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Improved Carving Machine.

This machine, the engraving and description of which we copy from *Engineering*, was specially designed by its inventor, Mr. Jordan, for assisting in the production of the vast amount of carved decorations required for the walls and ceilings of the Houses of Parliament, London, and it was so employed during the entire progress of the work. The late Sir Charles Barry was so well satisfied with it, that he frequently declared it would have been impossible to have accomplished the work without it. The department of Woods and Forests employed five of the machines at the Government Works, Thames Bank, for several years; and the machines have now passed into the hands of Messrs. George Trollope and Son, and are still used in the same building. Other leading firms have them in use, and the works first established, by the patentee, at Belvedere road, are still in full operation, principally on church fittings.

The new machines are like the originals in principle and general construction, but are greatly improved in some of the details, especially in those which tend to facilitate the production of works on the round, or such as require a large amount of under and through cutting.

The large machine consists of two principal parts: the first, a horizontal part, is a bedplate having two parallel rails, on which a frame, fitted with double-flanged wheels, travels; this frame, in like manner, presents two parallel rails at right angles to the former, on which the top casting, or floating table, rolls by its wheels, for flat work, such as the paneling of the House of Lords. This iron table is covered with wood, as the readiest means of fixing the work to it; but for round work another apparatus is fixed on it, called a turntable; this is fitted with three chucks, which revolve in it and are identically divided by deep square notches in their edges; and the table is fitted with detaining latches, which fall into the notches and keep each chuck securely fixed, in any position the workman gives it, in the plane of the table. The table itself is also fitted to revolve in bearings, which are fixed on the permanent horizontal table of the machine, and the motion can also be arrested, and the table fixed at any angle given it by the workman.

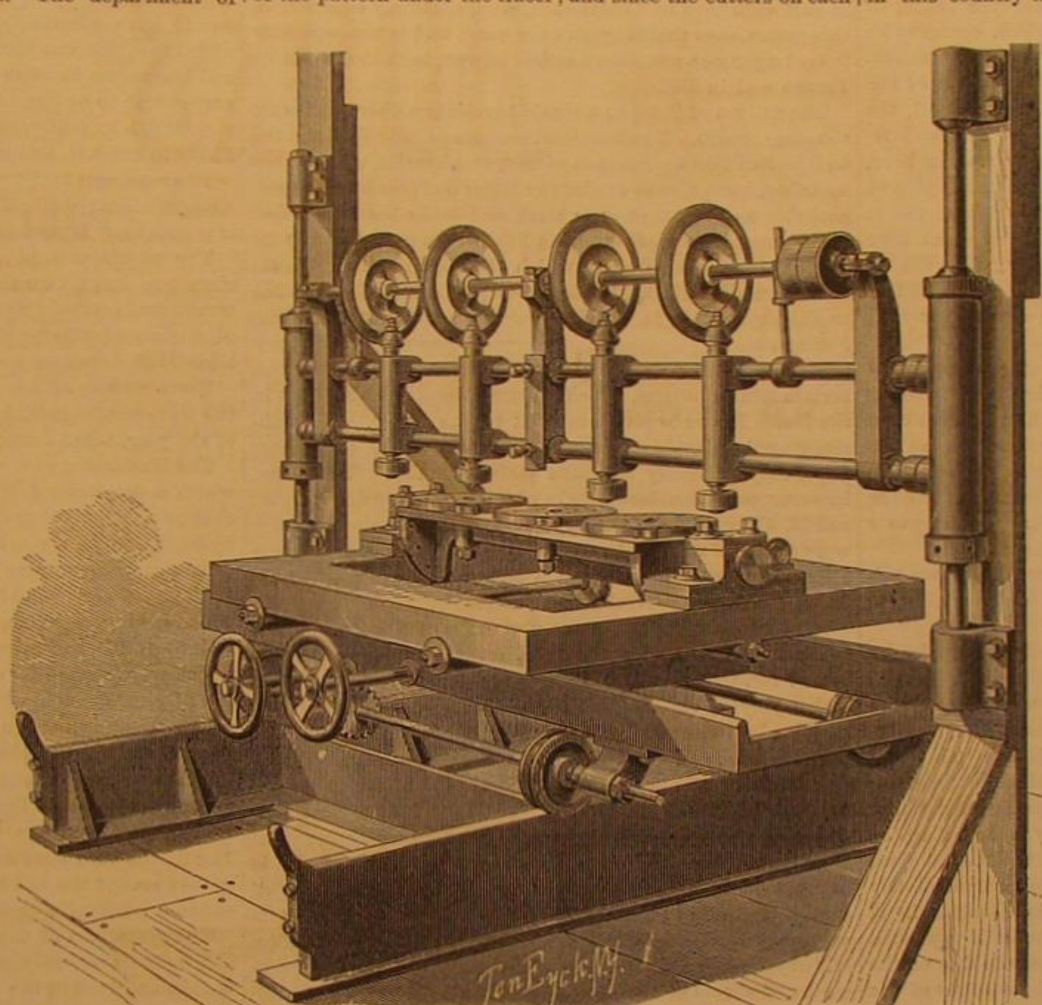
The pattern, of which it is desired to make copies, is fixed on the center chuck, and the pieces of wood, or other material for the work, are fixed on the other two chucks.

The revolution of the cutters at the high velocity required is obtained by beveled friction gearing, in which the elasticity of vulcanized rubber is well introduced.

The manipulation of the machine will now be readily understood. The workman takes his stand in front of the machine, with one hand on each of the hand wheels, and one foot on the treadle; with the right hand he can traverse the table from side to side; with the left, he can roll it to or from him, and by aid of these two motions he can bring any point of the pattern under the tracer; and since the cutters on each side are at the same distance from it as the centers of the respective chucks, they will always have the same relative positions to the blocks being carved. Hence, when the tracer has in succession been brought in contact with every point of the pattern, two exact copies of it will have been produced. But, in order to bring every point of a round pattern under the tracer, it is requisite to present all its sides upwards at various angles, and this is done by the two revolving motions of the turntable, previously described.

Mr. Jordan has also brought out a smaller machine, to be worked by hand wheel, which is capable of carving any statuette, or other subject within its range; this he calls the amateur carving machine, and, we doubt not, it will shortly become popular with the lovers of mechanical art, since it is capable of producing very closely elaborate work in hard or soft wood, ivory, alabaster, and marble, or in any other meterial which can be worked with a steel drill; and, indeed, we see no reason why it should not be applied to the harder materials, also, by substituting the abrasive tools of the lapidary for the steel cutters.

