conducts in the proportion to iron as 6 to *6,754,000,000. It is safe to say that this metallic plate, if immersed in water, should have a surface equal at least to the surface upon which the barn stands or covers. Again, as the earth conducts in proportion to the moisture contained, we will say the earth has five parts earth to one of moisture, where the plate is buried. Then the plate should be six times as large as if it were immersed in water, and until this rod is so fixed and secured it is insulated; not absolutely insulated, but insulated in proportion as its outlet has not the capacity to conduct off the rod itself. It is not necessary that the plate should be of the dimensions stated to protect the building from every bolt of electricity, but it is liable to be struck by a bolt of sufficient force to fly from the rod unless these conditions are first complied with, and if complied with, it would be physically impossible to fly from the rod and produce injury.

In the country the rod should go the ground and from that to the spring or well, and be connected to as much metallic surface in contact with water or moist earth as possible. If there was a spring convenient, I would run to the spring and have five hundred feet of the rod buried in the channel of the spring, the rod could be lessened in diameter for economy as it enters the moist earth or water.

In cities, the lightning rods should lead direct to the water pipes—the iron pipes in the streets—then there is no possible danger to the building, as lightning rods are usually constructed and applied.

Again, as to covering the rods with paint, and having the projections bright and pointed. Atmospheric electricity is the same as produced by zinc and copper plate in water, but a different degree of tension. Two cells have twice the tension of one, and a thousand—a thousand times the tension of one, and as the tension is increased, so is its nature to jump and crack, until we reach the effect produced by the Holtz machine and Ruhmkorff coil; lightning being the most extreme case of tension with which we are acquainted. Glass, wood, nor any substance is much of a barrier in the way of the discharge of electricity of high tension, no substance—nothing being an absolute non-conductor except a perfect vacuum, and any of these things as insulators about a lightning rod are of no earthly use—a metallic roof, connected to earth by an ordinary rod in the manner stated is as secure protection to a building as is possible to make, and perfectly secure.

PHILADELPHIA.

[The above communication is from a gentleman whose practical experience as an electrician is probably not surpassed by any other individual.—EDS.

How to Clean Files.

MESSRS. EDITORS:—I have just tried a very effective way of cleaning files filled with work. Simply holding them in a jet of steam under forty pounds pressure. In one minute the files come out "as good as new." This may accommodate some of your numerous readers.

Mt. Lebanon, N. Y. JAS. F. SMITH.

Finishing Taps and Reamers.

MESSRS EDITORS.—In the SCIENTIFIC AMERICAN, page 99, current volume, I find a plan for tempering taps, etc. I think it may answer in some cases, but I will give one which I have used for a number of years with great success. The forgings are got out in the usual way, left to anneal, then centered and turned just sufficient to remove the scale. Then anneal again and turn down to within a thirty-second of an inch, or less, of finishing size. Anneal once more and finish in the lathe. If not sprung in turning, the tap or reamer will come out all right when hardened. I have tried this process with taps ½ inch diameter and 3 inches long up to those 1 inch diameter and 2 feet long and found it always safe and sure.

Providence, R. I. D. B. K.

How the Scientific American is Appreciated.

From a private letter written by a prominent engineer in neighboring city we extract the following: "Your favor is at hand, and I have now, by me, completely finished and bound, all the volumes, new series, of the SCIENTIFIC AMERICAN from I to XIX, and many numbers of the old series. I intend to preserve each number and to pick up, at whatever reasonable cost, the earlier numbers. The SCIENTIFIC AMERICAN is a library in itself." T. P., Jr

Providence, R. I.

A RECENT analysis of Croton water by Professor Chandler, shows that the city of New York may congratulate itself upon having a supply of as pure water as is furnished to any city in the United States.

* Calley.

For the Scientific American.

"WASTE" AND "ECONOMY" OF FUEL.

NO. 2.

ON BOILER INCRUSTATIONS.

Without entering into a history of all that has been said and written on the incrustation of boilers and its prevention, we will limit ourselves to a summary of the late conclusive experiments conducted by Arthur Morin and H. Tresca, which give a clear idea of the loss of fuel caused by "dirty" boilers.

These gentlemen have practically demonstrated that, in a clean boiler, in good working order, they actually evaporated 441 lbs. of water by the combustion of 51·81 lbs. of coal, whereas, this same boiler, after having been run for some time, and becoming coated, only produced 299·88 lbs. of steam by the consumption of 76·51 lbs. of the same kind of coal. In the first case, 18·74 lbs. of water were converted into steam by the combustion of 2·205 lbs of coal; in the second, only 8·53 lbs.; this being equivalent to a loss of 52 per cent.

In the ordinary apparatus for distilling salt water on board of ships at sea, the same quantity of coal which will evaporate 600 lbs. of water, when the kettles have been newly cleansed, will, in a short while, only produce 200 lbs. of distilled water; being a waste of two-thirds of the fuel, attributable to incrustation alone.

All impure waters, or such as hold in solution chloride of sodium (common salt), sulphate of soda, carbonate of soda, carbonate of lime, or carbonate of magnesia, protoxide of iron, silica, chloride of magnesium, sulphate of magnesia, or sulphate of lime (and few waters are completely free from one or other of these substances), will, inevitably, after a longer or shorter period of time, form solid deposits on the sides and bottoms of the vessels in which they are heated.

The effect of this phenomenon is a constantly increasing waste of fuel by the gradual obstruction occasioned to the transmission of heat, from the coal to the water in the boiler, through a bad conducting medium.

The danger of burning the boiler-plates is well known to be great whenever incrustation is allowed to progress to any considerable extent, beside which, some of the impurities are sure, sooner or later, to find their way into the slide-valves and cylinders, where their action is eminently prejudicial to the durability of these parts of the engine.

The genius of inventors has been, for some time past, tasked to a remarkable degree, in order to discover some means of preventing incrustation in steam boilers. Chemical science, natural philosophy, and mechanics have, each of them, contributed many supposed "panaceas" for the attainment of this very important purpose, but we must humbly confess (regardless of the anathemas of said inventors), that we know of no *universal* remedy applicable in all cases, neither do we believe that such a one will be discovered.

A good chemist, knowing the impurities of any particular water, may, in some cases, be able to indicate to the engineer a chemical agent which will precipitate a portion of these impurities in a special feed-water tank; but in many instances the chemicals used will end by acting deleteriously on the iron or copper of the boiler or on the rubbing surfaces of the engine, so that they must always be applied with the utmost caution.

Heating the feed water by means of the exhaust steam is in most cases quite inefficient, the temperature attained being too low to be serviceable, except in the case of bicarbonate of lime.

Successful precipitation at temperatures higher than boiling water, needs the employment of accessory high-pressure boilers, which in their turn become incrustated, and waste as much fuel as the original boiler.

Blowing off is the usual mode of relief resorted to by our present engineers; how unsatisfactory this has proved itself to be, we attempted to show in a previous article.

Surface condensers, as at present manufactured, are too expensive and objectionable from many other causes.

Mashed potatoes, oxalic acid, carbonate of potash or soda, nitric, muriatic, or acetic acids, sulphate of alumina, and one hundred or more "patented" and "unpatented" *anti-incrustators*, may each of them individually find their useful application in special cases; but, as we have before remarked, none of them will answer for all sorts of boilers nor for all kinds of water.

Which method is to be preferred must be left to the judgment and science of the competent engineer, who ought to know, the *least objectionable* remedy to be applied in his own particular case.

Much valuable information in regard to the present subject will be found by looking through the back volumes of the SCIENTIFIC AMERICAN.

We conclude by the following "truisms," which are, unfortunately, too seldom sufficiently attended to, although of the highest importance in their bearing on the saving of fuel.

1. Use as pure water as your locality affords.
2. Clean and scrape your boilers as often as you possibly can
3. "Blow off" without excess.
4. In case of salt or brackish waters, never use steam of over 90 lbs. pressure to the square inch.
5. In case of sulphate of lime waters, never use steam of over 70 lbs. pressure.
6. In case of water holding carbonate of lime in solution, pass it through a feed-water heater made hot by exhaust steam or by waste heat.
7. In case of muddy waters, use large feed-water cisterns or reservoirs, on the bottom of which the suspended earthy matters will soon form a soft deposit, when the surface water can be drawn off for use.

8. Favor the invention of a compact, simple, cheap, and efficient surface condenser or its substitute, more than you do the quack "nostrums" of most anti-incrustators.

For the Scientific American.

EXAMINATION OF APPLICATIONS FOR PATENTS---THE TWO SYSTEMS COMPARED.

It is a subject of vital importance, not only to inventors but to the community at large, when it is proposed to discuss the workings of a system of laws relating to useful inventions or discoveries and their encouragement, and to propose or advocate changes therein, and one that should call for a full and free expression of opinion in order that all interested may understand some, at least, of the probable consequences thereof.

We have at present laws regulating the granting of patents, the principal feature of which is a full preliminary examination; and it is supposed by legislators, and others, that such feature has been well tested, or at least ought to have been, by this time. The question then arises with respect to it. "Are we ready to pronounce it a failure?" And if so, and in order to come to the conclusion that a radical change should be made, by doing away with such examination, are we prepared to assume that the same or increased benefits will flow from the change? May not possibly evils spring up in other directions, for we must bear in mind that the whole system of protection is an artificial one, and its defects inherent from its nature, no matter how the system is established by a code of laws for practice.

Assuming that the preliminary examination does not prevent the granting of invalid patents, it is not shown that little or no precaution, as practiced at the present time in England, will do so wholly or to a very considerable extent, and it therefore reduces the question of change merely to one of saving the expense of our present system. Here, however, it will be well to consider if this course may not be poor economy, when compared to the advantages gained by the adoption of at least some precautions against the granting of invalid patents.

In carrying out the system, as adopted in England, in order that the trouble to be anticipated in another direction might not occur, namely, the rapid increase of invalid and annoying patents, it would be necessary, also, to introduce the payment of large fees by patentees. But this the patentee ought properly and will resist, as it tends to impede the developing and patenting of that class of improvement, and which is by far the largest, which progresses by small stages only, but each step of which must be necessarily protected as it is developed.

Can we be satisfied that a system not requiring a preliminary system of examination, will work well in a community where invention is so rife, and patents have been found so lucrative as property, that many persons will patent not only their own actual improvements, but what they for a time *merely believe* to be theirs, without the payment of large fees, thereby tending to prevent an indiscriminate issue of patents? Even in England, however, with their enormous patent fees, the industries of the country do not solely receive benefit from, but are frequently burdened and oppressed by, the granting of patents. It is a question to be considered, then, whether the trouble in that country does not arise from the want of a proper system of preliminary examination, in order that the industries may be relieved, at least, from a large portion of the worthless and invalid patents that have been and will still continue to be granted.

The English do not believe that the system of preliminary examination would relieve them much, because they do not think that any examining corps would be competent for the work assigned them, and they look at what the Americans have done in this wise to be to a great extent a failure. It is evident, however, from all accounts, that their open system of granting patents is not wholly satisfactory, and it is, perhaps, only their extravagant fees which prevents an *exposé* of the worthlessness of their system, so far as the protection to the public and the community is concerned from worthless and frivolous patents. Even now the English manufacturer is compelled to buy up useless patents, that have been run through under their system, as a means of avoiding litigation, upon the principle that it is cheaper to buy off than to fight.

To what the American manufacturer and capitalist would be subjected in this way under a similar system, with a moderate system of fees, there is no arriving at, except by an actual trial of it. As all inventors are to be protected, according to the policy for many years past in existence here, in their inventions, no matter how small the degree of novelty and utility is, it is apparent that in order to keep this species of protection within reach of all, the fees must not, if at all, be much increased. And if not increased will not the door be open to the granting of a species of patents that will be taken out only for fraudulent purposes, which will cause the grant issued to the really meritorious inventor to be at least looked upon with suspicion, and himself and those interested be placed at greater trouble and expense than at present to establish his patent before the public?

The English have complained of the practical inconvenience from the multiplicity of patents, which, under their system, have been issued only as obstructive patents, which means patents that are issued to harass and annoy manufacturers and tradesmen, and are to be got rid of economically only by being bought up.

Are there not sufficient facilities for this thing now under our present practice without aggravating the evil?—a system which at least does not let everything slip through.

It may be found, after reflection, that it is not our system that is at fault, but the way in which it is carried out, and, therefore, the reform ought perhaps be limited to merely making it more effective by correcting its abuses.

The most perfect system may be rendered odious by the manner in which it is practiced, and its abuse, in this particular, very often makes those most nearly interested unwisely denounce the system itself and seek for relief in a radical change, although such change may not always bring about the desired results.

Extraction of Potash from "Yolk," "Suint," or Potassic Sudorate of Sheep's Wool.

(From Dr. Hoffman's "Report on Chemical Products and Processes," International Exhibition, 1862.)

It is well known that sheep draw from the land on which they graze a considerable quantity of potash, which, after circulating in their blood, is excreted from the skin with the sweat; in combination with which it is deposited in the wool. Chevreul pointed out that this peculiar compound, by the French called *suint*, forms no less than a third of the weight of raw merino wool; from which it may be readily dissolved out by simple immersion in cold water. In coarser wools, it is less abundant; and according to MM. Maumené and Rogelet, the potassic sudorate, or suint, of ordinary wools forms on the average, about fifteen per cent of the weight of the raw fleece.

This compound was formerly regarded as soap; doubtless because wool contains, beside the suint, a considerable proportion (about eight and a half per cent) of greasy matter (Chevreul). This grease however is, in fact, combined with earthy matter, chiefly lime, as an insoluble soap. The soluble sudorate is, according to MM. Maumené and Rogelet, a neutral salt, resulting from the combination of potash with a peculiar animal acid, of which little is known beyond the fact that it contains nitrogen.

At the great seats of the woolen manufacture in France, as at Rheims, Elbeuf, and Fourmiès, the new industry of MM. Maumené and Rogelet is either established, or in the course of establishment. Their plan is to buy of the woolen manufacturers the solutions of suint, obtained by the immersion of their raw fleeces in cold water; paying higher, of course, for those liquors in proportion as they are stronger.

The scale of prices adopted encourages the manufacturers to wash their wool methodically, so as to enrich the same water with the suint of a number of fleeces; and these scourings, weak or strong, MM. Maumené and Rogelet fetch away in casks to their factory, established in the neighborhood, and then boil them down to a dry carbonaceous residuum. This, by calcination in close retorts, is reduced to a charcoal, evolving during the process much gas, carbureted and ammoniacal, which may be passed through ordinary purifiers, to detain the ammonia, and to fit the carbureted hydrogen for illuminating purposes. The alkaline salts remain in the charred residuum, and may be extracted therefrom by lixiviation with water.

The alkaline solution thus obtained, contains a mixture of potassic salts, carbonate, sulphate, and chloride, which are separated and purified by evaporation and crystallization in the usual way. The carbonate of potassium thus obtained is stated to be remarkable for its entire freedom from sodic admixture, a purity doubtless valuable to the manufacturers of potassic glass and soap. The insoluble residuum of this lixiviation contains some earthy matters (lime, silica, and alumina, with a little iron and phosphoric acid), and it is stated to be so finely divided as to make a good black paint, possessing, in technical parlance, great "covering power."

An ordinary fleece weighing four kilogrammes contains, according to MM. Maumené and Rogelet, about six hundred grammes of sudorate of potassium or suint. This, according to their analysis, should contain thirty-three per cent of its weight, *i.e.*, one hundred and ninety-eight grammes, of pure potash. Of this, according to another estimate (showing the niter that it would produce), they appear to reckon on about one hundred and seventy-three grammes as being practically recoverable.

It appears from statistics given, that the process may be worked on a large scale, and with a very ample profit. MM. Maumené and Rogelet compute that if all the fleeces of French sheep were subjected to the new treatment, France would derive from her own soil all the potash she requires.