The second or vertical part of the machine is supported by side columns from floor to ceiling. It consists of a stiff parallel frame, which extends across the horizontal portion of the machine, and is fitted with mandrils which carry the carving tools, and a central head which carries the tracer. The whole of this frame is capable of motion in a vertical plane only, and its weight is very nearly balanced by a heavy treadle, with which it is connected by overhead levers and suspension rods, in such a way as to bring the vertical motion of the cutter and tracer under the management of the workman's foot.



JORDAN'S CARVING MACHINE.

SETTING LONG PLAIN CYLINDER BOILERS.

From a paper, entitled "the Durability of Steam Boilers," read by Mr. Jeremiah Head, of Middlesborough, England, before the Iron and Steel Institute, at their meeting in South Wales, Sept. 6, 1870, we extract some facts of interest relative to the number of plain cylinder boilers used in England, and defects in setting them, which lead to their rupture. There is probably as large a proportion of plain cylinder boilers used in this country than in England; at least there are enough of them in use to render a discussion of their merits and demerits, of interest and profit to steam users in America.

Throughout the manufacturing districts of the Eastern States they are quite popular, and also in the iron districts of Pennsylvania. On the Mississippi river and its tributaries they are very generally employed. We have not in our possession statistics by which we can arrive at an accurate statement of their number, in proportion to boilers of other types, but we judge it must be fully up to the English standard.

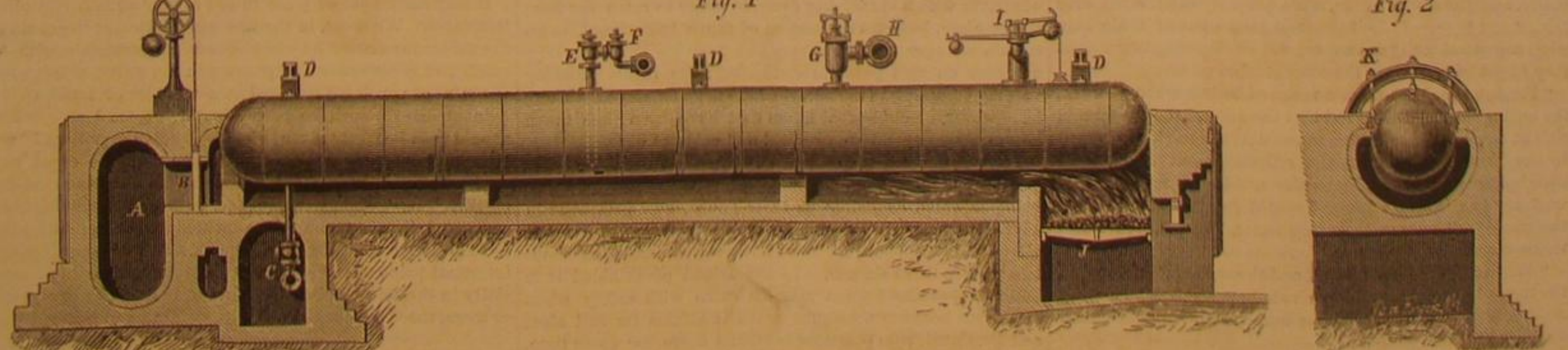
Mr. Head's paper is long, and we shall condense such extracts as we may make from it as much as possible, only aiming to place before our readers, the leading facts stated and points made in his argument.

The total number of boilers insured in the various associations and steam boiler insurance companies in England is 17,825, of which 4,052(22·7 per cent) are of the plain cylinder type. The accompanying engraving illustrates a boiler quite commonly used in the coal and iron districts of the north of England. A represents the main flue, in which an average temperature of about 750° Fah. is maintained. B is the damper, C, blow-off pipe, D, bearers, from which the boiler is suspended, as shown in section, Fig. 2. E represents the feed valves, F, the feed pipe, G, the steam valve, H, the steam main, I, the safety valve, J, the grate, and K, the suspension rods, of which last there are nine. The common method of setting these boilers in brick-work is shown in the section, Fig 2.

The suspension rods are secured to T-irons riveted to the boiler, and have double eyes at their lower, and adjustable nuts resting upon the bearers at their upper, ends. In this way the heating surface is not interfered with by the supports, and the latter are preserved from contact with high heats. The fittings consist of the following, viz.: Glass water gage, float gage, two safety valves, steam valve, feed valve, and mud cock. The steam, feed, and mud valves are directly connected with the same transverse mains, as the similar fittings of other boilers in the same range. The mud cock is fixed to the end of the boiler farthest from the grate, and a downward inclination in that direction assists in securing the complete removal of water and mud, when required.

Such a boiler is as simple as could possibly be constructed. No great bending or flanging tests are applied to the plates, and therefore an ordinary quality and ordinary workmanship are alone necessary.

Fig. 1   Fig. 2



ENGLISH LONG PLAIN CYLINDER BOILER.

The diameter being moderate, a high pressure may safely be maintained without the use of thick plates, and without the expense of double riveting and drilling holes. The brick work is simple and easily maintained, and the boiler is readily examined for cleaning or repairs, both inside and out.

Should the water be impure, this latter advantage becomes very prominent. Again, the risk of overheating for lack of water is much less than with internally fired boilers. The great quantity of water contained, undisplaced by internal flues or tubes, is a security against rapid change of level; and even should such change take place, it must amount to something very considerable before any portion of the heating surface in the locality of excessive heat would be laid bare.

Indeed it would not be easy to cause such a boiler to explode merely for lack of water. The cost is much less than of more complicated boilers. A boiler like the one shown, 45 feet long and 4 feet in diameter weighs $5\frac{1}{4}$ tuns, and costs in England, delivered, about $475 gold. It would have a grate surface of 24 square feet, and a heating surface of 283 square feet. It would consume 420 pounds of coal per hour, and its average evaporative capacity would be about 7·7 pounds of water per pound of coal consumed.

Mr. Head estimates the average evaporative power of internally fired boilers at 8·4 pounds of water per pound of coal, a difference of about 9 per cent, which economy he thinks is fully balanced by extra cost of interest, maintenance, and depreciation. As coal is, in many parts of the United States, much dearer in price than in England, the gain through economy of fuel would be larger in places remote from sources of fuel; but we doubt that even here, taking all things into consideration, there is as much gain in the use of internally fired boilers over plain cylinders, as is generally supposed. The plain cylinder boilers used here are, however, not generally as long, in proportion to diameter, as those of which Mr. Head speaks in his paper, and of course do not therefore, on the average, extract the heat from the gases so fully.

The question, then arises, why is it that more complicated boilers find so much favor? Costing nearly three times as much, and, so far as the contrast between them has yet been carried, apparently more dangerous, there must be some reason not yet considered, for the decided preference which in England has reduced their number to about one fifth the total number of boilers used, and in America is leading to a more and more extended use of internally fired boilers.

This reason is, in Mr. Head's opinion, due to defective setting, which renders long plain cylinder boilers liable to break their backs.

The engraving is that of a boiler laid off for repairs by reason of fractures, for the second time in six years.

"It will be observed," says Mr. Head, "that the fractures are all in a transverse direction at the bottom side, and extend upwards towards the top of the boiler. They all pass through the line of rivet holes of either an inside or outside lap. They are not found at that part of the boiler exposed to the fiercest heat. Although, by means of a peep hole in the main flue beyond the damper, the flames were observed to extend the full length of the boiler immediately after firing, they usually appeared only as illustrated. A minute examination of the bottom, after the boiler was laid off and turned up to the light, showed that the fins of the rivets, the marks of the caulking tools, and the edges of the plates, were, except in the region of constant flame, as sharp and fresh as ever. The feed being introduced at nearly boiling temperature, and in a direction parallel with the bottom, could hardly be supposed to have had any influence, especially when the relative magnitude and position of the cracks in regard to it is considered.

"There did not appear to be any great difference in quality between the top and bottom plates. Small pieces were cut from each locality and broken cold, but the quality revealed was fully equal to the average used for the purpose.

"How then shall we account for these fractures? Why should they be always at the bottom and in a transverse direction? Is not the action of heavy tensile strains indicated—strains which could not exist if the weight of the boiler, and the water inside, were properly distributed over the several bearers? Is it possible that some of these supports are occasionally not acting, and so throwing the weight they ought to bear upon the others? Let us see.

"Passing over the tops of a range of boilers when at work, the writer has often observed that the nuts of the suspension rods at one end of the boilers were slack, and might be turned by the hand. This led to the reflection that that end of each boiler must be resting on the middle bearer alone. A tendency to raise the other end would result, and so almost the whole weight—say, including water, 16 tuns, would fall to the share of one bearer.

"When a boiler ceased work, and the water within cooled, the nuts of the end suspension rods became fast, and could no longer be moved, while the nuts of the middle bearer exhibited signs of lifting.

"The boiler thus appeared to have been at one time supported from a single point, with $22\frac{1}{2}$ feet of length, and 8 tuns weight either way: and, at another time, to have been stretched between two supports 38 feet apart, and having, say, 14 tuns intervening. Such an operation, especially if often repeated, would obviously suffice to destroy structures of the nature we have under consideration."

Passing over the detailed consideration of the *modus operandi* of expansion and contraction, which a boiler of this kind undergoes, and its consequent alteration in shape by the lifting of the ends when the under side is hotter than the upper side, which he maintains is always the case when the boiler is making steam, we come to the remedy proposed. This is, to place upon the suspension rods volute springs beneath their nuts, so that upon alteration of shape of the boiler, the raised parts may still be supported by their appropriate rods, instead of transferring their entire strain to the middle portion of the boiler.

It is obvious that any method of setting a plain cylinder boiler upon immovable supports is open to the same objection as the method described by Mr. Head as so generally in use in the north of England, and that the general principle of compensating springs proposed by him is applicable to all boilers of this class.

POISONOUS FISHES.

Condensed from All the Year Round.

The noxious properties of some fishes are supposed to be dependent upon the nature of their food. Munier, in a letter to the well-known naturalist, Sonnerat, written nearly a century ago, states that in Bourbon, and in Mauritius, none of the parrot fishes, which in those islands are called by the popular names of vieille, or old wife, perroquet, etc., are eaten between December and the beginning of April, being regarded as unwholesome during that period, because they then eat large quantities of coral polyps. This statement is in part confirmed by Commerson, who, speaking of a fish of this genus, says that it gnaws the coral, and is consequently looked upon as a suspicious article of diet, both in the Ile de France and in Bourbon.

The natives of Bombay are said to reject another species for the same reason. The beautiful medusa or jelly fish, and the well known Portuguese men-of-war, or physalia, when eaten by fishes, seem also to render the latter unfit for human food, probably on account of their acrid and irritating properties. Risso describes a Mediterranean fish, which cannot safely be eaten at the periods during which it feeds on this medusa; and the sardine of the Antilles is so poisonous, after feeding on the physalia, as to occasion death in a few minutes. The common herring is sometimes very unwholesome, although perhaps scarcely poisonous, in consequence of its living on certain minute worms, which are occasionally so abundant in the North Sea as to give a red tint to the water. Notwithstanding the abominations greedily devoured by eels, these fishes may generally be eaten with impunity. There are, however, occasional instances in which they prove deleterious; and M. Virey, in describing a case in which a whole family were attacked with violent pains and diarrhœa, a few hours after eating eels taken from a stagnant castle ditch, near Orleans, refers to several similar accidents.

In many cases the poisonous properties of fish may be due to the food of which they partake, but this cannot be the sole cause: for, while poisonous fishes are found in localities in which polyps, etc., do not abound, in certain islands surrounded by these zoöphytes the fishes are safely edible. The barracouta is, as a general rule, eaten with perfect immunity in Trinidad, while in the neighboring island of Grenada, and in most of the other parts of the West Indies, death, or lingering sickness for many years, has frequently occurred after eating this fish in its fresh state. The barracouta is fit for food in Trinidad, in consequence of the absence of coral reefs in that island, while for the opposite reason it is poisonous in Grenada and elsewhere in the West Indies. Midway between Cuba, Hayti, and Jamaica, lie extensive reefs and shoals of the Formigas (or Ants' Nests). They are several miles in extent, and are so shallow that they can only be navigated by moderate-sized vessels in a smooth sea. They closely resemble the fringing shore reefs that have been so often described; presenting to the eye of the naturalist arborescent corals and huge brain stones, amongst which are a profusion of sea cucumbers, star fish, sea urchins, and sponges. The Formigas constitute a very warren or vivarium of all kinds of fishes. Those who have waded on these coral reefs are well aware of the pungent scent given out by the polyps which build there, and often experience their stinging influence when they come in contact with the exposed skin. It has been invariably found that all the fishes taken on the Formigas, and the barracoutas especially, are poisonous.

In some countries it is a common habit to poison the water of a river with a stupefying drug, in order to catch the fish; it, therefore, becomes a question of much importance, to ascertain whether the poison may be transmitted to man. The evidence on this point is conflicting: the result probably varying according to the nature of the drug employed. There is, however, no doubt that fishes that have been thus taken become dangerous, if not cooked and eaten at once.