The difficulty of collecting the wash-waters of fleeces, scoured in small numbers by the farmers all over the country, would oppose an insuperable bar to such an extension of the process.

In great manufacturing centers it appears likely to be economically available; at any rate so long as the farmers continue to send away as waste matter, in the fleeces they sell, the potash drawn from the land. Doubtless, in honest husbandry, that potash is due to the source whence it came. Its exportation, year after year, must tend to the progressive exhaustion of the soil; and the policy of the judicious farmer should be to soak his fleeces at home, and to distribute on his fields, as liquid manure of high value, the potassic and nitrogenous wash-waters so obtained.

The Self-raising Flour of Prof. Horsford, and Jones and Standing's Corn Flour.

Our readers will recollect Prof. Horsford's lecture on "The Philosophy of the Oven." Since that time we have been experimenting in various ways with the preparation therein described and with the most gratifying results. We saw in a recent English periodical, in an article on celebrated cooks, a remark that cooks, like poets, were born not made. Our own gifts in that line have generally been supposed not to be great. In our youthful days we once made an oyster stew in a tin paste dish cleaned out for the occasion in a rural printing office, which resulted in making "pi" of an entire form, which unluckily occupied the "stone" upon which we proposed to serve our repast. The stew did not taste well, whether on account of being eaten after 'pi" or our want of skill in its preparation, we cannot say, and we have remained in doubt up to the date of our recent experiments, as to whether any amount of "making" would compensate for our natural deficiencies. Our doubts are, however, ended. We are able to make anything of which flour is to any degree a constituent, and make it well too. Bread, white and light; crullers, tender and delicious; apple dumplings of the most tempting character have been the result of our manipulations. The next trip we take to Brown's Tract, this article shall form a part of our stores. All that is necessary to make a good loaf of bread is some water, a pan, a spoon, Horsford's prepared flour, and apparatus for baking. The success of the process depends upon no variable circumstances but upon actual measure; it is therefore uniform. We have eaten of the bread for weeks, and either hot or cold it is both palatable and digestible.

Another preparation which is worthy of commendation is Jones & Standing's corn flour. It is prepared by mixing Indian corn flour with "wheat bran dustings" and "middlings" by a process patented, together with the preparation after it is made, by Charles Jones and William Standing, of De Soto, Ill., Jan. 5th, 1869. We have also tried this preparation and find that it makes most excellent bread, something lighter and better than we have ever before tasted. Those who are fond of good corn bread, and those delicious corn cakes for which many parts of the country are celebrated, will confer a pleasure upon themselves by a trial of this corn flour, which is as wholesome as it is palatable.

Manufacture of Paper from Okra.

We condense from the Mobile *Weekly Register* an account of some experiments which have been in progress during the last two or three weeks at the Chickasabogue Paper Mills, near Mobile, under the direct supervision of Dr. J. B. Reed, well known as the inventor of the Reed Shell which has rendered the Parrott gun so effective an engine of destruction in warfare. The inventive genius, energy, and perseverance of the Doctor were this time, however, directed to the "arts of peace."

The above journal asserts that previous experiments had demonstrated the fact that good brown paper could be made of okra, but it remained to show that this material could be bleached to sufficient whiteness to make it available for printing or book papers, and if so, at what cost in comparison with rag or other material.

On page 36, Vol. XIX, of the SCIENTIFIC AMERICAN we described specimens of okra paper ranging from coarse brown to finest white, therefore the first of the above objects was already determined. The comparative cost was, perhaps, an unsettled question. The experiments were conducted under unfavorable circumstances. The material used was, for the most part, very inferior of its kind, and the orders for paper pressing on the mills, required that as little of the time of the employés, and as small a portion of the machinery as possible, should be yielded for the purpose; consequently most of the work was done without at all disturbing the regular operations of the mills. The experiments were concluded on Friday last, and the result was eminently gratifying to those engaged in them, and is of particular interest to the press, dealers in and manufacturers of paper generally, and to farmers and gardeners in the South within reasonable distance of paper mills. In the opinion of the experienced paper makers who watched the progress of the work from the cutting of the dry stalks of okra to the production of paper from the machine, the following points may be regarded as established:

1. Okra requires but little handling to prepare for boiling, is readily passed through the cutter, needs no sorting, and the entire plant is available from the root to the pod.

2. It is easily boiled if well cured, requires only lime to reduce it, and may be washed and beaten ready for the machine in about half the time required for preparing rag stock, thus largely increasing the productive capacity of the mill without additional machinery.

3. When properly boiled it yields readily to the action of chemicals and can be bleached with no greater expense than ordinary rags.

4. The pulp works as freely and smoothly on the machine as any other fiber—does not stick to metallic press rolls like straw or wood, even when working pure okra pulp. It dries readily and can be run safely at the highest speed of the machine.

5. The paper made from it is very strong, tough and elastic—better in these respects, when made entirely of okra, than either straw or wood pulp when mixed with fifty per cent or more of rags. It has none of the brittleness and hardness so objectionable in straw papers, and may be subjected to strong friction by rubbing between the thumb and fingers, or between the hands, and will open out smoothly and soft as a glove.

6. It will make an excellent substitute to mix with other fibres in the beading engines, and is of itself a superior hard stock.

7. Whether worked pure or mixed with rags, it makes a paper entirely free from the objections justly raised by the printer against straw and wood papers.

8. It makes an excellent stock for fine wrapping paper, and imitation manilla paper, and even in its raw state *without boiling or bleaching*, makes a strong article of common wrapping paper, suitable for grocers and hardware use—superior to any paper made of straw.

THE PRESIDENT has appointed Chauncey Snow, one of the proprietors of the *National Intelligencer*, as a Government Director of the Union Pacific Railroad, *vice* the Hon. James S. Rollins, of Maryland, resigned. Mr. Snow is a practical railroad man, having surveyed and located several of the western railroads, and having also been an engineer, for many years, of the Philadelphia, Wilmington, and Baltimore Railroad.

Steam Gages and their Tests.

The steam gages manufactured by the Utica Steam Gage Co., are so well known and appreciated that it is unnecessary to negatively set forth their excellences by any labored attempt to decry the qualities of others. A description of the gage and its parts and of the method of testing its accuracy will be sufficient.

Fig.1

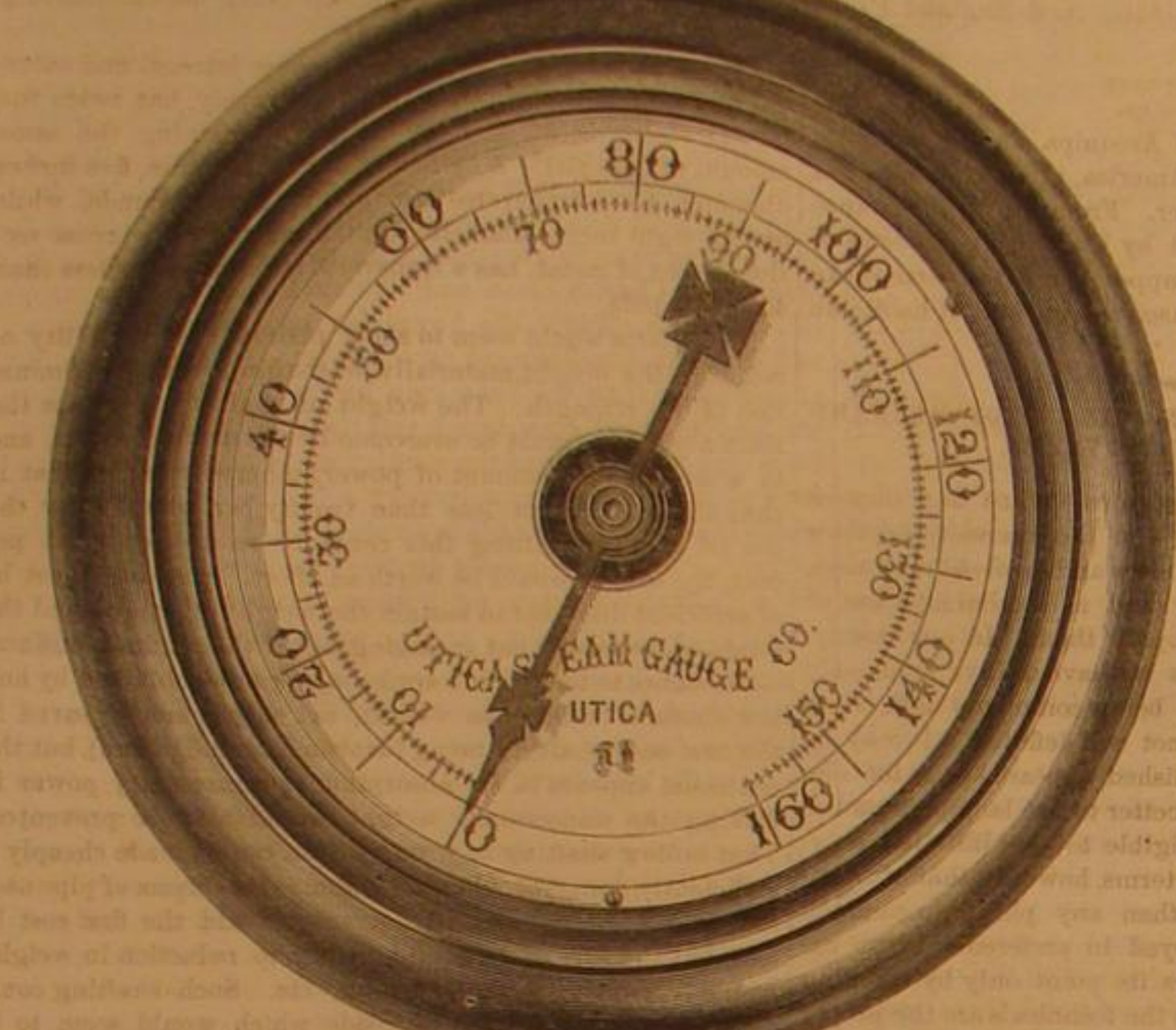


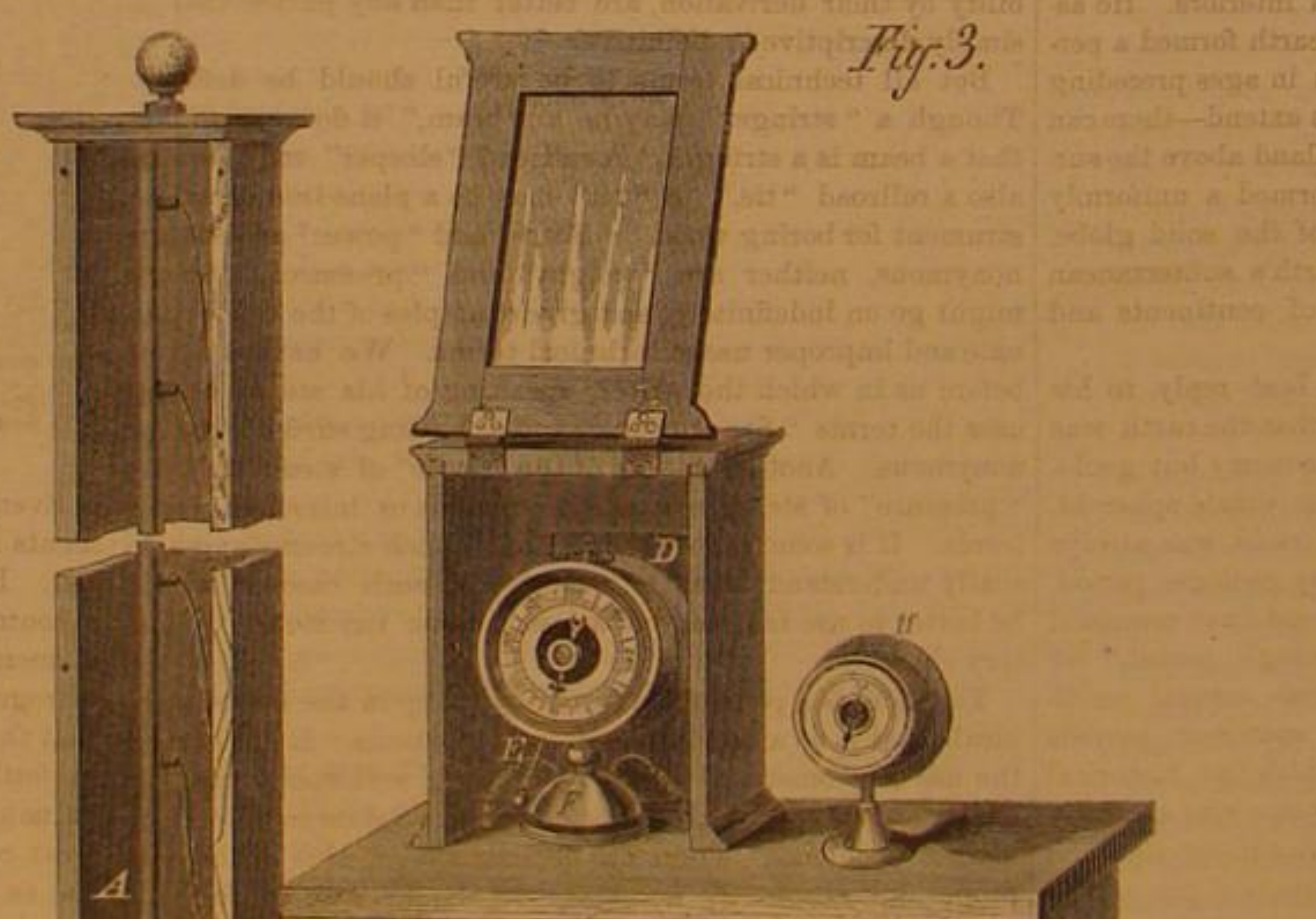
Fig. 2

THE UTICA STEAM GAGE AND MERCURIAL TESTER.

Fig. 1 shows the face of the gage, and Fig. 2 the inside with the face removed. Fig. 3 represents the apparatus for testing the gages. A is a tube more than fifty feet in hight terminating at its base in a reservoir, B, of mercury. C is an ordinary galvanic battery, having one of its poles in the mercury in the tube and another in the hand, which is insulated, on the register, D; the wire connecting this hand with the battery passing around a temporary magnet in the register, which magnet works the bell hammer, E, striking the bell, F, whenever a circuit is made.

At proper distances from each other in the tube, A, are insulated points, G, piercing the tube and successively connecting with the mercury as it rises, each point being connected by a wire with a corresponding insulated point on the face of the register, D, these points being numbered to indicate the actual pressure of the mercury when standing at the correspondingly connected points of the tube. In short, the graduations of the tube are brought on to the face of the register, and are read from it. To use the apparatus, place the hand of the register, say on the second point on the face of the register, which is marked, 5; as it is connected with the second point of the tube, and the graduations are of five pounds each, and forcing the water into the gage to be tested, and at the same time upon the mercury in the reservoir, the hand of the gage begins to turn and the mercury to rise in the tube, until the instant the mercury reaches the second point in the tube, the circuit is completed, the bell sounds and the dial of the gage is marked at the spot indicated by its hand, to show a pressure of five pounds. Moving now the hand of the register on to the third point on its face, marked 10, and proceeding as before, when the mercury reaches the third point in the tube, the bell again sounds, the mark to show ten pounds pressure is made on the dial of the gage, and so on until the gage is graduated.

Fig. 3.