The age and size of the fish are supposed in some species to influence their unwholesomeness, certain kinds of fishes being regarded as edible in their youth, and poisonous in advanced life. In Havannah there is a fish which is not allowed to be exposed for sale if it weighs more than about two pounds three ounces. In the Island of Trinidad it is believed that the becuna may be eaten with safety when small, but becomes poisonous when it attains its full size; and Dr. Court, who practised medicine there for some time, states that the same rule applies to all the fishes said to be poisonous. The natives of Hayti hold a similar opinion regarding a species known by English sailors as the rock fish.

The season of the year is supposed by some writers to have an effect in rendering certain fishes dangerous as food. In the Loyalty Islands, M. Jouan, the captain of a French frigate, has found that many species are dangerous, and even deadly, at some periods of the year, while at others they may be eaten with impunity. It is possible that "the season of the year" may be only another expression for "the food of fishes at certain times." While the process of spawning is going on, it has been observed that certain fishes become dangerous articles of food, the eggs and milt being especially virulent. The conger eel is said to occasion dysentery if it be eaten at this period. The spawn of the barbel, and to a less degree that of the pike and burbot, will occasionally, if eaten, induce great irritation; and if it be necessary to eat these fishes during the spawning period, the milt and roe should be carefully removed.

In countries in which poisonous fish abound, certain tests are in general use with the view of deciding whether any particular specimen may be safely brought to table. M. Poey states that "in barracouta, that are in a condition to produce mischief, the roots of their teeth will be found of a blackened color; and that, wanting this mark, the fish may be eaten without fear; or," he adds, "if a silver spoon or coin, placed in the vessel in which the cooking is going on, be not blackened, the fish is equally safe." Dr. Hill, to a certain degree, confirms the efficacy of the tooth test.

Several co-partakers of the becuna, were seized very shortly after the conclusion of the repast. After full vomiting, they all recovered under the administration of enormous doses of laudanum. On mentioning this circumstance to a West Indian, he said that the accident must have proceeded from culpable negligence on the part of the host, who, before introducing such a fish to his guests, should, knowing how dangerous it was, have first given the head to one of his negroes to dine upon, which, having taken effect upon him, would have effectually prevented all that followed. He added that this was the common way of dealing with quaco and barracouta in some of the Leeward Islands. The only sure course to be pursued is that of giving the offal of suspicious fish to some domestic animal, such as a duck, not likely to reject it, and judging by what ensues.

The mackerel taken at St. Helena is poisonous if kept for a single night; while if prepared on the same day on which it is caught, it is perfectly fit for food.

The inhabitants of the Antilles assert that the bonito should be dressed for the table as soon as it is taken from the water; and several cases are on record illustrating the danger of neglecting this precaution. The Chinese will eat one of their best fishes, only as soon as it is captured.

The instances of fish poisoning occur almost solely where the temperature is high, and especially in the hottest period of the year, when decomposition is most rapid.

The blackening of a piece of silver placed in the vessel in which a poisonous fish is cooked, supports this view: the change of color being due to the liberation of sulphuretted hydrogen which accompanies decay of tissue.

An American whaler in March, 1854, stopped at the island of Juan Fernandez, to take in water, and some of the men began fishing, and caught more than four hundred pounds weight of fish, including carangues, capitaines, and old wives, which were cooked for supper. In a few hours forty-two of the fifty-seven men who formed the ship's company, were seized with dizziness, abdominal pains, nausea, and repeated vomitings. Prostration and coma then came on, and in eleven hours from the beginning of the seizure, thirty-four of the sailors were dead. The remaining eight, after suffering extremely for from five to eight days, gradually recovered. The fifteen who were not put on the sick list, did not altogether escape the bad effects of the meal; several of them suffered from colic or dysentery for two or three days.

The symptoms of fish poisoning are dizziness, dimness of sight, giddiness, palpitation of the heart, and a feeling of weight and heat in the stomach and abdomen. Obliged to assume the recumbent position, the patient notices an itching of the skin; the face, and other parts, presenting red or white blotches, surrounded by a crimson ring. In the palms of the hands and soles of the feet the itching amounts to a burning sensation, and if these parts be immersed in water there is a feeling of tingling, which is regarded as characteristic of the disease. Pains in the limbs and at the joints are also commonly present.

In cases likely to prove fatal there are intense abdominal pains, dysenteric symptoms, and often convulsions. When convalescence begins the scarf skin peels off as after scarlatina, and the hair, and sometimes even the nails, drop off. The effects are often felt for years, and disappear only by degrees, and after removal to a cold climate.

It may not be out of place to add a word or two regarding treatment. We must, in the first place, attempt to get rid of the poisonous matter by clearing out the stomach with an emetic, of a scruple of sulphate of zinc, or of a large teaspoonful of powdered mustard in a tumbler of tepid water. Diluent drinks, such as barley water, or toast and water, should then be freely given, after which, if the patient be not too prostrated, a dose of castor oil will serve to expel any noxious matter that may have got beyond the reach of the emetic. The poison having thus, as far as possible, been evacuated, its effects must be combated with stimulants, such as coffee, wine, and alcoholic liquors. If the vomiting and intestinal pains do not yield to this treatment, opium, especially in the form of Dover's powder, in doses of five grains or more, three or four times a day, should be given.

The enormous consumption of whites of eggs, in albuminizing paper for photographic purposes, may be doomed to come to an end. *Dingler's Journal* announces a substitute for albumen for this purpose, under the name of lactarine. It is a white or slightly yellow powder, with the odor of casein. When subjected to ether, a small amount of saponaceous fat may be extracted from the mixture. The powder resists water, but is accessible to the influence of the alkalies, either caustic or carbonated. Treated with the proper proportion of either acetic or hydrochloric acid, a curd is precipitated, which is found to be soluble in excess of the acid. In use, it is dissolved in ammonia, and can be colored to any required shade.

EXPERIMENTS ON THE OXIDATION OF IRON.

Read before the Manchester Literary and Philosophical Society, by Prof. F. Crace Calvert, Ph.D., F.R.S., etc.

Some two years since, Sir Charles Fox inquired of me if I could give him the exact composition of iron rust, namely, the oxidation found on the surface of metallic iron. I replied that it was admitted by all chemists to be the hydrate of the sesquioxide of iron, containing a trace of ammonia; to this he answered, that he had read several books on the subject in which the statements referring to it differed, and from recent observations he had made, he doubted the correctness of the acknowledged composition of iron rust. He further stated that if he took a bar of rusted wrought iron, and put it in violent vibrations, by applying at one end the fall of a hammer, scales would be separated which did not appear to him to be the substance I had described.