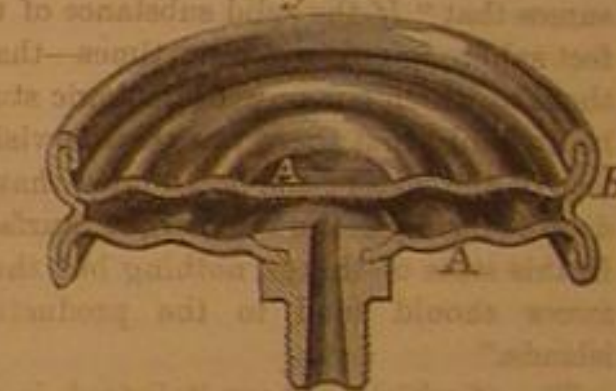
The accuracy of the instrument is proved by removing the gage, H, placing the hand of the register, D, on the point marked O, on its face, and using the pump until the water appears even with the top of the coupling for connecting the gage, H, when the bell should sound, the mercury then standing at the starting point in the tube, A, and allowance being made for the pressure of the water contained in the tube, I, of the force pump, J, which takes water from the reservoir, K, and on the surface of the mercury in the reservoir, B.

The spring of which Fig. 4 is a section in perspective, is made of two flanged corrugated disks, A, of spring brass, and a band, B, of brass, which is spun up without seam. In this band a groove is spun, which forms a shoulder or seat, against which the disks rest, when pressed to their places in the band, one above, the other below the groove. The edges of the band project beyond the flanges of the disks, are soldered and then spun or locked over the flanges, holding the disks firmly, without interfering with their elasticity. The lower disk has a pipe fixed in its center by which it is fastened to the gage case and through which pressure is communicated to the interior of the spring. The spring is an inch and three-quarters in diameter and is capable of an expansion of 1-12 of an inch without injury.

It is claimed that the objection made to ordinary disk springs, that after being used for a time they either become set or the disk cracks, is fully met in the construction of this spring. While the corrugations of the disks alone, would not be adequate to meet the strain which would follow the application of pressure, these are supplemented by the flanges, which give as occasion requires, and by the band, which is elastic. The strain instead of coming most severely upon the edge of the disks, as is the case where these are fastened in a rigid manner, and where the fracture generally occurs, is distributed equally throughout this spring.

The movement by which the action of the spring is conveyed to the dial is simple in its character and readily understood from an inspection of the engraving, Fig. 2, in which it is represented. It is of cast brass, and is made and fitted from gages. It is fastened to the case by two substantial screws at the bottom of its frame, on each side of the spring, the rest of the frame being set away from the back of the case, leaving the index hand wholly unaffected by any springing of the case in putting the gage up, which sometimes happens. By bending the tongue, C, of the sector, Fig. 2, backwards or forward, the leverage is altered and the gage can readily be adjusted to the correct standard, should it ever require it. The index hand of the dial is left free from any action other than that of the varying pressure within the spring, and the vibration of the hand so common in gages upon locomotives, is wholly avoided. The gage is graduated from the patent mercury column, invented by the patentee of the gage and is thoroughly tested by steam pressure, in addition, before leaving the works. These gages have been before the public for five years and some 5,000 of them are now in actual use.

Fig. 4



Manufactured by the Utica Steam Gage Co., Utica, N. Y., to whom all orders and communications should be addressed.

Cerium.

Woehler has prepared metallic cerium in the following way: A solution of the oxide in hydrochloric acid is mixed with equal parts of chloride of potassium and chloride of ammonium and evaporated to dryness, fused, and poured out to partially cool, and then coarsely pulverized and mixed while still warm with pieces of sodium, and the whole projected into a clay crucible previously heated to redness. In this manner the cerium is reduced, and appears in the slag in the form of two pellets, which can be collected and fused into one mass.

The color of cerium is between that of iron and lead, and when cut and polished exhibits a high metallic luster. It is easily hammered into a thin leaf, and can be cut like lead. Its specific gravity is 5·5, though this must be taken as only approximate, as the specimen tested was impure. The metal has no application in the arts, and is of very rare occurrence. Some of the salts of ceria are, however, highly prized in medicine.

THE District of Columbia contains twenty-seven regular telegraph offices, exclusive of fire-alarm and police telegraph-stations. The bulk of these are in Washington from whence they transmit news, at all hours of the day or night, to the press at all points of the country.

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Contents:

(Illustrated articles are marked with an asterisk.)

LAND AND WATER---ARE EARTHQUAKES LAND MAKERS?

A writer in a late number of *Chambers' Journal*, under the caption, "The Usefulness of Earthquakes," attempts the theory that these phenomena, combined with volcanic eruptions, are the means of repairing the waste made by the action of the sea on shores and of rainfall on interiors. He assumes that "*If* the solid substance of the earth formed a perfect sphere in ante-geologic times—that is in ages preceding those to which our present geologic studies extend—there can be no doubt that there was then no visible land above the surface of the water; the ocean must have formed a uniformly deep covering to the submerged surface of the solid globe. In this state of things, nothing but the earth's subterranean forces should tend to the production of continents and islands."

The *if* which we have italicized is the best reply to his doubtful assumption; there is no evidence that the earth was ever a perfect sphere; in fact, not only astronomy but geology witnesses the contrary. The earth is an oblate spheroid, and, so far as our means of ascertaining extends, was always of this form. If the earth was ever, for any geologic period, submerged with water, some evidences would have remained in every portion of its surface. By a "geologic period," we mean the duration of time between one great natural condition, as determined by geologists, and its successor; periods counted by a lapse of time compared to which our historical period is as the dust in the balance. Any one who carefully reads the records of geological investigation will see that the probabilities are strongly in favor of a condition of the earth's surface as regards protuberances and depressions—mountains and valleys, elevated plateaus and depressed plains, land and water—in ancient times very similar to that which now exists. To be sure, it is evident that portions, now dry land, formed once the bottom of seas, and mountains were but islands, but there is no reason for doubting that the present seas might have been dry land; our means for determining this fact, however, are meager compared with those afforded for an examination of dry land. We cannot traverse the ocean's bottom as we can the valleys of the habitable earth. It may be possible that a larger proportion of the earth's surface was once covered by water than at present; but while this opinion may be entertained, it is morally certain that where seas now roll their unobstructed waves dry land in many instances existed. Why could not the peninsula of Yucatan with Cuba, Hayti, Jamaica, and the group of Caribbean islands once have inclosed as an inland lake what is known now as the Caribbean Sea? And why not the peninsulas of Florida and Yucatan with western Cuba have similarly inclosed the Gulf of Mexico? So at the Straits of Dover, there is evidence, from recent soundings and examinations, that England and France were once physically united as they subsequently were politically.

The writer makes this statement: "At first sight it may seem paradoxical to assert that earthquakes, fearfully destructive as they have so often proved, are yet essentially preservative and restorative phenomena; yet this is strictly the case. Had no earthquakes taken place in old times, man would not now be living on the face of the earth; if no earthquakes were to take place in future, the term of man's existence would be limited within a range of time far less than that to which it seems likely, in all human probability, to be extended."

This *does* seem paradoxical, because, for every case of the permanent upheaval of barren rock by earthquakes there can be brought the record of permanent disappearance of fertile lands. Indeed, the destruction caused by earthquakes in the sinking or ingulfing of tracts of land and producing in their place lakes of noxious waters, or allowing the inroads of the sea has been so great and so much more frequent than the gift of solid land, that earthquakes are, the world over, and in all times, regarded with dread as the most destructive agent in nature. From the time that (as the "New England Primer," published in 1770, has it),

Proud Korah's troop
Was swallowed up,

down to the recent destruction of Arequipa and other cities on the western coast of South America, the earthquake has been a destroyer and not a restorer. From the disappearance of the island, Atlantis, mentioned by Plato in his *Timæus* to the recent reports of similar disappearances, the earthquake has diminished rather than increased the amount of habitable land.

IMPORTANCE OF ACCURACY IN THE USE OF MECHANICAL AND SCIENTIFIC TERMS.

The general employment of technical terms and phrases among scientists and mechanics, and the necessity for their use to avoid inconvenient paraphrases and involved sentences, make a thorough understanding and a discriminate use of these terms a duty to all who employ them. In our descriptions of machinery and processes we have always studiously avoided those terms, which, not being commonly used, were either generally unfamiliar or not self-defining. It may be that at times the article as published appeared to be too elementary in character, but it is better to use language understood by all than a *patois* intelligible to the initiated only. There are in use many technical terms, however, that of themselves are far more expressive than any phrase in common use, and these should be employed in preference to an explanatory sentence which reaches its point only by seeming to aim at another. In such cases the technicals are the proper terms. Many of them are not laid down in the dictionaries, and different ones are used in different sections of the country by men engaged in the same business; but some are so apparently demonstrative and in their sound so well convey the idea that they are always understood. For instance, if a smith speaks of a "suant" heat, every one knows at once that it means a soft, even heat, permeating the mass of iron—the very sound of the word conveying the idea. The "bite" of an acid or file, the "hang" of a hammer, the "rake" of a turning tool, and many others beside those which show their applicability by their derivation, are better than any phrase that is simply descriptive or definitive.

But all technical terms to be useful should be definite. Though a "stringer" may be a "beam," it does not follow that a beam is a stringer. A railroad "sleeper" may not be also a railroad "tie." A "bit" may be a plane iron or an instrument for boring wood. "Force" and "power" are not synonymous, neither are "weight" and "pressure." So we might go on indefinitely, and give examples of the indiscriminate and improper use of technical terms. We have a letter before us in which the writer, speaking of his steam boiler, uses the terms "fire surface" and "heating surface" as synonymous. Another speaks of the "force" of steam and the "pressure" of steam, also as synonymous or interchangeable terms. It is sometimes difficult, under such circumstances, to really understand what is meant. In such cases it would be better to use language of a less concise but more explanatory character.

Yet there is a pedantry affected by many in the use of technicals that is as annoying as it is pretentious. It is seen in the use of geometrical terms in defining well-known and familiar forms, and of algebraic formulas to state simple arithmetical problems. There are occasions when this is not only proper, but absolutely necessary for the defining of the subject. As to those who air their superficialties by a malapropos employment of all the technical terms they have been able to pick up, they do not deserve notice; such are beneath criticism and beyond improvement.

But even our professional teachers, the compilers of manuals designed to aid the beginner, are open to the charge of pedantry, and not unfrequently to that of writing about what it is evident they do not themselves understand. It would be unkind and harsh, perhaps, to refer by title to such works, but we have been several times much surprised to note the ingenuity of two, at least, of these authors in concealing their own ignorance while assuming to teach others. Nystrom, in his "Technological Education" says: "We frequently find most valuable formulas given by scientific men in such a shape that it requires to know more than the author in order to employ them; they are not only not trimmed to a practical shape, but even the meaning of letters is rarely explained in proper technical language."

We are convinced that the reason why our mechanics do not generally take kindly to scientific education applicable to their department, is not because of a dislike to the subject, but because of the needless obstructions in the way of ambiguous and involved statements that seem to be made or presented in a form purposely designed to annoy, or carelessly calculated to mislead.

HOLLOW vs. SOLID SHAFTING.

Hollow shafting, where large diameter is not objectionable, has long been in use, made generally of cast iron, and frequently used as a drum or continuous pulley for the reception of belts. Such a shaft was used in the "pistol shop" of Colt's factory before the destruction of the building by fire about four years ago, and a similar line may now be in use in the reconstructed building. This shaft was five hundred feet long and fifteen inches diameter, made of hollow cast-iron cylinders, connected with each other by a solid shaft or bearing at each end, resting in a box as a journal. The result was an almost continuous drum, of five hundred feet in length, from which belts led to the counter shafts of the machines, the speed of each machine being regulated by the diameter of the pulleys on the counter shafts. We have heard also of wrought iron pipes of only two inches diameter being used as shafting successfully.

Tredgold says that a round tube whose internal and external diameters are as seven to ten, respectively, has twice the lateral strength of a solid cylinder containing the same amount of material. A cylinder (solid) of cast iron, five inches diameter, has a transverse strength of 21,104 pounds, while one of eight inches diameter, containing the same cross sectional area of metal, has a transverse strength of no less than 45,416 pounds.

These facts would seem to show plainly the possibility of reducing the weight, materially, of shafting without a diminution of its strength. The weight of shafting is a mass the inertia of which must be overcome by the driving power, and in some cases the amount of power, otherwise useful, that is thus absorbed, is not less than twenty per cent. If by the use of lighter shafting this could be reduced only five per cent, the saving would be worth an effort. Shafting must be of sufficient diameter to sustain the weight of pulleys and the strain of belts without springing, but if the requisite stiffness—resistance to torsion and springing—can be obtained by hollow shafts of much less weight, not only is money saved in the first cost (shafting being furnished by the pound), but the continual expense in the absorption of unnecessary power in driving the unnecessary weight would also be prevented. That hollow shafting of wrought iron can be made cheaply is sufficiently apparent when we examine specimens of pipe used for various purposes. And not only would the first cost be less, but the ease of handling, owing to reduction in weight, would lessen the cost of turning, etc. Such shafting could also be easily oiled from the inside which would seem to be the proper method.

THE WICKEDNESS OF WASTE.---VALUE OF BONES.

If persons who carelessly and thoughtlessly throw away what they consider useless to themselves, understood the intrinsic value of these discarded trifles or this unpleasant rubbish, we are certain some little trouble would be taken to preserve and direct them to their real use. We will, from the thousand and one of these unconsidered trifles, select but one—bones—as a text for a few words in regard to their waste; and we will not refer even to their use in the arts as material for manufacture into various forms of use and beauty in which they reappear on our persons and in our dwellings, but confine our remarks to the value of bones as a fertilizing agent.

Let us see, first, of what bones are composed. Take ox bones, which comprise the larger part of household bone waste. Berzelius gives the following as the constituents of the dry bones:

Phosphate of lime with a little fluoride of calcium	57·35
Bone gelatin	33·30
Carbonate of lime	3·85
Phosphate of magnesia	2·05
Soda and common salt	3·45
	100·00

Every intelligent farmer knows that these are just the elements for combining with inorganic matter to make a fertile soil. It is, however, maintained by some that the nitrogen—contained in the gelatin—is not beneficial as a fertilizing element, from the fact that calcined bones deprived of their nitrogen, are still very valuable as a manure. But we believe that the nitrogenous element is really a valuable ingredient in fertilizers, for nitrate of soda, NaO, NO_5 is known to be a valuable fertilizer, and where found in natural beds as on the west coast of South America, it is exported for agricultural use as well as for the manufacture of nitric acid. The necessary amount of soda to form this combination exists in bones, and as the oxygen of the atmosphere readily combines with it, the objections against it as being unfit for fertilization do not seem to be tenable.

Prof. Johnston (than whom no better authority can be quoted) says that one hundred pounds of dry bone-dust add to the soil as much organic animal matter as three hundred or four hundred pounds of blood or flesh, and also, at the same time, two-thirds of their weight of inorganic matter—lime, magnesia, common salt, soda, phosphoric acid—all of which should be present in a fertile soil. From this it will be seen that even if the usefulness of bones was limited to their application to the soil, their value is sufficient to induce care in their saving and preparation. The superphosphate of lime so favorably known to our farmers is simply bones treated with one-third their weight of sulphuric acid and an equal quantity of water. The farmers of England understand the value of bones. Beside those gathered in their own country, they import them from the pampas of South America, the feeding and slaughtering grounds of millions of semi-wild cattle, and prepare them for their soil.

VEGETABLE OILS USED IN PAINTING.

There are two kinds of oils found in plants, called respectively *volatile*, or essential oils, and *fixed* oils. The former are those of which essences and extracts are made, and are called volatile because when exposed to the air they will, like ether or alcohol, entirely evaporate. The fixed oils, on the contrary, will not evaporate, hence their name. The latter are divided into two classes, *unctuous*, or *greasy* oils, and *siccative*, or *drying* oils. The drying oils are of great value in the arts, their principal application being in the art of painting. They are the vehicles for the distribution of colors over the surfaces of materials which it is desirable to ornament or to protect from the chemical action of external substances. Thus used they perform a two-fold office, as beside enabling the colors to be uniformly spread upon any surface, they form of themselves a protective coat owing to their siccative properties.

The sources of the siccative oils are numerous. They exist in the seeds of the order of plants, called by botanists Linaceae, commonly known as the flaxes. Of these a species is grown in the East Indies, and large quantities of the seed are imported to this country from that source. The plant is also largely cultivated in Ireland, Holland, America, and other places, not only for its fiber, but the seed. The oil obtained from flaxseed, commonly known as linseed oil, is an important and valuable article of commerce, and is sold in two states, called *raw* and *boiled*.

Beside the flaxes numerous other plants produce seeds containing siccative oils. Of these the hemp, poppy, sunflower, and many nut-bearing trees may be mentioned. Indeed good nut-oil, according to some authorities, possesses the siccative property to a greater extent than any other.

The fixed vegetable oils are either cold or hot expressed. The former are the best oils, but the latter are much used, as a better yield can be obtained by the use of heat, and consequently they are cheaper; while if too high a degree of heat is not used, their quality is not very seriously impaired.

In extracting these oils, the seeds are ground under heavy stone rollers, revolving upon an axis which passes through an upright shaft. As the outside of the rollers must travel faster than the sides nearer the upright shaft, a rubbing as well as crushing effect is obtained. The meal thus produced is subjected to enormous pressure, and the oil is squeezed out. This is the raw oil of commerce. The siccative property of this oil, as of all other drying oils, depends upon the effects of oxygen upon it. When exposed to the air, it absorbs oxygen and becomes resinous in its character. This is drying in one sense, but not, as is often supposed, drying by evaporation. The latter takes place when any substance parts with its liquid portions, or that which holds its solid ingredients in solution. Oils, on the contrary, dry by absorbing oxygen and combining with it to form resinous substances nearly allied to the well-known resin obtained from pine. Cold solidifies linseed oil, and most other drying oils. They therefore spread better in in a warm temperature. The siccative property of linseed oil is increased by heating it with litharge. It was formerly thought that the increased drying property of linseed oil, when heated with litharge, depended solely upon its combination with the oxygen contained in that substance, and it would dry quicker when exposed to atmospheric action. But, according to Liebig, the principal use of the lead oxide is to precipitate the mucilaginous and albuminous matters contained in oils, which, when present, interfere with the action of oxygen.

Linseed oil is used not only in painting but in the manufacture of printers' ink, varnishes, oilcloths, etc. When adulterated with fish oil, the presence of the latter may be detected by rubbing a small quantity in the palm of the hand; the smell of the fish oil can then be detected. It is also used in the manufacture of linoleum, which is a combination of the oxidized oil with resinous gums and other substances, possessing the appearance and many properties of india-rubber. This substance can be vulcanized like rubber, and is applicable to very many purposes in the arts.

Many painters suppose that it is necessary to use "dryers" in paint, as litharge, dissolved usually in linseed oil by the aid of heat. It has, however, been demonstrated by Chevreul that these substances are not essential to make paint dry. He performed the following experiments:

Four oak strips were painted, each on one side, with a paint composed of white-lead and linseed oil, and on the other side with a paint composed of white zinc and linseed oil. The strip No. 1 was exposed to the air to dry; No. 2 was put into a bottle of the capacity of two liters (3·52 pints) and closed; No. 3 was put into a similar bottle, containing dry oxygen gas; No. 4 was put into a similar bottle, containing dry carbonic acid gas. The results as to drying were examined after twenty-four hours, and again after 72 hours:

After twenty-four hours the lead paint on No. 1 was almost dry; the zinc paint had set, but was not dry. On No. 2, the lead paint was almost dry; the zinc paint had set, but was not dry. On No. 3, both the lead and the zinc paints were perfectly dry. On No. 4, both paints were still wet and fresh, and had undergone no change.

After seventy-two hours the paints on Nos. 1 and 2 were perfectly dry. The lead paint on No. 4 had almost set, but it had no adhesion to the wood, and could be easily removed by friction; the zinc paint had undergone no change, but stuck to the finger like fresh paint.

These paints contained none of the so-called dryers, yet when they came in contact with free oxygen they dried perfectly. But while it is thus shown that dryers are not absolutely essential, it is none the less true that their use greatly facilitates the setting and drying of paint, a very desirable thing under many circumstances.

Any admixture of non-drying, or unctuous oils, in the oils used for painting renders them "tacky" when spread upon any surface. A good test of their presence is, therefore, their behavior in this respect when their layers are exposed to the atmosphere or oxygen in a closed vessel.

It is the affinity which such oils possess for oxygen that renders them liable to take fire spontaneously when spread over the fibers of wool or cotton waste, by the heat resulting from the slow combustion which takes place under such circumstances. Even animal oils, similarly treated, are liable to pontaneous combustion.

BULLETIN OF THE NATIONAL ASSOCIATION OF WOOL MANUFACTURERS.

The first number of the above publication is received and contains much interesting and valuable information. It is distributed gratuitously among the members of the Association from the commencement of the year in which they are admitted. Whether it is to be obtained by outsiders upon the payment of a subscription price, or otherwise, does not appear, so far as we can see, from the number before us.

Among other interesting statistics we find it stated that the number of sets of machinery or series of cards—a set forming the unit for calculation in woolen machinery—employed in the United States, reported to the National Association of Wool Manufacturers, on the 25th of October, 1865, was 4,100. The estimated number in the United States, as all were not reported at that time, was 5,000. From a carefully prepared table we find that Massachusetts consumes more wool in her factories than any other four States in the Union, her weekly consumption being 857,496 pounds of scoured wool. Of this aggregate 560,896 pounds are domestic wool and the balance is of foreign production. Connecticut stands next to Massachusetts in her consumption of wool, using weekly 252,880 pounds of scoured wool. New York uses 236,510 pounds, and New Hampshire, 217,110 pounds. The total amount used weekly in the United States is, according to the table, 2,252,545 pounds. It will thus be seen that Massachusetts manufactures more than one-third of all the wool consumed in the woolen mills of this country. The smallest consumption of any given in this table, is that of Minnesota, which is only 1,200 pounds per week. Some of the States and Territories consuming little wool are not, however, reported; but they will not vary the statement to any noticeable extent. In New York there are 124 mills that have not been heard from. In Massachusetts 74 have not reported. In all the States there are 624 mills not reported, against 917 which have forwarded their statements. From this it will be seen that the large aggregate weekly consumption, as above stated, falls much below the reality. It is fair to suppose, however, that many of those not heard from are small establishments; but, granting that, the weekly consumption will not fall far below 3,000,000 pounds.

The value of the wool manufacture as given in the report of the United States Commissioner of Revenue, is $121,868,250·33.

The effect of the establishment of mills in California and Oregon has been greatly beneficial to the wool growers of those States; previous to their erection theywere at the mercy of speculating monopolists from the Atlantic States. This is another illustration of the value of home markets.

Returns of woolen machinery constructed by the principal manufacturers of cards and jacks in the country show that *two thousand and eighty-six sets* have been made since January 1865. These facts show that the wool industry of the United States is already not only a large and important, but a vigorously growing one.

The *Bulletin* contains much other matter of interest to which we cannot at present allude. Communications should be addressed to John L. Hayes, Editor, and Secretary of the Association, 75 Sumner street, Boston, Mass.

CONSERVING OF FRUIT.

This may seem to the general reader a more inviting topic than the conservation of force, of which we are frequently called to speak. To our lady readers—for we are well aware there are plenty of them—who look weekly over our columns to find something to help them in their housekeeping duties, we are sure the topic will be interesting, although it may appear a little out of season to them. But they will remember when we put them in mind of it, that the putting up and conserving of fruit has got to be a business of very large proportions throughout the civilized world; and although the bulk of it is put up in the summer and autumn, it is eaten throughout the entire year. Nay, it may be eaten for several years after it is put up, provided proper pains are taken. It is quite possible that the advice we shall give, if followed, may save much loss in the value of fruit already put up, and stored for sale.

"Forewarned is forearmed" and to wait until the very time when information is wanted before attempting to obtain it, is something like death-bed repentance—mostly too late. We recently had something to say on the subject of confectionary, which has called forth considerable correspondence, asking for an extension of the subject so that it should embrace the conserving of fruit. In complying with this request, we shall first call attention to the chemical composition of fruits. To intelligently conserve anything, we should know what it is we wish to conserve.

In all organic substances, the chemical elements which are essential to their existence exist in a state of combination. Destructive distillation or destructive fermentation resolves these, either into their ultimate elements or transforms them into new compounds. Any of the different kinds of fermentations is the partial or entire decomposition of the natural combinations (proximate principles), and their recombination into other and distinct combinations, during which some portions of the proximate principles escape as gaseous products, while oxygen is taken up from the atmosphere or from other sources. The first step toward the total breaking up and destruction of any organic compound is some kind of fermentation. It follows, therefore, that if fermentation be prevented, the keeping of any organic substance for any length of time is possible.

The proximate principles of plants, including fruits, are divided into two classes, those which contain nitrogen and those which do not contain it.

The most important proximate principles not containing nitrogen are starch, gum, fructose or fruit sugar, glucose or grape sugar, pectose or vegetable jelly, cellulose or cellular tissue, lignine or wood substance found in the skins of fruits as well as their stems, and cane sugar, or the sugar in common use for confections and domestic purposes.

The important nitrogenized substances found in plants, are vegetable albumen vegetable casein and gluten. This class of proximate principles owing to the feeble affinities of nitrogen are, under favorable circumstances, particularly liable to decompose.

Starch is acted upon by acids, and converted into glucose (grape sugar). This takes place in the ripening of fruits, as is shown by their greater sweetness when ripe, and also in the mellowing of fruits after they are plucked, which is neither more nor less than partial decomposition. From this it may at once be concluded that fruits which have become mellow to any considerable extent, are more or less unfitted for conserves, as they are already partly decomposed. It does not follow, however, that they are unfitted for food after becoming mellow—as has been asserted by some—unless the mellowing has proceeded too far. When merely mellowed so as to become palatable, the partial decomposition is, in some respects, analogous to that produced by cooking, and renders the fruit more digestible and wholesome. This mellowing will take place in the process of conserving, and in the jars, also, sufficiently to render the fruit tender and palatable, unless the fruit be immature, which is an extreme, also, to be avoided. Gum, although included in the list of non-nitrogenized proximate principles, has but little to do with the subject. Fructose and glucose will be considered in connection with cane sugar. Pectose is an important substance in its relations to the conservation of fruits. It is the proximate principle which becomes jelly when the juices of fruits are boiled. It is insoluble in water, until its characters are changed by the acids contained in the fruits aided by heat, which converts it into pectine which is soluble. It contains the same elements as sugar, but in a very different proportion. By continued boiling it loses its glutinous consistency, an important point as will be seen further on. The so-called "candying" of conserved fruits consists partly in the crystallization of the sugar employed, and the formation of jelly on account of *over-boiling*

Cellulose is only important as it forms the walls of the cells which inclose the proximate principles, and also of its intimate association with the pectose above alluded to. Lignine (wood substance) forms a portion of the rinds or skins of fruits. It is insoluble in water and, as found in the rinds of fruits, has little effect upon their preservation except to protect the more unstable interior compounds from the action of atmospheric oxygen. But all fruits contain more or less air in their interior, which, in the process of conservation, ought to be expelled and replaced by the substance used as a conserving agent. To avoid a too protracted heating of fruits, which is frequently injurious, they should either be deprived of their skins or the latter should be punctured.

The sugars are the most important substances in this class. The elements of the sugars and their proportions by weight in the different sugars, are as follows:

	CARBON.	HYDROGEN.	OXYGEN.	WATER.
Cane Sugar....................	72	9	72	18
Grape Sugar (Glucose)....	72	12	96	18
Fruit Sugar (Fructose)....	72	12	96	00

As water is composed of one part by weight of hydrogen and eight parts of oxygen, it will be seen that only three elements are found in the sugars, and that the variations in their proportions are very slight. The natural change which cane and grape sugars first undergo when incipient decomposition sets in, is combination with water, they thus becoming transformed into grape sugar. Alcoholic fermentation then sets in, followed by the acetic and destructive fermentation and total decay. It is unnecessary, for our present purpose, to follow out the two latter fermentations, as when the alcoholic fermentation takes place the fruit, considered as a conserve, is already spoiled. It is true that the fermentation may be arrested by boiling, but the latter process so greatly deteriorates the appearance and flavor of the fruit that it is not too much to call it spoiled.

Albumen is particularly liable to decay, but as little of it occurs in the pulp of fruit, and that contained in the stems is coagulated by heat during the usual processes of conservation, it need not be considered here. The same is true of caseine and gluten, except the remark upon coagulation. Thus it will be seen that the chemistry of fruit conservation is chiefly confined to the non-nitrogenized substances contained in fruits.

Beside the proximate principles above enumerated, there are over two hundred distinct acids of vegetable origin which are isolated by chemists. But few of them, however, exist in a free state, they being for the most part combined with alkalies or vegetable alkaloids to form salts. Malic acid, which exists in the apple and its kindred fruits, citric acid which is found in lemons and kindred fruits, tartaric acid found in grapes in the form of tartar or bitartrate of potassa, oxalic acid, the acid of the sorrel and rhubarb, or "pie-plant," etc., may be mentioned. A minute description of them is unnecessary. They all contain the same elements as sugar in different proportions, and their action upon starch is, as above described, to change it into grape sugar.

Having thus reviewed the principal substances found in fruits, let us next trace some of their more important reactions when decomposition takes place. First, the starch becomes more or less converted, first into dextrine, and subsequently into grape sugar which, being soluble, dissolves in the juice; thus the solid portions of the fruit become liquid and it becomes mellow. Vinous or alcoholic fermentation supervenes and the grape sugar, is decomposed, alcohol being formed and carbonic acid being disengaged. The alcohol thus formed is changed to acetic acid, thus constituting what is called the acetous fermentation. Finally the destructive fermentation begins, which speedily breaks up all the compounds not yet unchanged, and total decay is the result. Conserving fruit is the prevention of these changes for a greater or less period, by the use of *cane sugar*.

The mechanical structure of fruits has, however, much to do with conservation. If you peel an orange carefully and then dissect it, it will be found to be made up of divisions, each of which contains a seed or the rudiments of one. Each of these divisions is covered with a continuous skin of cellulose which, although it would not totally prevent the absorption of liquid sugar would greatly retard it. If one of these divisions be dissected, it will be found to contain numerous sub-cells of irregular form, having the same cellular tissue for a covering. It is at once obvious, therefore, that an entire orange would need to be kept much longer in a mass of liquid sugar, in order to become saturated, than one separated into the single divisions above described; and the latter would also be slower in saturation than slices of orange, in which large numbers of the cells would be severed. It follows that it is necessary to consider the structure of the first in order to consume it in the best manner.

Three results are to be attained in the proper conservation of fruits, viz.: They must look well; they must taste well; they must keep well.

The latter result depends upon the removal of air from the cellular structure of the fruits, replacing it with, and enveloping the fruit in liquid sugar; by which means, if properly done, further danger of fermentation by the action of the atmospheric oxygen is obviated for a considerable time; although if the air be excluded by mechanical means (self-sealing jars), the fruit may be preserved much longer than without. In the latter case a solution of sugar may be employed, instead of concentrated sugar. This is much the best plan, as by it the natural taste of the fruit may be preserved if other proper precautions are taken.

The putting up of fruits in concentrated sugar is rapidly going out of use for most domestic fruits, and it is to be rejoiced at, for a more ill-looking, ill-tasting compound than many of the old-time conserves, would be hard to find.