This conversation induced me to commence a series of experiments which I shall now detail. I first carefully analyzed some specimens of iron rust, which were procured as free as possible from any source of contamination. Thus, one of these samples was supplied to me by Sir Charles Fox, as taken from the outside of Conway Bridge, the other secured by myself at Llangollen, North Wales. These specimens gave the following results when submitted to analysis:

	Conway Bridge.	Llangollen.
Sesquioxide of iron	93·094	92·900
Protoxide of iron	5·810	6·177
Carbonate of iron	0·900	0·617
Silica	0·196	0·121
Ammonia	Trace.	Trace.
Carbonate of lime		0·295

These results clearly show the correctness of Sir Charles Fox's foresight, that the composition of the rust of iron is far more complicated than is stated in our text books. Therefore the question may be asked, is the oxidation of iron due to the direct action of the oxygen of the atmosphere, or to the decomposition of its aqueous vapor? or does the very small quantity of carbonic acid which it contains determine or intensify the oxidation of metallic iron? To reply to it, I have made a long series of experiments, extending over two years, and which I hope will throw some light on this very important question.

Perfectly cleaned blades of steel and iron, having a gutta-percha mass at one end, were introduced in tubes which were placed over a mercury trough, and by a current of pure oxygen conducted to the top of the experimental tube, the atmosphere was displaced, and it was then easy to introduce in these tubes traces of moisture, carbonic acid, and ammonia.

After a period of four months, the blades of iron so exposed gave the following results:

Dry oxygen	No oxidation.
Damp oxygen	In three experiments only one blade slightly oxidized.
Dry carbonic acid	No oxidation.
Damp carbonic acid	Slight appearance of a white precipitate of the iron, found to be carbonate of iron. Two only out of six experiments did not give these results.
Dry carbonic acid and oxygen	No oxidation.
Damp oxygen and carbonic acid	Oxidation most rapid, a few hours being sufficient. The blade assumed a dark green color, which then turned to brown ocher.
Dry oxygen and ammonia	No oxidation.
Damp oxygen and ammonia	No oxidation.

The above results prove that under the conditions described, pure and dry oxygen does not determine the oxidation of iron, that moist oxygen has only feeble action; dry or moist pure carbonic acid has no action, but moist oxygen containing traces of carbonic acid acts most rapidly on iron, giving rise to protoxide of iron, then to carbonate of the same oxide, and last to a mixture of saline oxide and hydrate of the sesquioxide of iron.

These facts tend to show that carbonic acid is the agent which determines the oxidation of iron, and justifies me in assuming that it is the presence of carbonic acid in the atmosphere, and not its oxygen nor its aqueous vapor, which determines the oxidation of iron in common air. Although this statement may be objected to at first sight, on the ground of the small amount of carbonic acid gas existing in the atmosphere, still we must bear in mind that a piece of iron, when exposed to atmospheric influences, comes in contact with large quantities of carbonic acid during twenty-four hours.

These results appeared to me so interesting that I decided to institute several series of experiments.

When perfectly clean blades, of the best quality of commercial iron, are placed in ordinary Manchester water they rust with great facility; but if the water be previously well boiled and deprived of oxygen and carbonic acid, they will not rust for several weeks. Again, if a blade of the same metal is half immersed in a bottle containing equal volumes of pure distilled water and oxygen, that portion dipping in the water becomes rapidly covered with the hydrate of the peroxide of iron, while the upper part of the blade remains for weeks unoxidized; but if a blade be placed in a mixture of carbonic acid and oxygen, a very different chemical action ensues, as not only that portion of the blade dipping in the water is rapidly attacked, but the upper part of it immediately shows the result of chemical action and also the subsequent chemical re-actions are greatly modified by the presence of the carbonic acid. For in this case that portion of the blade is only covered with a film of carbon, together with a dark deposit, composed of carbonate of the protoxide and hydrate of the sesquioxide. The fluid, instead of remaining clear, becomes turbid.

These series of experiments substantiate the interesting fact observed—that carbonic acid promotes oxidation.

A long series of experiments was also made, to try and throw some light on the curious fact, first published by Berzelius, subsequently studied by other chemists, and well known to soap and alkali manufacturers, namely, that caustic alkalies prevent the oxidation of iron. My researches can be resumed as follows:

1 That the carbonates and bicarbonates of the alkalies possess the same property as their hydrates; and

2. That if an iron blade be half immersed in a solution of the above mentioned carbonates, they exert such a preservative influence on that portion of the bar which is exposed to an atmosphere of common air (oxygen and carbonic acid), that it does not oxidize even after a period of two years.

Similar results were obtained with sea water to which had been added carbonates of potash and soda.

HISTORICAL AND ANTIQUARIAN COLLECTIONS IN NEW YORK.

The museum and library of the New York Historical Society, in Second avenue, is interesting, not only to the man of learning and the *savan*, but also to every man, woman, and child of average intelligence.

Although several of the most valuable of the collections of curiosities and antiquities committed to the safe keeping of the Society (such as the Indian collection and the Peruvian antiquities), are at present hidden away from sight, owing to the want of sufficient space and the necessary accommodation, yet enough remain to occupy the attention and supply instructive and amusing food to the mind for weeks and months. The museum, as presented to the public at the present time, consists chiefly of a very rare and antique collection of Egyptian antiquities, together with a number of objects of national interest, culled from the vicinity of New York, and the continent of America generally.

EGYPTIAN REMAINS.

The Abbott collection of Egyptian antiquities, although not so imposing in effect as those of London and Paris, owing to to the absence of the colossal statues to be found in these cities, is richer than they by far in specimens illustrative of the manners, customs and every day life of that ancient and mysterious people. The collection was formed under the most favorable auspices. Dr. Abbott, a well known scholar, during a residence of twenty years in Cairo, had many opportunities of obtaining all that was most valuable, which came to the light, during the time of his residence there. It was his delight to occupy his spare hours in diving down into the ancient tombs, and when valuable relics were to be had, he spared neither time nor expense in securing them. Many of these relics were taken out of their original deposits under the surveillance of Dr. Abbott, and their genuineness has been vouched for by Sir Gardner Wilkinson, J. Pening, Lepsins, Poole, and other well known Eastern scholars. To the student, the antiquary and the divine there is a vast field presented for verification, illustration and comparison.

One of the most startling of the relics is the remains of three mummied bulls, of the sacred breed Apis, found in the tombs at Dashour. It is believed, with good reason, that they are the only specimens known of in the world at present. The Egyptians honored this animal as an image of the soul of Osiris, and believed that this soul migrated from one Apis to another in succession. The death of the animal was the signal for general mourning, and its obsequies were performed with much pomp.

Two earrings and a necklace found in a jar at Dendera bear the name of Menes, the first Pharoah of Egypt, who reigned 2750 B. C., and who has been considered to be the oldest King of whom we have any record in history. The ornaments are made of gold, and there are three pendants of lapis lazuli attached to the centre, where is also an oval amethyst head, capped at each end with gold.

There is a very fine sand stone head, which at one time must have formed part of a colossal statue of Thothmes III., the Pharoah of the Exodus and the tyrant of the Hebrews. A gold signet ring bears the name of Shoofoo, the Cheops who built the first pyramid. The hieroglyphics engraved upon it are distinct, and in some respects peculiar.

The iron hemlet of Shishak, along with his breast plate and armorial bearings, are in a very fair state of preservation. This King is understood to be the same that carried Rehoboam captive from Jerusalem 971 years before Christ.

It has been related by Herodotus that, at the entertainments of the rich Egyptians, just as the company were about to rise from the repast, a small coffin was carried round containing a perfect representation of a dead body, and the bearer exclaimed: "Cast your eyes on this figure; after death you yourself will resemble it; drink then and be happy." Accordingly, the Society has one of those mummies, in a coffin which was used for this singular purpose.

A battle-ax formed of bronze, and firmly bound to a handle by means of slender interlaced thongs, is worthy of attention on account of the beauty of the workmanship, as is also a bronze dagger beside it, with a horn handle attached to the blade with silver rivets.

Seventeen Chinese vases, a padlock and other articles found in Egyptian tombs in Thebes, Sakarah and Ghisch, prove the communication which existed at an early date between the Egyptian and the Flowery land. A beautiful little figure, in gold, of a bird, with a human head and the wings expanded, was taken from the breast of a mummy, and typifies the departure of the soul from the body.

A magnificent funeral papyrus, twenty two feet long, is covered with hieroglyphics and finely illuminated. Upon it is sketched out the whole belief of the Egyptians of the life after death, their ideas of a future state and of rewards and punishments. From it is learned the reason of the strict attention which they paid to preserving and mummifying the bodies of the dead, believing as they did, that the soul after purification in purgatory was allowed to return to earth and to reoccupy the body, if this last had been preserved in a perfect state. A caricature painted upon a fragment of limestone is a sample of what humor was in those ancient times. The caricature represents a lion seated as a king upon a throne, and a fox officiating as high priest, and making an offering of a plucked goose and a native fan. An oblong box, with a drawer for containing twenty-one porcelain pieces, has two separate series of squares upon the lid, evidently intended as a field for the working out of several games.

When we come next to inspect the smaller and less important implements of every-day life, nothing is more striking than the fact of their similarity in ancient times in many respects to those of the present day.

Here is a maiden's foot well preserved, of great symmetry, with the toe nails distinctly marked as if she had died but yesterday. The foot is ensconced in a tight fitting white kid shoe, such as might be purchased today in a fashionable boot-maker's in Fifth avenue; and there are many such in the museum, of various colors, such as purple, red, buff, etc, with gilding upon them. Household jars with long pointed ends to stick in the mud, very elegant in form, were used for containing wine; one of those now in the museum, contained a number of eggs at the time of its discovery, which are still in an excellent state of preservation.

A unique example of primitive ingenuity is to be found in six conical stamps used by the Egyptian Government for sealing the locks of the public granaries. The locks were covered with the mud of the Nile, and were stamped while wet with the Government stamp, after which they could not be opened without breaking the impression of the Government seal. Besides those specimens of home life three thousand years ago in the "cradle of knowledge" which have all been noticed, there is a perfect host of others too numerous to mention.

The bread which that ancient people ate, their grain, the bricks of Egypt, (made with and without straw), needlework, children's toys, dolls, woolen and linen cloth, toilet stands for ladies when darkening the margins of the eyelids, chignons almost identical with those of 1871, false hair, chessmen, rings, beads and porcelain ornaments of every description; also, a large number of mummied animals, such as cats snakes, monkeys, &c.

It is worthy of note that Louis Napoleon, when resident in America, came to the museum, especially for the purpose of seeing the mummied animals, and exhibited great interest while inspecting them. At that time the sacred bulls stood upon their feet, but having decayed much from exposure to the air, they are now preserved in a glass case. Another memento of a different kind must have made a deep impression upon him, being none other than the chair in which his great uncle Napoleon I., presided as First Consul over the meetings of the French Assembly. The chair is plain and yet handsome, the seat being covered with crimson tapestry and the wood work partially gilded.

Besides these foregoing antiquities there are those of other nations, chief among which are the Aztec statuary, the Lenox collection of Assyrian sculptures, and many objects of historical interest, both ancient and modern. The historical gallery of portraits is a chief feature in the museum, and will become more valuable every year. The works of fine art, especially the Bryan collection, would require a day to be devoted to themselves, and there is employment to a connoisseur for a month. The Crawford marbles have gained a standard celebrity.—*N. Y. Times.*

Trial of a Balloon Propeller.