The first thing to be done, in successful conservation, is the selection of the fruit. From what we have already said of the constituents of fruits and their chemical changes, it will be seen that it should be *ripe, but not mellow or stale*, of good size and fair surface. The next thing is the sugar, which should be the best white lump sugar obtainable. It should be perfectly dry, and should be destitute of foreign odors. Frequently a musty smell may be detected in sugar. Sugars sometimes also acquire the smell of kerosene, etc., by being placed in the vicinity where the latter is kept.

The fruit and sugar being selected, the nature of the fruit should be well considered. Fruit looks very well when put up whole, but if in order to do so they require boiling until the pectose is changed to jelly, and the fruit is so cooked as to drive off its delicate flavors, you have paid dearly for the privilege of having your fruit whole. Beside, long boiling is sure to darken the color and thus damage the appearance. Apples should be quartered unless very small. Pears should be halved, unless quite small; the little Secklers may be put up whole. Peaches may be put up whole or halved, with the pits removed: the last is much better, as the prussic acid in the pits gives otherwise too strong a flavor to the fruit. All fruit having thick dense rinds should have the rind removed or punctured. Puncturing may be done by setting a number of very fine needles in a piece of pine wood which serves as a handle. The use of an ordinary fork for the purpose is barbarous, as it makes the fruit appear as though it had had the smallpox and was just recovering. The fruit should be peeled or punctured only the shortest time possible before it is put in the sugar, otherwise it will become discolored, therefore the sugar should be first prepared. If, however, fruit when peeled or punctured be placed under cold water and kept until the sugar is ready its color will not change.

If hermetically sealed jars are used only enough sugar is needed to make the fruit palatable this should be put into a brass kettle with a little water, and allowed to melt slowly, and then the heat should be gradually raised to nearly the boiling point. The fruit properly prepared is next put into the jars, from which it should not again emerge until wanted for the table. The amount of sugar proportioned to the fruit by weight, established by previous experiment, should then, after being cooled, be divided as equally as possible between the jars, and the remaining space nearly filled with pure water. The jars should then be placed in a kettle containing cold water, pebbles being used to prevent contact with the bottom and consequent cracking of the jars, and the whole raised as quickly as possible to the boiling point and kept there about ten minutes. Too long boiling alters the taste and color of the fruit, and changes the pectose into jelly. It should be borne in mind that all the heating is intended to do is *to expel the air*, not cook the fruit. Whatever space is left in the jars should now be filled with hot water, and they should be immediately sealed. We have eaten fruit put up in this way that, after two full years' keeping, could scarcely be distinguished either in color or taste from that freshly prepared and placed by it on the same table.

The old method of cooking fruit in sugar, pound for pound, is a relic of barbarism. The sugar needs to be boiled by itself in this process, else it will crystallize upon standing. Care is also necessary not to cook the fruit too long, else a gummy, sticky, dark-colored mass will be the result, as much inferior to fresh fruit as molasses is to nectar.

In making jellies the boiling is for the most part too protracted. The pectose, as we have seen, is the jelly principle of fruits, and it requires heat to cause it to form a jelly, but too much heat causes it also to lose this quality. It is this that gives the granular consistence often seen in jellies which have been too long boiled.

Fruit, after it is conserved, should be kept in a dry, cool, and dark place. All these requisites must be observed if you desire perfection. The action of light discolors the fruit. Heat promotes fermentation. Dampness, strange as it may appear, also favors a sort of sub-fermentation, which greatly deteriorates quality. We can give no reason why outside dampness should affect fruit inclosed in hermetically sealed jars; but our own experience and that of others whom we have consulted on this point, warrant the assertion that it is a fact.

Much, however, depends upon experience in this as well as other arts, but if the directions we have given be intelligently followed, in the light of the chemical principles involved, a good degree of success is sure.

THE GARD BRICK MACHINE.

In volume XIV, page 238, and Vol. XVI, page 132 of the SCIENTIFIC AMERICAN, we published illustrations and descriptions of the above machine and subsequently we saw it at work in this city, and found that the machine, much improved in its construction, fully corroborated the favorable opinion we had conceived from an examination of the model. More than sixty bricks per minute can be turned out by this machine, each perfect in form and so well pressed that it may be hacked at once. The clay is used direct from the natural bank, no preparation being required except occasionally the addition of a little water previous to throwing it in the pug-mill. The quality of the bricks is very superior, the faces being smooth, the corners sharp and the sides just rough enough to hold the mortar firmly. The only limitation to the capacity of the machine is that of the attendance necessary to remove the bricks as they are made. The simplicity, strength, and durability of the machine, having no parts to get out of order, the rapidity of its operation, and the superiority of its products entitle it to the notice of every builder and brick manufacturer. Over 14,000,000 of bricks were manufactured by these machines in Chicago, alone, the past year.

The machine may be seen, for a time, in operation at the rear of 59 Ann street, New York city. Mr. Gard's manufactory is at Nos. 116, 118, 120, and 122 South Clinton street, Chicago. For the present he may be addressed at the Astor House, New York.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

A Pennsylvania exchange says an old mill, built in 1844, under the authority of the Moravian church, was burned last week in the town of Bethlehem, in that State. It had an historical interest. It was owned by David and Anthony Luckenbach, whose family have held possession of it ever since it was erected. In the olden time it was a central point to which farmers and others gathered from great distances. The building was of stone, massive and strong. The first miller employed was Christian Christianson, who was placed in charge under Count Zinzendorf. He was a man of skill, and projected the plan of the water works at Bethlehem, said to have been the first works of the kind built in the State.

The artesian well of St. Louis, which has reached a depth of nearly three thousand five hundred feet, and is still going downward, is said to be two degrees colder than at the surface. How is this? Have the philosophers been wrong in the opinion that the temperature of the earth increases toward the center.

It is said that the coal dealers in London are obliged to have their carts or wagons so made that each of them is in effect a weighing machine. By the use of a lever near the wheel the load of coal is placed upon the scale, and the true weight immediately and easily ascertained.

Engineers are now testing the bed of Detroit river with a view to a railroad tunnel connecting the Great Western railroad of Canada with the Michigan Central Michigan Southern, and Detroit and Milwaukee roads. Tough clay is the result on the Michigan side of the river.

The Shah of Persia has recently granted to English capitalists the monopoly of railroad building in that country for twenty years.

The yield of the coal mines in Prussia during 1867, was 105,000,000 tuns of coal from 426 mines, and they give employment to 102,773 men and 175,229 women and children.

A flag made entirely of California silk is to be presented to the State for the new Capitol at the next session of the legislature by an extensive silk manufacturer.

A Boston firm have received an order from China for 600 cases of boots and shoes. This is supposed to be the first order of the kind ever received in this country, and will probably lead to a larger demand for this line of goods.

About 60,000 tuns of ice, mostly for transportation, have been stored in Gardiner, Maine, this winter. Three hundred vessels will be engaged in taking it away next summer.

NEW PUBLICATIONS.

THE LADIES' REPOSITORY for February is at hand, with an unusually rich table of contents. This magazine is the representative of the highest type of intellectual taste and culture to be found among American women. Were it to crowd out the trashy publications filled only with fashion plates and silly love stories, now the only literature, especially designed for women, to be found in many homes, and occupy the place of the latter, it would be "a consummation devoutly to be wished." It opens with a graphic description of Surrey Chapel, in which the Rev. Newman Hall officiates, and of his work and method as the head of a peculiar ecclesiastical organization. This article is followed by a large number of most excellent essays, poems, and miscellanies, forming one of the most attractive collections to be found in any of the monthlies published in this country. This magazine is doing good work, and we wish it most heartily Godspeed. Published by Hitchcock & Walden, Cincinnati, and Carlton & Lanahan, New York city.

HEARTH AND HOME is the title of a new weekly of sixteen quarto pages, which has made its appearance with the advent of the new year. Edited by Donald G. Mitchell and Harriet Beecher Stowe. It is specially designed for families situated in rural districts, and is largely devoted to agriculture and horticulture. It contains also well-selected miscellanies and stories from the best and most popular story writers in the country, among whom are J. T. Trowbridge, Mrs. Stowe, Grace Greenwood, and Mrs. Mary E. Dodge. The first number contains the beginning of a story entitled "Life in the Ice," by Trowbridge, which is to be followed by a novel from the pen of the gifted authoress of "Life in the Iron Mills." It also has a department devoted to the "Boys and Girls," filled with amusing and instructive matter. It is illustrated profusely, and in the best style. A good paper. We wish it success. Published by our neighbors, Pettengill, Bates & Co., extensive advertising agents, 37 Park Row, New York. Single copies $4 per annum, in advance.

Recent American and Foreign Patents.

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

WINDOW SASH LOCK AND SUPPORTER.—William Lee McKibbin, Buck Valley, Pa.—This invention has for its object to furnish an improved lock and supporter for window sashes, which shall be so constructed and arranged as to hold the sash securely locked when lowered, and to securely support it in any position to which it may be raised.

MOLDERS' RIDDLES.—James C. Ward and Joseph Hudson, Peekskill, N. Y. —This invention has for its object to furnish an improved riddle for molders' use, simple in construction, strong and durable, not liable to break and not liable to burn out when used to receive and screen hot metal.

SASH CLAMP.—Elijah F. Dunaway, Cincinnati, Ohio.—This invention has for its object to furnish an improved machine, by means of which sashes may be quickly, conveniently, and accurately shaped, and the joints tightened and squared ready to be pinned.

HARVESTERS.—William Michael, Murrysville, Pa.—This invention has for its object to improve the construction of harvesters and mowers, so as to make them more effective in operation and more reliable in the various places, and under the various circumstances in which they may be used, and which shall, at the same time, be simple in construction and not liable to get out of order.

HORSE HAY FORK.—Samuel Miller, Mohawk, N. Y.—This invention has for its object to furnish an improved horse hay fork, simple in construction, and effective in operation, doing its work better, and with more ease to the operator than the forks now in use.

SAIL BENDER.—Henry W. Ketcham, New York city.—This invention has for its object to furnish an improved sail bender or detachable metallic seizing, by means of which the sail may be securely attached to the hoop in such a way that it may be securely held and easily and quickly detached when required.

CIGAR TRIMMER.—P. A. La France, Elmira, N.Y.—This invention relates to a new machine for trimming the ends of cigars, and especially the thick ends, which, for cigar makers' use, is of great importance to have nicely executed, as thereby also the length of the cigars is regulated. The invention consists of a grooved bed, on which the cigars is supported, and of two cutters, operating like shears, one of them being secured to the edge of the bed, while the other is pivoted to be swung up and down at will; a spring keeps the knives apart, so that the machine is always in a position ready for action.

VELOCIPEDE.—William Donovan, Philadelphia, Pa—This invention relates to a new velocipede, which is propelled partly by muscular, partly by spring power. It consists in a new manner of connecting the swinging seat with a crank axle and with a spring, whereby the aforementioned object of combined muscular and spring propulsion can, in a satisfactory manner, be obtained.

MACHINE FOR FILLING BOTTLES.—James Alcorn, Charleston, Mass.—The object of this invention is to afford a simple and effective means for filling bottles with fluid, whether the latter is under pressure or not, as the circumstances of the case may render most convenient.

MACHINE BELTING.—George Hurn and Daniel Hurn, London, England.—This invention relates to an improvement in the manufacture of driving belts for machinery, and it consists in forming the same from a weft and warp of leather, woven with selvages without joints or splices, and with a double face or running surface.

HAY TEDDER.—M. D. Myers, Frankfort, N.Y.—This invention consists chiefly in attaching the tines to a shaft, that has its loose bearings in the cranks of a rotating shaft, and in connecting the tine-shaft with a stationary drum, or disk, that is arranged concentrically around the rotating shaft, by means of an endless band or chain, thereby the tine-shaft is, while it is being carried around the rotating shaft, also turned around its own axis in such manner that the tines will always remain in the same, *i. e.*, nearly perpendicular, position.

STEM-WINDING WATCH.—Vitalis Himmer, Brooklyn, N. Y.—The object of this invention is to produce a stem-winding watch, which is so arranged that the spring cannot be overwound, and that, if it is wound up to the requisite limit, the gearing connection between the drum and the stem will be automatically and effectually interrupted. It consists more particularly in the use of a pin, fitted through the wheel that is mounted on the spindle of the spring, and in a fingered wheel, resting upon, and turning with the drum; during the revolutions of the aforesaid spindle, while the spring is being wound up, the pin is carried round and against the fingers of the wheel on the drum, thereby turning the said wheel; when the spring is wound up, the pin again strikes the fingered wheel, and travels upon an inclined edge formed thereon; it is thereby raised, and pushes the wheel that connects the spindle wheel with the stem up, out of gear, so that the stem can be turned at pleasure without affecting the spring.

GLUE POT.—Joseph Tinney, Westfield, N. Y.—This invention relates to a new glue pot, in which the vessel for containing the glue is made annular or otherwise, so that a pipe is formed with, in which the water from the lower vessel may stand; thereby additional heating surface is not only provided, but also an escape for the surplus steam, and an open water vessel is produced to allow the wetting of a sponge or cloth for cleaning the surplus glue from the work, and for washing the brush without removing the upper glue cap.

FISHING TACKLE.—Ferdinand Tellgmann, Stamford, Conn.—This invention relates to a new sinker attachment for fishing tackle, and consists in the use of a hollow sectional sinker, which is so arranged, that it will be without corners, projecting flanges, and such devices, which might serve to retain it on the ground; the knots formed at the junction of the hand line with the hook cords are all concealed within the hollow sinker, and can, therefore, not be caught by projecting stones, shells, or other obstructions.

DOUGH BOX FOR CAKE MACHINES.—Daniel M. Holmes, Williamsburgh, N. Y.—This invention has for its object to improve the construction of the dough boxes of that class of machines in which the dough is cut off into cakes or slices as it is forced out through orifices in the bottom of the box; and it consists in the construction of said orifices and of the parts connected therewith, so as to make the machine more accurate and satisfactory in operation, cutting off the cakes or slices of uniform thickness.

PAGING AND NUMBERING MACHINE.—Philip Koch and Gottlob Schule, New York city.—This invention relates to a new machine for paging blank books, and for numbering bank notes, bills, checks, and other suitable articles; and the invention consists, first, in a new apparatus for turning the printing roller, which is turned or set when it arrives at its highest elevation by a lever, which can be adjusted so as to turn the said roller one-tenth or one-fifth part of a revolution, as may be desired, or not at all, if the same figure has to be continually printed. It consists also in a novel device for nking the printing type, and in a new manner of operating the said device. The inking roller is applied to the figure which is to print, immediately after it has been set by the aforesaid setting device.

CARPET STRETCHER.—William Brown, New York city.—This invention has for its object to furnish a simple, convenient, and effective self-clutching carpet stretcher, which shall be so constructed and arranged as to require much less space for operating it than the ordinary carpet stretchers while, at the same time, drawing the carpet up closer to the side walls of the room than is possible with carpet stretchers constructed in the ordinary manner, which can be handled in much less time than other stretchers, and requires no set screws to clamp the carpet in the jaws of the stretcher.

NEEDLE WRAPPERS.—Charles Bartleet James, Redditch, England.—This invention relates to improvements in needle cases and wrappers for packing needles for market and use, whereby it is designed, by the employment of an outer case and an interior packet, arranged in a peculiar manner, to facilitate the removal of the packet when access to the needles is desired.

BREECH-LOADING NEEDLE GUNS.—Jean Mathieu Deprez, Liege, Belgium.—This invention refers to an improved system of breech-loading needle firearms, the peculiar distinctive features of which are: 1st. The manner of opening and closing the breech for the insertion of the cartridge, and the drawing off of the same. 2d. The adaptation of this arm to the use of either paper or pasteboard cartridge, or metallic central percussion ones. 3d. The employment, according to the use of either paper or metallic cartridges of either one of two cylinders; one of these cylinders serving only, for instance, to fire paper cartridges, while the other serves to fire the ones the shells of which are entirely metallic. A fourth feature consists in fitting to this system of arm a safety trigger, whereby are prevented accidents whenever the arm is loaded and maneuvered.