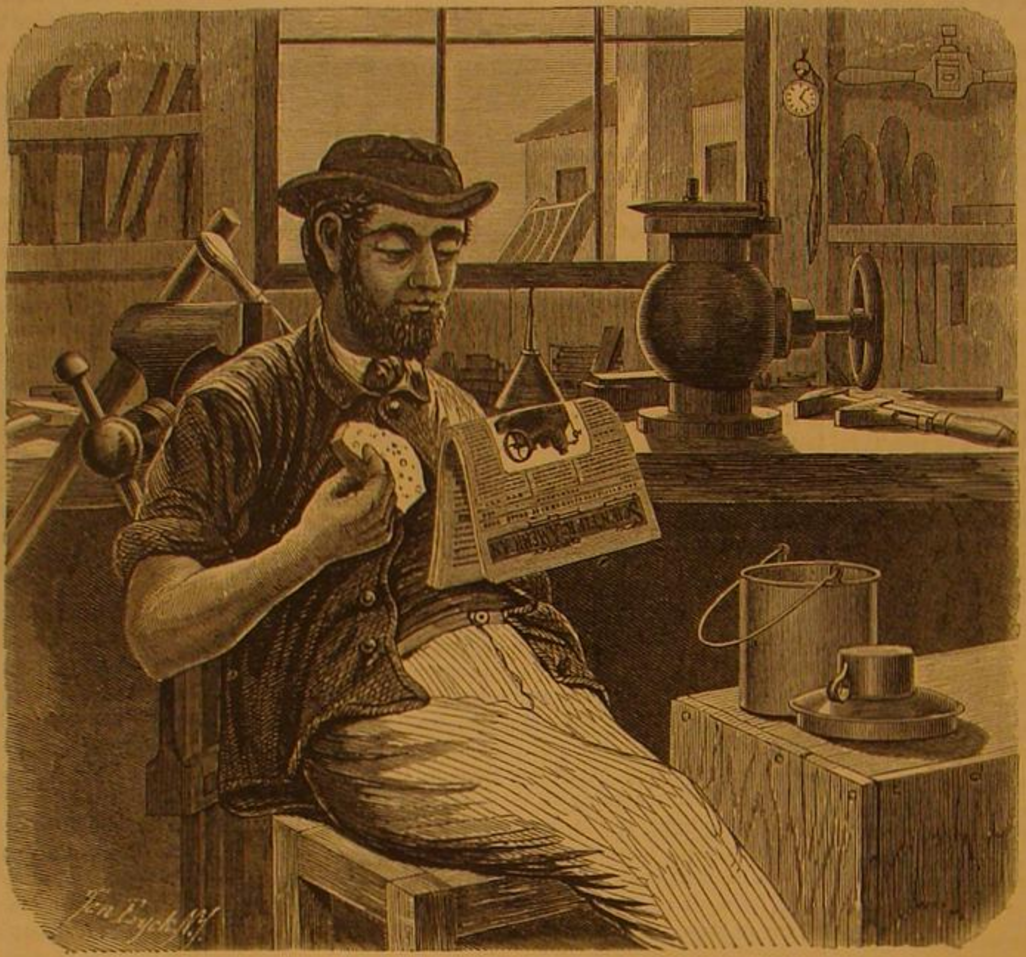
Inventors who are giving their attention to the great balloon problem, which the siege of Paris raised anew for solution, will not be disheartened by the failure of M. Richard in "Le Duquesne." This balloon had attached to it machinery by which M. Richard hoped to control its direction. The machinery consisted of two screws, easily worked, and rotating only at a rate of twenty-five rotations per minute. The diameter being four yards, the motion of the screws in feet per second was about sixteen, or five or six times more than the rapidity intended to be given to the balloon—three miles an hour. M. de Fonvielle, who reports the experiment, pleads that the conditions were unfavorable. Night was chosen instead of day, and the reigning current was a strong southwest wind, which was against the aerial voyagers escaping the Prussian lines. Considerable interest was manifested in the experiment, and many French *savans* collected at the Orleans station to see the balloon off. It was evident from the commencement that the directing machinery failed. M. Richard and his three sailor companions had no more control over their balloon than aeronauts whose balloons have no directing machinery. In other ways they were unlucky. As the balloon descended, one of the projecting screw axes caught the ground, the car was upset, and its four inmates dragged under it for several hundreds of yards in a perilous position. The three sailors were only injured slightly, but M. Richard was believed to be dead when he was picked up. Notwithstanding the failure of this attempt to navigate Le Duquesne, M. de Fonvielle promises to make another experiment, the scene of which is to be the Crystal Palace, London, provided he can obtain the consent of the authorities there.

SCIENCE has often been talked of as a revealer of knowledge, but it is much better described as the embodiment of knowledge classified.

THE AMERICAN MECHANIC.

" Come hither, ye who press your beds of down
And sleep not: see him sweating o'er his bread,
Before he eats it. 'Tis the primal curse,
But softened into mercy; made the pledge
Of cheerful days, and nights without a groan.

Our artist has produced for our readers this week a spirited sketch of an American mechanic resting from his work, at the hour of noon. The shop in which he sits is quiet; the noise of whirling machinery, of ponderous hammers and mighty engines, has ceased; and with the keen appetite that labor gives, he has seated himself to his simple meal. The tin pail, so contrived as to be a convenient receptacle for coffee, butter, cold meat, bread, and pastry, without mixing the whole mass into what a printer would figuratively call "pi," stands by his side.



THE AMERICAN MECHANIC.

If the curious reader will rise sufficiently early, and place himself on one of the thoroughfares leading to the manufacturing localities of this city, he may see thousands of these tin pails hurrying along to their destination. Could he follow each of them to its work, and follow it home at night, he might see many a sight that would make him wiser, better, more sympathizing with his fellow-men, and more patient under the trials and difficulties which beset his own pathway. On the other hand, could he, from following the tin pails, turn to follow the elegant carriages, which daily surround Stewart's dry goods palace, and step with their occupants into splendid up-town mansions, he would probably discover that true happiness is found in the humble mechanic's home as much as in the gilded saloon, and that the rich have their sorrows as well as the honest sons of toil.

Perhaps there is no position in which a man can be placed, which has more elements of content to a healthy mind and body than that of the first-class American mechanic. Earning enough for present comfort, and, with prudence, being able to gradually accumulate a store for a "rainy day;" mind and body both occupied in skilled labor, and both performing their functions with the ease and pleasure that health bestows; sufficiently intelligent and well informed, to follow and discuss the leading topics of the day, as well as those immediately pertaining to his own calling; he never knows that curse of luxury, *ennui*, nor that curse of extreme poverty, despair.

The intelligence of this class in America is one of the first things a foreigner remarks, in visiting the industrial establishments of this country. The picture drawn by our artist is true to the life. Nothing of the stolid, brow-beaten look, so apparent on the faces of foreign workmen, no consciousness of inferiority, no surly, morose expression, engendered by oppressive burdens and class restrictions, is found in the countenance of the American mechanic, as he sits by his bench at noon, feeding his mind as well as his body.

Our artist also has significantly placed in his hand a copy of the SCIENTIFIC AMERICAN, whose proudest boast is that it has done, and is still doing, more to instruct and improve American mechanics than any other paper published on the continent. An English cotemporary recently opened upon us the harmless batteries of its sarcasm, because we did not make it our exclusive aim to become the leading organ of the engineering profession in the United States. We have a broader field than this to cultivate, a far more useful work to perform, one which our critic can neither engage in nor sympathize with, namely, the education of skilled labor. We do not address our efforts to overseers and proprietors alone, or to rich and titled engineers; but to the hard-handed, hard-headed, and hard-working men, like those represented in the picture.

Let *Engineering*, which seems not to comprehend in the least the work we are engaged in, study this picture, and compare it with what it may see in any large manufacturing establishment in England, and it may have its eyes opened not only to our mission, but to the reason why we, with others, do not wish to see American labor degraded to the English level, from the effects of a mistaken free-trade policy.

The SCIENTIFIC AMERICAN is the friend of the American mechanic. It is for him chiefly its weekly repast is spread. It is to his intelligent appreciation that it owes its success as an industrial newspaper; and it can well afford to smile at the sneers and taunts of a foreign journal, which knows apparently nothing of the fact that there is one land on the face of this broad earth, where mechanics can hold up their heads as proudly as men in any other position in life, and whose average intelligence, education, and general information, is equal to that of any other calling, except those exclusively intellectual in their character.

To the American mechanic this nation must look, as one of the most important elements of its future prosperity.