PACKING NEEDLE.—Wm. H. Marriott, Baltimore, Md.—This invention relates to a new and useful improvement in needles for sewing canvas, and other heavy and thick material, which needles are known as " packing needles " and the invention consists in forming a cutting edge in the eye of the needle for cutting the thread when desired.

PLANER AND SCRAPER.—Wm. Dutton, Boston, Mass.—This invention relates to new and useful improvement in tools, used for scraping and planing boxes or barrels, for marking, or for removing marks from boxes or barrels, and for other purposes.

GLOBE VALVES.—H. H. Hendrick, Dayton, Ohio.—This invention relates to a new and useful improvement in globe valves, whereby they are made more useful and durable than they have hitherto been.

HEAT-RETAINING PAIL.—John C. Brain, Brooklyn, N. Y.—This invention relates to a new and useful improvement in vessels to be used as non-conductors of heat, whereby the heat imparte d to the contents of such vessels may be retained.

VENTILATOR.—John Lesperance, St. Louis, Mo.—This invention relates to improvements in ventilating apparatus for houses, cars, etc., whereby it is designed to provide a purified and regulated flow of air, by the employment of a filtering apparatus to be placed in the window opening through which the air is caused to pass in entering the house, etc.

HAME FASTENING.—J. V. Hutschler, Keyport, N. J.—This invention relates to improvements in devices for fastening hames of harness, the object of which is to provide a metallic fastening of cheaper and more durable construction and more convenient to operate than the leather straps or buckles now commonly employed.

MACHINE FOR MAKING PLUGS OF TOBACCO.—Peter M. Guerrant and Peter M. Rowlett, New Concord, Ky.—This invention consists in the arrangement upon a table of a trimming bed, a portion of which is movable, in combination with trimming cutters, whereon the leaves or strips are laid in suitable thickness to form the sheets, and trimmed to the proper shape, from which they are moved on the said movable portion of the bed to a press to be pressed into sheets; also, in an arrangement of sliding table and rotating cutters, for cutting the said sheets into plugs.

SASH FASTENER.—T. O. Wilson, Fisherville, N. H.—This invention relates to improvements in sash stops, the object of which is to provide a simple arrangement of spring bolt for working the sash in any position, all the parts being arranged and attached to a plate which may be readily attached to any window with but little labor.

ROTARY HARROW.—Samuel Lubolt and Jacob Trout, Lykens, Pa.—This invention relates to that class of double rotary harrows in which two horizontal harrows are caused to rotate by means of a vertical wheel between them, and has for its object an improvement of the construction of such harrow so as to render the whole instrument lighter, neater in appearance, and cheaper in construction, than as it has heretofore been made, while operating in the field to better advantage.

BEEHIVE.—R. P. Buttles, Mansfield, Pa.—This invention relates to a new and useful improvement in the construction of beehives whereby perfect ventilation is obtained, simplicity in construction, and suitable guides provided for the building of the combs.

THRESHING MACHINE.—Matthias Fuos, Castroville, Texas.—This invention relates to a new and improved machine for threshing grain, and it consists in a novel construction of the same.

BAKING DISH.—H. C. Wilcox, West Meriden, Conn.—This invention relates to a new article of manufacture for baking puddings, pies, and other similar dishes, and consists in employing an iron enameled dish in combination with an outer plated containing vessel or casing.

FIREARM.—S. G. Bayes, Wauseon, Ohio.—This invention relates to a new and useful improvement in that class of firearms which are known as "magazine" guns.

MANUFACTURE OF BOOTS AND SHOES.—S. C. Phinney, Stoughton, Mass.—This invention relates to an improvement in the method of cutting leather in the manufacture of boots and shoes.

CULTIVATOR AND SEED PLANTER.—D. B. Morgan, Washington, Ohio.—This invention relates to a new and improved cultivator and seed planter, and consists in a novel construction and arrangement of parts.

CARRIAGE WHEEL.—Dr. W. S. Mayo, New York city.—This invention relates to a new and useful device for aiding and facilitating the crossing of railroad tracks by carriages and other wheeled vehicles, and consists in forming a series of shoulders and inclined planes on the edges or corners of the wheel by notching or crenating the same, so that the wheel, when brought in contact with the rail at any angle angle other than a right angle, will take hold or bite the rail, and thereby allow the wheel to mount and pass over the rail.

BOTTLE FILLER AND CORKER.—T. W. Cowey, Cannonsburg, Pa.—This invention consists, in the first place, in adapting to a vessel for receiving liquids from the barrel preparatory to the bottling corking processes, an automatic device for regulating the quantity to be drawn off.

SAFETY STOVE FOR RAILROAD CARS.—Arnold A. Wheelock, Washington D. C.—The object of this invention is to construct a stove for railway cars of such a character, that, if accidentally overturned from any cause, the coals, ashes, etc., will not escape, but the fire will be instantly extinguished.

VELOCIPEDE.—A. D. Thompson and J. Marden, Jr., Baltimore, Md.—The object of this invention is so to improve the construction of three-wheeled velocipedes, that their speed and the power necessary to move them can be adjusted and changed without changing the movement of the pedals, and that they can be operated either by foot or by hand, or by both together. In attaining these ends the general construction of the vehicle has been so changed and improved that several other important advantages result therefrom.

CORN PLANTER.—Jacob R. Randall, Camargo, Ill.—By this invention the corn planter is so improved in construction that it can be turned more easily, and the action of its plows, seeding apparatus, etc., can be more readily and conveniently controlled than heretofore.

MATCH SPLINT CUTTER.—M. D. Murphy and O. C. Barber, Middlebury, Ohio.—The object of this invention is to produce a cutter which can be kept sharp more easily and perfectly than those hitherto used, and which will economize the material to better advantage. To this end the invention consists, first, in the form of the edge, and of the holes through which the splints are forced, and secondly, in the method of forming the said edge and holes in manufacturing the instrument.

SLEIGH AND SLED.—D. C. Frazeur, Siddonsburg, Pa.—This invention is an improvement upon the device patented to D. C. Frazeur, January 28, 1868, No. 73,885, and consists in a new apparatus for throwing the carriage upon its wheels or its runners, a new method of attaching the wheels to the runners, and a new construction of the axle and reach, whereby the vehicle can be more readily turned, whether on wheels or runners.

SEED SOWER.—M. F. South and T. J. Howe, Owatonna, Minn.—This invention relates to that class of seed sowers in which the seed is distributed by means of a series of grooved cylinders arranged upon a rotating shaft under the seed box, each working in a concave cap through which the seed is fed. This improvement consists in a novel construction and arrangement of the shaft, clutch, draft wheels, and axles, in connection with said cylinders and caps, and the lever for regulating the feed; whereby the construction of the machine is greatly simplified and its cost reduced, while it is rendered stronger and more durable than heretofore.

PREPARED PHOSPHATE.—O. A. Moses, Charleston, S. C.—This invention has for its object the production of an improved article of manufacture by extracting, by a new method, the most valuable fertilizing ingredients of the so-called South Carolina phosphates and marls, and of all other substances possessing characteristics analogous thereto, that is to say, containing the valuable phosphates of lime, magnesia, etc., intermingled with useless particles of said carbonate of lime, the oxides of iron, etc., etc.

AX HANDLE SHIELD.—Beauman Butler, St. Johnsbury Center, Vt.—This shield is composed of sheet iron, lap-brazed, one and one-half inches in length on top by three or more on bottom. It is driven firmly on to the helve and then inserted about one half inch into the eye of the axe; it prevents the helve from being bruised in splitting wood, also makes it much stronger in resisting side strains, rendering the helve (at the trifling cost of a dime) of equal value to two or three without it, a very small but excellent improvement. One of them adjusted to an axe can be seen at our office. Patented January 26, 1869.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,800.—SECURING SOLES UPON SHOES, ETC.—B. D. Godfrey, Milford, Mass. September 11, 1868.

3,959.—EXTRACTING THE COLORING MATTER OF MADDER ROOT.—A. Paraf, New York city. December 29, 1868.

3,979.—SPINNING MACHINE.—John Goulding, Worcester, Mass. December 18, 1868.

3,980.—MACHINERY FOR SEPARATING THE FIBERS OF HAIR ROPES.—Abner Mellen, John H. Wilcox, and Abner Mellen, Jr., New York city. December 31, 1868.

3,981.—REVOLVING BREECH-LOADING FIREARMS, AND CARTRIDGES AND CHARGING DEVICES.—Colt's Patent Firearms Manufacturing Company (incorporated), Hartford, Conn. December 31, 1868.

3,985.—WRENCHES.—Wm. Baxter, Newark, N. J. December 31, 1868.

3,986.—WASHING MACHINES.—H. E. Smith, New York city. December 31, 1868.

3,987.—REVOLVING FIREARMS, AND CARTRIDGES FOR FIREARMS.—E. H. Plant, A. P. Plant, and A. Hotchkiss, Southington, Conn. December 31, 1868.

16.—APPARATUS FOR SEWING IN THE OPERATION OF BOOK-BINDING.—H. G. Thompson, New York city. January 2, 1869.

18.—PROCESS OF REFINING IRON AND MAKING STEEL.—C. J. Caumon (also known as John Absterdam), New York city. January 4, 1869.

31.—SEWING MACHINES.—Greenleaf Stackpole, New York city. January 5, 1869.

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; beside, 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 advertisemets at $1 00 a line, under the head of "Business and Personal."

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

A. S. W. A., of Mo., asks "what power would be gained on an engine with a single slide valve having twice the capacity for exhaust as for inlet, the valve having one and a half inches throw, opening the inlet port half an inch, and the exhaust one and a half inches?" We cannot see in what respect this proposed valve differs from many single slide valves in common use. As to the "gain" of power there is none whatever; all engines should have abundant exhaust space or large exhaust ports.

J. O. S., of N. Y.—"If large drivers were best on freight engines why are they not used?" You know—or at least railroad men know—that for loads small drivers give the best results, while large wheels give speed, not power. The reason is apparent.

E. T. of Pa.—Your drawing and description is almost identical with others which have been devised for rotary engines and for other purposes. If you write to Pratt, Whitney, and Company, Hartford, Conn., you can procure an engraving of a much superior, because simpler, device used successfully as a pump and water motor, but never considered by the inventor, Mr. Stannard, one of the firm, as suitable for a steam engine; yet it is better than your plan. One great difficulty in the production of a good rotary engine is the excessive friction, and another the excessive amount of steam required. Overcome these, the annoyances and stumbling blocks of your predecessors, and then you may look for success.

W. W. P., of Mass.—Brass, either a rod or pipe, expands in length more than iron at the same temperature. Brass expands from 32° Fah. to 212° Fah. 1 in 536, and iron 1 in 846.

M. L. R., of Col., says that to prevent kerosene lamp explosions the holes in the net or screen under the chimney should be made as large as possible to admit more air. This may be done by reaming them out with a hand reamer. The amount of oxygen admitted to the flame he thinks is usually too small.

E. S. N., of Mich.—In Vol. XII, page 151, we published an article on the "Pressure of a slide valve," to which we refer you as a reply to your interrogatory. As you are an "old subscriber," undoubtedly you have the volume.

J. P., of Pa.—One of our correspondents writes that the best hardening pickle he ever used was spring water made into a brine strong enough to float an egg, then boiled to precipitate the lime and allowed to cool.

J. C. M., of Ohio.—The following are the most amusing and easily prepared sympathetic inks: Yellows—Sulphate of copper and sal amoniac equal parts disolved in water. 2d. Onion juice. Both colorless when first applied, but visible when heated. Black—A weak infusion of galls, show upon application of a weak solution of proto-sulphate of iron. 2d. a weak solution of proto-suluhate of iron; gives a blue when moistened with a weak solution of prussiate of potash; black, when moistened with infusion of galls. Brown or yellow—Very weak solutions of nitric acid, sulphuric acid, muriatic acid, common salt, or nitrate of potash. Shows when heated. Green—Solution of nitro-muriate of cobalt, appears when heated and disappears again on cooling. Rose-red—Acetate of cobalt solution with the addition of a small quantity of nitrate of potash, appears and disappears alternately on heating and cooling. Solutions of nitrate of silver and terchloride of gold, become permanently dark on exposure to sunlight.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEBRUARY 9, 1869.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT OFFICE FEES:

On filing each caveat	$10
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In addition to which there are some small revenue-stamp taxes. Residents of Canada and Nova Scotia pay $500 on application.

Patents and Patent Claims.—*The number of patents issued weekly having become so great, with a probability of a continual increase, has decided us to publish, in future, other and more interesting matter in place of the Claims. The Claims have occupied from three to four pages a week, and are believed to be of interest to only a comparative few of our readers. The publication of the names of patentees, and title of their inventions, will be continued; and, also, as heretofore, a brief description of the most important inventions. We have made such arrangements that we are not only prepared to furnish copies of Claims, but full Specifications at the annexed prices:*

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Full information, as to price of drawings, in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, No. 37 *Park Row, New York.*

86,623.—CUTTING STONE.—John R. Abbe, Providence, R. I.
86,624.—RAILWAY SIGNAL.—Jas. D. Akley, Mifflin, and F. P. Coggeshall, Patterson, Pa.
86,625.—DRYER.—Charles E. Ashcroft, Boston, Mass.
86,626.—CAN OPENER.—Richard H. Atwell, Baltimore, Md.

86,627.—Machine for Attaching Labels to Spools.—Q. S. Backus (assignor to himself, Sidney Fairbanks, and Orlando Mason), Winchendon, Mass.

86,628.—Blind Fastener.—Jas. M. Barnaby, West Harwich, Mass.

86,629.—Die for Bending Equalizing Bars.—A. E. Barnard, Akron, Ohio.

86,630.—Device for Opening and Closing Window Blinds.—Elias Bascom, New York city.

86,631.—Railway Curve.—Vertot D. Beach, Battle Creek, Mich.

86,632.—Sewing Machine for Sewing Leather.—Edwin E. Bean, Boston, assignor to David Whittemore, North Bridgewater, Mass.

86,633.—Machinery for the Manufacture of Bricks.—Benj. D. Berry, Edwardsville, Ill., assignor to Lauven C. Woodruff, Buffalo, N. Y.

86,634.—Cord-Tightener for Curtains.—Wm. H. Betts, Brooklyn, N. Y.

86,635.—Fire Kindling.—Ira Bicknell, Cincinnati, Ohio.

86,636.—Compound for Removing Silver Stains.—Victor G. Bloede, Brooklyn, N. Y.

86,637.—Combined Blade-Case and Attaching Pin.—W. L. Bowser, Moncton, New Brunswick.

86,638.—Inhaler for Medical Purposes.—John P. Brower, Syracuse, N. Y.

86,639.—Composition for Enameling Paper, Cloth, Card-board, etc.—Morgan W. Brown, New York city. Antedated Jan. 23, 1869.

86,640.—Apparatus for Imparting Artificial Age to Wine and Spirits.—Samuel C. Bruce, New York city.

86,641.—Latch.—Henry Budd and Samuel W. Budd, Philadelphia, Pa.

86,642.—Braiding Machine.—James D. Butler, Lancaster, Mass.

86,643.—Beehive.—James Alexander Cameron, Memphis, Tenn.

86,644.—Settee Frame.—T. J. Close, Philadelphia, Pa.

86,645.—Forcing Pump.—Nicholas Clute, Schenectady, N. Y.

86,646.—Head Light.—E. Hall Covel, New York city.

86,647.—Needle Threader.—Oliver Cox, Alexandria, Va

86,648.—Wagon-Brake Block.—Heman Crowell, Washington Corners, Cal.

86,649.—Apple Sauce.—A. R. Davis, Cambridge, Mass.

86,650.—Steam-Engine Slide Valve.—A. J. Davis, and Jno. McGill, Pittsburgh, Pa.

86,651.—Loom for Weaving Pile Fabrics.—E. K. Davis, New York city.

86,652.—Flexible Hose.—James Davis, Pawtucket, R. I.

86,653.—Razor Strap.—A. D. Ditmars, Lancaster, Pa.

86,654.—Steam Press.—Wm. Dobbins (assignor to himself and John J. Crawford, Lowell, Mass.

86,655.—Mold for Casting Sleigh Shoes.—Jno. W. Dryer, Macedon, N. Y.

86,656.—Horse Power.—John A. Eberly, Jacob Lutz, and Henry Becker, East Cocalico township, Pa.

86,657.—Knife.—J. Olden Ely, Philadelphia, Pa.

86,658.—Gate-Hinge.—Jerome B. Farmer, Indianapolis, Ind.

86,659.—Wagon Brake.—Gilbert Gibbs, Fairview, Ind.

86,660.—Lamp Chimney.—Wm. T. Gillinder (assignor to himself and Edwin Bennett), Philadelphia, Pa.

86,661.—Horse Hay Fork.—Benjamin F. Gladding, Providence, R. I.

86,662.—Bridle for Preventing Horses form Kicking.—D. V. Grace and J. S. Elliott, Coshocton, Ohio.

86,663.—Ventilating Houses, Halls, etc.—Wm. C. Grimes, Philadelphia, Pa.

86,664.—Brick.—John Grimm, Cuyahoga Falls, Ohio.

86,665.—Clothes Dryer.—Asher M. Gurley, Waterville, N.Y.

86,666.—Apparatus for Drying Paper.—A. E. Harding (assignor to Harding, Erwin, and Company), Middletown, Ohio.

86,667—Torch and Fire Kindler.—A. T. Harrison (assignor to himself, Wm. P. Hunt, and Geo. Estabrook), Clinton, Ill.

86,668.—Shuttle Guide for Looms.—Wm. A. Hastings, Palmer, Mass.

86,669.—Meat Cutter.—Jacob Hetzel and S. H. Hager, Miamisburg, Ohio.

86,670.—Inkstand.—Gibbons G. Hickman, Coatesville, Pa.

86,671.—Cooking Stove.—Michael Holdener, Belleville, Ill.

86,672.—Varnish.—Wm. Hopson, South Malden, Mass.

86,673.—Car Coupling.—Henry R. Howe, Hartwick, N. Y.

86,674.—Countersink.—L. H. Hunt, Rockingham, Vt., assignor to himself and N. G. Manson, Jr., Cambridgeport, Mass.

86,675.—Feed Regulator for Bark Mills.—Benjamin Irving, New York city, assignor by mesne assignment, to South Boston, Iron Company.

86,676.—Apparatus for Towing Vessels.—Jas. M. Kilner, 8 Saltney Road, Chester, England.

86,677.—Apparatus for Confining Horse Powers.—Richard Knott, Suisun, Cal.

86,678.—Excavator.—Joel Lee, Galesburg, Ill.

86,679.—Axle-Box.—J. Stone Lister, Philadelphia, Pa.

86,680.—Newspaper Addressing Machine.— C. K. Marshall, New Orleans, La. Antedated Jan. 29, 1869.

86,681.—Machine for Cutting Grape-Vines.—L. W. Mayer, Sonoma, Cal.

86,682.—Velocipede.—Chas. H. Miller and George Ellis, Cincinnati, Ohio.

86,683.—Attaching Knobs to their Spindles. —W. T. Munger, Branford, assignor to P. and F. Corbin, New Britain, Conn.,

86,684.—Feeder for Threshing Machines.—Wm. Ostermeyer, Kane, Ill.

86,685.—Running Gear for Railroad Cars.—J. R. Perry, D. W. Perry, and James Perry, of Wilkesbarre, Pa. Antedated Aug 10, 1868.

86,686.—Shutter Fastener.—John H. Peterson, Philadelphia, Pa., assignor to himself J. R. Tobin, and Houston Smith, Jr.

86,687.—Grain Separator.—A. W. Powers, Barrington, Ill., assignor to H. W. Crabtree, and John C. Wiltsie.

86,688.—Shuttle-Binder for Looms.—Ephraim Prentice, Wauregan, Conn.

86,689.—Window-Sash Supporter.—Asa H. Read, Factoryville, Pa.

86,690.—Breech-Loading Firearm.—Samuel Remington, Ilion, N. Y.

86,691.—Torpedo for Oil Wells.—E. A. L. Roberts, Titusville, Pa.

86,692.—Mechanical Movement.—Edwin O. Rood, Lodi, Ill.

86,693.—Carriage Axle.—J. A. C. Ruffner (assignor to himself and Wm. N. Prothero), Hillsdale, Pa.

86,694.—Lamp Burner.—Datus E. Rugg, Sing Sing, assignor to himself and A. C. Kuck, Brooklyn, N. Y. Antedated Jan. 25, 1869.

86,695.—Sewing Machine for Sewing Leather.—Wm. W. Russell, Tepic, Mexico.

86,696.—Top-Iron and Prop for Carriages.—C. W. Saladee and Wm. Bauder, Circleville, Ohio.

86,697.—Top-Iron and Prop for Carriages.—C. W. Saladee and Wm. Bauder, Circleville, Ohio.

86,698.—Slop-Pail Lid.—Wm. B. Sawyer, New York city.

86,699.—Apparatus for Supporting Skaters and Invalids.—P. I. Schopp, Louisville, Ky.

86,700.—Liquid Measuring and Registering Faucet.—E. W. Scott, Wauregan, Conn.

86,701.—Preserving Nitro-Glycerin, etc.—T. P. Shaffner, Louisville, Ky.

86,702.—Composition for Cleaning Painted Surfaces.—Benj. F. Shaw, Peabody, Mass.

86,703.—Elevator.—Adam Shoemaker and John R. Gearhart, Marion, Pa.

86,704.—Cotton Scraper.—J. C. Smith, Helena, Ark.

86,705.—Steam Water Elevator.—George T. Snowden, and I. V. Lynn, Pittsburgh, assignors to themselves and Thomas Snowden, Brownsville, Pa.

86,706.—Fastening for Carriage Curtains.—James H. Spencer, Philadelphia, Pa.

86,707.—Threshing Machine.—Isaac Starr, Prairieville, Mich.

86,708.—Draft Equalizer.—Isaac Starr, Prairieville, Mich.

86,709.—Carriage Wheel.—C. S. Stearns (assignor to himself and C. F. Davis, Marlborough, Mass.

86,710.—Composition for Moldings.—Joseph Thiem and Wilhelm Thiem, Lawrenceburg, Ind.

86,711.—Fluting and Puffing Iron.—Amanda M. Thorne Syracuse, N. Y.

86,712.—Paper File.—Jacob P. Tirrell, Charlestown, and S. G. Brett, Somerville, Mass., assignors to themselves, M. S. Marshall, and Hiram Whitney; and said J. P. Tirrell assignor to Hiram Whitney; and said Brett assignor to M. S. Marshall.

86,713.—Volute Spring.—Joseph Trent, Millerton, N. Y.

86,714.—Carpet Rod.—Hyppolite Uhry, New York city.

86,715.—Stair Rod.—H. Uhry, New York city.

86,716.—Stair Rod.—H. Uhry, New York city.

86,717.—Horse Rake.—Moses M. Ward (assignor to himself, Benj. S. Grant, and Thomas Hersey), Bangor, Me.

86,718.—Toy Row-Boat.—Nathan S. Warner, Bridgeport, Conn.

86,719.—Regulator for Drawing Frames.—S. J. Whitton, Coleraine, assignor to G. and W. F. Draper, Milford, Mass.

86,720.—Gun Carriage.—G. R. Wilson (assignor to himself, Wm. Fitch, H. M. Valle, and Chas. E. Rittenhouse), Washington, D. C.

86,721.—Bottle-Filling Machine.—James Alcorn, Charlestown, Mass.

86,722.—Finger-Exercising Apparatus.—Arthur C. Armengol, New York city.

86,723.—Magazine Firearm.—S. G. Bayes, Wauseon, Ohio.

86,724.—Screw Driver Handle.—Eli S. Bitner, Lock Haven, Pa.

86,725.—Uterine Supporter.—R. D. Bogert, Nanuet, N. Y.

86,726.—Rivet.—Edward Bourne, Pittsburgh, Pa.

86,727.—Heat-Retaining Pail.—John C. Brain, Brooklyn, N. Y.

86,728.—Carpet Stretcher.—Wm. Brown, New York city.

86,729.—Beehive.—R. P. Buttles, Mansfield, Pa.

86,730.—Harvester Dropper.—Jarvis Case, Lafayette, Ind.

86,731.—Sulky Harrow.—Jas. E. Cheasebro, Marilla, N. Y.

86,732.—Brick Machine.—Peter Clark, Brooklyn, N. Y. Antedated Jan. 30, 1869.

86,733.—Method for Growing Fruit Annually.—Francis Clymer, Galion, Ohio.

86,734.—Machine for Hackling Shucks for Mattresses.—David A. Cole, Nashville, Tenn.

86,735.—Stopping Mechanism for Looms.—Geo. Crompton, Worcester, Mass.

86,736.—Sheep-Shearing Table.—Jas. E. Daniels, Pleasant Prairie, Wis., assignor to himself, H. H. Doolittle, and N. D. Edwards.

86,737.—Propelling Vessels on Canals.—Baron Oscar de Mesnil, Brussels, Belgium, and Max Eyth, Stuttgart, Wurtemberg.

86,738.—Velocipede.—W. Denovan, Philadelphia, Pa.

86,739.—Breech-Loading Firearm.—J. M. Deprez, Liege, Belgium.

86,740.—Sash Clamp.—E. F. Dunaway, Cincinnati, Ohio.

86,741.—Box Scraper.—Wm. Dutton, Boston, Mass.

86,742.—Metallic Protector or Shield for Traveling Bags.—F. Fischbeck, Chicago, Ill.

86,743.—Threshing Machine.—M. Fuos, Castroville, Texas.

86,744.—Ottoman.—A. O. Ganiard and E. G. Ganiard, New York city.

86,745.—Bag Tie.—L. H. Gano, New York city.

86,746.—Threshing Machine.—J. W. Garver and C. A. Bikle, Hagerstown, Md.

86,747.—Soft Pedal Attachment for Pianofortes.—J. Greener, Elmira, N. Y.

86,748.—Machine for Cutting Tobacco Plugs.—Peter M. Guerrant and Peter M. Rowlett, New Concord, Ky.

86,749.—Globe Valve.—H. H. Hendrick, Dayton, Ohio.

86,750.—Cultivator.—T. Hicks, Pacatonica, Ill.

86,751.—Stem-Winding Watch.—Vitalis Himmer, Brooklyn, N. Y.

86,752.—Dough Box for Cake Machines.—D. M. Holmes, Williamsburg, N. Y.

86,753.—Mode of Attaching Erasers to Pencils.—G. L. Holt, Springfield, Mass.

86,754.—Process of Extracting Copper from its Ores.—T. S. Hunt, Montreal, and J. Douglas, Jr., Quebec, Canada.

86,755.—Manufacture of Machine Belting.—G. Hurn and D. Hurn, London, England.

86,756.—Hames Fastener.—J. V. Hutschler, Keyport, N. J.

86,757.—Needle Wrapper.—C. Bartleet James, Redditch, England.

86,758.—Process for Drying and Renovating Grain.—G. H. Johnson and G. Milsom, Buffalo, N. Y.

86,769.—Handle for Casks.—J. L. Jones, Utica, N. Y.

86,760.—Sail Bender.—H. W. Ketcham, New York city.

86,761.—Oil Cup for Adjustable Boxes.—C. C. Klein, Philadelphia, Pa.

86,762.—Nursing Bottle.—A. M. Knapp, Racine, Wis.

86,763.—Paging and Numbering Machine.—P. Koch and Gottlob Schule, New York city.

86,764.—Machine for Trimming the Ends of Cigars.—P. A. La France, Elmira, N. Y., assignor to himself and H. R. Kendall.

86,765.—Beehive.—A. S. Layton, Yellville, Ark.

86,766.—Ventilator.—John Lesperance, St. Louis, Mo.

86,767.—Fire Kindler.—J. W. Lowe, Ottumwa, Iowa.

86,768.—Rotary Harrow.—S. Lubolt and J. Trout, Lykens, Pa.

86,769.—Needle.—W. H. Marriott, Baltimore, Md.

86,770.—Carriage Brake.—M. S. Marshall, Somerville, and J. G. Bicknell, Cambridge, Mass., assignors to themselves, J. T. Folsom and J. S. Folsom; said Marshall assignor to said J. T. and J. S. Folsom.

86,771.—Envelope.—J. S. Martin, Atlanta, Ga.

86,772.—Carriage Wheel.—W. S. Mayo, New York city.

86,773.—Sash Lock.—W. L. McKibbin, Buck Valley, Pa.

86,774.—Harvester.—Wm. Michael, Murrysville, Pa.

86,775.—Horse Hay Fork.—S. Miller, Mohawk, N. Y.

86,776.—Cultivator and Seed Planter.—D. B. Morgan (assignor to himself and M. Gilmore), Washington, Ohio.

86,777.—Hay Spreader.—M. D. Myers, Frankfort, N. Y. Antedated August 29, 1868.

86,778.—Trunk Lock.—J. Nock, Washington, D. C.

86,779.—Manufacturing Counters for Boots and Shoes.—S. C. Phinney (assignor to himself and John G. Phinney), Stoughton, Mass.

86,780.—Railroad Car Ventilator.—Wm. M. Russell and D. E. Holmes, Cincinnati, Ohio.

86,781.—Game Counter.—E. Schellhorn, Urbanna, Ohio. Antedated February 1, 1869.

86,782.—Soda Fountain.—A. D. Schnackenberg and Otto Rosenkranz, Brooklyn, N. Y., assignors to A. D. Schnackenberg.

86,783.—Meat Chopper.—F. G. Siemers, Winona, Minn.

86,784.—Coating and Water-Proofing Woven Fabrics.—H. F. Smith, London, assignor to J. Buckingham, Walworth, England.

86,785.—Cooking Range.—W. Steffe (assignor to himself and J. Reynolds), Philadelphia, Pa.

86,786.—Fishing Tackle.—F. Tellgmann, Stamford, Conn.

86,787.—Velocipede.—A. D. Thompson and J. Marden, Jr., Baltimore, Md.

86,788.—Glue Pot.—J. Tinney, Westfield, N. Y.

86,789.—Molders' Riddle.—J. C. Ward and Joseph Hudson, Peekskill, N. Y.

86,790.—Railroad Car Stove.—A. A. Wheelock, Washington, D. C.

86,791.—Baking Dish.—H. C. Wilcox (assignor to the Meriden Britannia Company), West Meriden, Conn.

86,792.—Sash Fastener.—T. O. Wilson, Fisherville, N. H.

86,793.—Manufacture of Gas from Petroleum.—G. W. Wren (assignor to U. E. Wren), Brooklyn, N. Y.

86,794.—Cultivator.—G. W. Zeigler, Maumee City, Ohio.

86,795.—Cupola and other Melting and Smelting Furnaces.—J. Absterdam, New York city.

86,796.—Construction of Converters and Furnaces for Treating Iron and other Metals.—J. Absterdam, New York city.

86,797.—Guard for Door Keys.—H. A. Adams (assignor to himself and G. E. Hill), New York city.

86,798.—Manufacture of Saddle Cloths.—R. Allison, New York city.

86,799.—Composition for Pavements, Sidewalks, etc.—A. G. Anderson, Hoboken, N. J., assignor of one-half of said invention to E. W. Ranney.

86,800.—Pocket Knife and Door Fastener.—J. Armstrong, Bucyrus, and O. Dame, Wyandot county, Ohio.

86,801.—Composition for Refining and Carbonizing Iron.—J. E. Atwood, Trenton, N. J.

86,802.—Handle for Taps, Augers, Drills, etc.—William Baxter, Newark, N. J., assignor to himself and W. D. Russell.

86,803.—Apparatus for Extracting Essences, etc.—G. Bantz, Frederick, Md.

86,804.—Pump.—John Bean, Hudson, Mich.

86,805.—Power Loom.—Erastus B. Bigelow, Boston, Mass.

86,806.—Loom for Weaving Ingrain Carpets.—Erastus B. Bigelow, Boston, Mass.

86,807.—Wagon-Tongue Support.—F. Bremerman, Indianapolis, Ind.

86,808.—Compound for Preserving Wood, Leather, etc.—J. P. Bridge, Boston, Mass.

86,809.—Ventilator.—B. J. Burnett, Mount Vernon, N. Y.

86,810.—Curtain Fixture.—R. Cassady, Newport, N. J.

86,811.—Whiffle-Tree Plate.—J. B. Clark, Meriden, Conn. Antedated Feb. 1, 1869.

86,812.—Horse Collar.—J. Cogan, Cambridge, Mass.

86,813.—Propeller.—C. Cole, San Francisco, Cal. (Suspended.)

86,814.—Toy Carriage.—J. Condell and A. Condell, Plainville, Conn. Antedated Feb. 3, 1869.

86,815.—Door Spring.—J. M. Connel, Newark, Ohio.

86,816.—Bottle Filler and Corker.—T. W. Cowey, Cannonsburg, Pa.

86,817.—Polishing Needles.—C. O. Crosby, New Haven, Conn.

86,818.—Polishing Needles.—C. O. Crosby, New Haven, Conn.

86,819.—Machine for Scouring Needles.—C. O. Crosby, New Haven, Conn. Antedated Feb. 3, 1869.

86,820.—Mode of Constructing Bed Lounges.—Edward P. Curtiss and H. H. Hendee, Buffalo, N. Y.

86,821.—Well Tube.—D. A. Danforth, Elkhart, Ind.

86,822.—Trace Buckle.—E. S. Dawson, Syracuse, N. Y.

86,823.—Liquid Meter.—G. W. Devoe, New York city.

86,824.—Shade Holder.—G. H. Dimond, G. Doolittle, and T. B. Doolittle, Bridgeport, Conn., assignors to G. H. Dimond, G. Doolittle, and T. Wallace, Jr.

86,825.—Lamp Shade.—G. H. Dimond and George Doolittle, Bridgeport, Conn.

86,826.—Mechanical Movement.—A. Duvall, Baltimore, Md.

86,827.—Rubber Boot.—L. Elliott, Jr. (assignor to L. Candee and Company), New Haven, Conn.

86,828.—Cant Hook.—J. E. Emerson, Trenton, N. J.

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86,830.—Machine for Making Carpet Lining.—J. Foster, Jr., Camden, N. J., and F. J. Dill, Foxborough, Mass.

86,831.—Horse Hay Fork.—D. G. S. Gochnauer, Mulberry, Pa.

86,832.—Boot and Shoe Nail.—B. D. Godfrey, Milford, Mass.

86,833.—Treadle for Operating Machinery.—W. S. Hall, Quincy, Mass.

86,834.—Velocipede.—Wm. Hanlon (assignor to George, Alfred, Edward, and Frederick Hanlon), New York city.

86,835.—Manufacture of White Lead, and Puification of the Products of Combustion for the Same.—H. Hannen (assignor to himself, Thomas Woods, and B. F. Pine), Philadelphia, Pa. Antedated Feb. 1, 1869.

86,836.—Compound for Ornamental Painting, Graining, etc.—B. S. Harrington, Pontiac, Mich., assignor to himself, C. S. Green, J. D. Shults, and M. S. Angell.

86,837.—Saw Gage.—A. E. Hoffmann, Philadelphia, Pa.

86,838.—Fire Kindler.—Henry K. Horton, Winfield, Mich.

86,839.—Plow.—Albert P. Ingalls (assignor to himself and James W. Cheney), Shelbyville, Ill.

86,840.—Dryer.—C. Kaibel, Sacramento City, Cal.

86,841.—Compound for Coating Textile Fabrics for Manufacturing Hats and Bonnets, and for Other Purposes.—John L. Kendall, Foxborough, Mass., and Richard H. Trested, Jamaica, N. Y.

86,842.—Stump Extractor.—T. B. Kirby, Flowerfield, Mich.

86,843.—Glue Cement.—Samuel Krewson, Springfield, Ohio.

86,844.—Safety Watch Key.—Perley Laflin, Warren, Mass., assignor to himself and John J. Sprague, Providence, R. I.

86,845.—Safety Clock Key.—Perley Laflin, Warren, Mass., assignor to himself and John J. Sprague, Providence, R. I.

86,846.—Horse Hoe.—N. H. Lindley, Bridgeport, Conn.

86,847.—Carriage Shackle.—John Low, New Britain, Conn.

86,848.—Sewing Machine.—T. A. Macaulay, Florence, Mass.

86,849.—Construction of Teapots.—E. B. Manning, Middletown, Conn.

86,850.—Saw. — Gottlieb Maulick (assignor to himself and Thomas P. Marshall), Trenton, N. J.

86,851.—Molding Plane.—A. W. Maxwell, Milton, Pa

86,852.—Back Band Hook.—Wm. McKerahan (assignor to Samuel Reynolds), Allegheny City, Pa.

86,853.—Brick Machine.—John McManus, Pittsburgh, Pa.

86,854.—Cooking Stove.—Mary Mellinger, Upper Leacock township, Pa.

86,855.—Horse Rake.—Abraham Miller, Hagerstown, Md., assignor to himself, William H. Protzman, William Updegraff, and A. R. Appleman.

86,856.—Velocipede.—Joshua Monroe, New York city.

86,857.—Calk for Boots.—Herman Myer, Derby, Conn.

86,858.—Engine for Making Paper Pulp.—Wm. Parkison, Monongahela City, Pa.

86,859.—Manufacture of Iron and Steel. — Orville M. Phillips, New York city.

86,860.—Apparatus for Obtaining Cream from Milk.—Andrew Pope, Randolph, N. Y.

86,861.—Beer Faucet.—A. D. Puffer, Somerville, Mass.

86,862.—Grate Bar.—Wm. Randall, Salem, Mass.

86,863.—Spring Draft Link.—Benjamin Richards, North Industry, Ohio.

86,864.—Ornament for Jewelry, etc.—Celius E. Richards, North Attleborough, Mass.

86,865.—Sash Elevator and Fastener.—Bartholomew Roy, St. Clair, Mich

86,866.—Gearing for Carriages.—Cyrus W. Saladee, Circleville, Ohio.

86,867.—Lamp.—John F. Sanford, Keokuk, Iowa.

86,868.—Lamp Wick Trimmer.—John F. Sanford, Keokuk, Iowa.

86,869.—Lamp Burner.—John F. Sanford, Keokuk, Iowa.

86,870.—Vapor Burner.—Herrman S. Saroni, Chicago, Ill.

86,871.—Hydrocarbon Burner.—Clement Sauvage, Paris, France.

86,872.—Machine for Weaving Hair for Wigs, etc.—Lydia A. Seago, Jerseyville, Ill.

86,873.—Compound for Destroying Insects.—Philo B. Sheldon, Bath, N. Y.

86,874.—Railway Rail Chair.—O. L. Shepherd, United States Army.

86,875.—Bronzing Machine.—Henry Skidmore, Mount Vernon, N. Y.

86,876.—Alarm Bell.—C. A. Slack, Frenchtown, N. J.

86,877.—Thill Coupling.—C. A. Slack, Frenchtown, N. J.

86,878.—Car Wheel.—John Y. Smith, Pittsburgh, Pa.

86,879.—Garden Cultivator.—Wm. S. Spratt (assignor to himself and W. T. Jaquith), Allegheny City, Pa.

86,880.—Drill Stock. — Edward A. Stockton, San Francisco, Cal.

86,881.—Manufacture of Sulphuric Acid.—A. H. Tait, New York city.

86,882.—Horn Tip for Cattle.—J. C. Thompson, Charlestown, Mass.

86,883.—Sawing Machine.—Alfred W. Townsend Washington, D. C.

86,884.—Stair Rod.—H. Uhry, New York city.

86,885.—Car Brake and Starter.—A. B. Vandemark, Phelps, N. Y.

86,886.—Fruit Box.—Jonathan Vincent (assignor to himself, Walter Shaw, and Selden D. Redman), Newfane, N. Y.

86,887.—Sash Holder.—Felix Walker, New Orleans, La.

86,888.—Clothes Pin.—Felix Walker, New Orleans, La.

86,889.—Attaching Handles to Saws.—John Walwork, Philadelphia, Pa.

86,890.—Vent Plug.—George Weaver and Horatio N. Allen, Boston, Mass., assignors to themselves and E. R. Cheney.

86,891.—Chimney Cowl.—John W. Whiting and Charles E. Whittemore, Bay City, Mich.

86,892.—Bedstead.—Daniel Witt, Hubbardstown, Mass.

86,893.—Combined Breaker and Leveler.—Daniel Witt, Hubbardstown, Mass.
86,894.—Ice Creeper.—David Cumming, Philadelphia, Pa.
86,895.—Quilting Frame and Clothes Dryer.—John G. Ishler, Martinsville, Ill.

REISSUES.

55,087.—Cement Roofing Fabric.—Dated May 29, 1866 ; reissue 3,287.—Wm. Green, Cleveland, Ohio.
53,140.—Roofing Cement, Paint, etc.—Dated March 13, 1866 ; reissue 3,288.—Wm. Green, Cleveland, Ohio.
38,744.—Cooking Stove.—Dated June 2, 1863 ; reissue 3,289.—George P. Hopkins, Albion, N. Y.
19,933.—Rolling Taper Bars of Iron.—Dated April 13, 1858 ; reissue 3,290.—Charles Parker, Meriden, Conn., assignee, by mesne assignments, of John A. Bailey.
9,611.—Book for Photographs and Other Pictures.—Dated March 8, 1853 ; extended seven years ; reissue 3,291.—Eliza Mascher, Philadelphia, Pa., administratrix of the estate of John F. Mascher, deceased.
43,202.—Iron Bridge.—Dated June 21, 1864 ; reissue 2,701, dated July 30, 1867 ; reissue 3,292.—David Hammond and W. R. Reeves, Canton, Ohio.
73,806.—Skating Rink.—Dated January 28, 1868 ; reissue 3,293.—I. H. A. Hervey, Cleveland, Ohio.
44,382.—Nail for Leather Work.—Dated September 27, 1864 ; reissue 3,294.—Gordon McKay, Boston, Mass., trustee of the McKay Sewing Machine Company, assignee of Stephen W. Baldwin.
64,175.—Spring Bed Bottom.—Dated April 23, 1867 ; reissue 3,295.—Dexter P. Webster and Herman W. Ladd, Boston, Mass.
69,738.—Concrete Pavement.—Dated October 8, 1867 ; antedated July 30, 1867 ; reissue 3,296.—Russell Fisk, New York city.
79,654.—Velocipede.—Dated July 7, 1868 ; reissue 3,297.—William Hanlon and Edward Hanlon, New York city, assignees of George, William, Alfred, Edward, and Frederick Hanlon.

DESIGNS.

3,357 and 3,358.—Top or Bottom of a Sheet-metal Can.—Charles Pratt, New York city. Two Patents.
3,359.—Top of a Sheet-metal Can.—Charles Pratt, New York city.
3,360.—Carpet Pattern.—James Allinson (assignor to John Bromley, James Bromley, Thomas Bromley, George D. Bromley, and John H. Bromley), Philadelphia, Pa.
3,361.—Trade Mark.—Taylor Blow, St. Louis, Mo.
3,362.—Bustle.—Spencer H. Brown and Charles H. Willets, New York city.
3,363.—Canceling and Embossing Stamp.—Robt. B. Carsley, Boston, Mass.
3,364.—Group of Statuary.—John Rogers, New York city.
3,365.—Corner of Sheet Metal Can.—Conrad Seimel, Greenpoint, assignor to Charles Pratt, New York city.
3,366.—Trade Mark.—Taliaferro P. Shaffner, Louisville, Ky.

EXTENSIONS.

Machines for Making Weavers' Harness.—Joseph S. Winsor, Providence, R. I.—Letters Patent No. 12,175, dated Jan. 2, 1855.
Machine for Cutting Boot and Shoe Soles.—Jesse W. Hatch and Henry Churchill, Rochester, N. Y.—Letters Patent No. 12,128, dated January 2, 1855 ; reissue No. 2,321, dated July 24, 1866.
Machine for Blowing Blasts, etc.—P. W. Mackenzie, Orangeville, N. Y.—Letters Patent No. 12,165, dated January 2, 1855.
Grain Harvesterr.—Fanny Holmes, Whitehall, N. Y. executrix of John E. Newcomb, deceased.—Letters Patent No. 12,215, dated January 9, 1855.
Operating Slide Valves in Direct-action Engines.—George W. Hubbard and William E. Conart, New York city.—Letters Patent No. 12,203, dated January 9, 1855 ; reissue No. 2,359, dated September 18, 1866.
Building Block.—Ambrose Foster, Lauraville, Md.—Letters Patent No. 12,264, dated January 16, 1855.
Corn Planter.—Jarvis Case, Lafayette, Ind.—Letters Patent No. 12,231, dated January 16, 1855 ; reissue No. 623, dated November 16, 1858 ; again reissued. No. 2,227, dated April 17, 1866.
Sewing Machine.—Jotham S. Conant, Hackensack, N. J.—Letters Patent No. 12,233, dated January 16, 1855 ; reissue No. 3,214, dated November 24, 1868.
Hay-making Machine.—George A. Brown, Middletown, R. I.—Letters Patent No. 12,269, dated January 23, 1855.
Rolling Iron Shutters.—Charles Mettam, New York city. Letters Patent No. 12,281, dated January 23, 1855.

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This wheel was started in April, 1868, and is now driving 8128 Throstle Dead Spindles on No. 20 yarn, 222 4-4 Sheeting Looms, with all the preparation, except Pickers. The wheel is running under 17 feet head at high tide. We have had, at times, three feet backwater over her without checking speed. We have no means of telling the exact amount of water used, but we think it is about one-third less than the old wheels used. We shall add next week 650 more spindles, and have no doubt that the wheel will carry this additional work, as we have never had full gate on her yet.

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Charlestown, Mass., January 21, 1869.

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I am pleased to be able to do so now, as I kept a very close and accurate account of the fuel used from December, 1867, to December, 1868, in order to compare your boilers with the old ones, which we took out in September, 1867.

The amount of raw sugar we refined during that time was larger than ever before. The steam pressure was always kept over fifty pounds, and we were therefore enabled to do more work in a shorter time, with the same machinery and apparatuses than with our old steam boilers, in which the pressure at times could not be kept up higher than twenty to thirty pounds.

The actual saving in fuel during this time was one thousand seventy-one tuns of coal. Yours truly,

GUSTAVUS A. JASPER, Superintendent.

KEYSTONE ZINC WORKS,
Birmingham, Huntingdon Co., Pa., Jan. 25, 1869.

JOSEPH HARRISON, JR.,—DEAR SIR: In reply to yours of the 7th inst., would say, it gives me great pleasure to bear testimony in favor of your Boilers. We have had them in use for two years. I put them up myself, and had never seen anything of the kind until they came here, and, with the aid of your draft, I had no trouble in erecting them.

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8 4os E. O. BARTLETT, Superintendent.

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