"Full many a blank his destined realm displays,
Yet see the promise of his riper days!
Far through the depths the panting engine moves,
His chariots ringing in their steel-shod grooves;
And Erie's naiad flings her diamond wave
O'er the wild sea nymph in her distant cave."

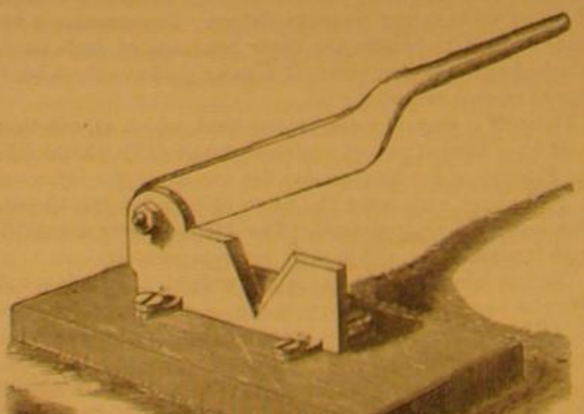
The First Daily Newspaper in England.

On March 11, 1702, the first number of the first daily newspaper in England, was published; and the contrast between the contents of the *Daily Courant* and the intelligence provided for the reader of to-day (says the London *Daily News*), furnishes a significant testimony to the alteration in public taste and public acquirements. The first daily newspaper was about the size of half a sheet of foolscap, and printed on one side. It contained neither leading articles, nor advertisements, nor home news. Quotations from foreign journals, and a couple of announcements concerning its own scope and mission, fill the number, which ends thus: " This *Courant*, as the Title shows, will be published Daily, being design'd to give all the Material News as soon as every post arrives, and is confined to half the compass to save the Publick "—we are almost afraid to say what the public of Queen Anne's day required saving from—" at least half the impertinences of ordinary newspapers."

Six weeks later, on April 24th, the *Daily Courant* appeared printed on both sides, its anxiety for " saving the public " having succumbed to the pressure of a column and a half of advertisements of books, and its " compass " becoming that of the " ordinary newspapers " it had sneered at just before.

SHEARS FOR TRIMMING BRUSHES.

The invention, patented by Charles Brombacher, of New York city, illustrated in the annexed engraving, is designed to facilitate and perfect the trimming of brushes, by preventing the spreading of the corn or bristles, as the case may



be, while trimming. The bed shear is formed, as shown, with a triangular opening, provided with cutting edges, and in it the brush is placed while it is cut. The pressure of the upper blade then causes the brush to converge, rather than spread, as would be the case were both blades straight.

Watering Streets with Chemicals.

Notwithstanding the skepticism that prevails in this country in regard to this method of watering streets, it steadily gains in favor abroad. The *Builder* (London) says the Westminster Board of Works, having determined to try the effect of the salts over the whole of their district during last summer, ordered 80 tuns, on the understanding that if they did not give satisfaction in every respect, a sum of £100 only should be paid to the patentee, but if the result proved efficient and economical, a sum of £200 was to be paid to the same person, and at a recent meeting of the Board a unanimous resolution was passed for the payment of £200: so we may feel assured the experiment has been a success. The parish of St. Luke, Finsbury, has also adopted this system of street watering, which is now in use in several provincial towns.

Compressed Air in Coal Mining.

The operations carried on in the Mont Cénis Tunnel long ago proved, in the most incontestable manner, the feasibility of employing compressed air in situations where the application of steam power was entirely out of the question. Some time before the successful completion of that gigantic undertaking, the attention of engineers was directed to the subject, and a practical result of their experiments is now to be seen in operation at the Holmes Colliery, near Rotherham. Numerous machines have been invented and worked, in a more or less successful manner, by means of which the power of water has been utilized in the getting of coal. And possibly, by the great advantage derived from its employment, compressed air will ultimately supersede all other methods at present in vogue among miners. In the Mont Cénis Tunnel it would have been almost impossible to convey high pressure steam to the excavating tools, for any considerable distance, without an enormous loss of power. Independently of this, supposing it practicable, the escaping steam and the heat would have made so confined a space simply unbearable. On the other hand, it was found possible not merely to convey the compressed air without appreciable loss of power, but also to ventilate the tunnel and keep the atmosphere of the workings comparatively cool, by releasing the air after the completion of its work. After a considerable number of experiments, Mr. Cooper has succeeded in pumping water from the above mentioned mine, and hauling the coal along the tramways—all attempts to accomplish the latter feat by means of hydraulic machinery having proved unsuccessful. Endeavors have also been made in various parts of the coal districts to apply this principle, with an average result of a loss of 75 per cent of power, arising, it is considered, from the employment of pipes of too small a diameter; but Mr. Cooper is convinced, by his experiments, that a power of 100 horses can be transmitted for a mile and a half, when pipes of sufficient size are used. The *modus operandi* at present in successful working consists in compressing the air by a powerful steam engine, operating two air pumps 20 in. in diameter, with a stroke of 3 ft., which communicate with a large receiver on the surface, the latter being connected, by 7 in. cast iron pipes, to three receivers in the mine, at a distance in this case of nearly a mile. The air thus forced into the receivers of the mine operates an air engine with two 14 in. cylinders, having a stroke of 12 in., and working two double action 5 in. force pumps, also with a stroke of 12 in. The discharge pipes have a length of about 3,000 ft., and a vertical lift of 300 ft., and are 5 in. in diameter. A uniform pressure of 25 lb. per square inch has been maintained for upwards of eight hours at a time, and, with the steam and air engines respectively working at the rate of fifty strokes per minute, nearly three gallons of water have been discharged per second. At the same mine, coal is now being hauled in the most successful manner by this machinery, and its application to the tools for cutting the coal is only a matter of detail, if not actually achieved at the time we write. Experiments are in progress, also, to ascertain the relative power given out by the air engine, when compared with the amount necessary to compress the air by the steam engine, trials being conducted at different velocities and pressures.—*English Mechanic.*

Women Telegraphers in Sweden.

Women telegraphers in this country are paid according to their skill, independently of sex. In other countries they are not so fortunate. The following, from an exchange, shows how they are treated in Sweden:

"Sweden employs women in her telegraph bureau, under very severe restrictions, however, which are not applicable to men. She must present a certificate from her parish priest, stating her age, and attesting her moral and religious character. She must have a clear and legible handwriting, and be acquainted with the main outlines of universal history, and of the history of Sweden in detail, as also with political geography, arithmetic (to decimals and the rule of three), the Swedish grammar, and so much of French, German, and English as may suffice to write and translate them into Swedish. The magnificent salary given her is from $100 to $140 per year, and she can retain her position as long as she remains single. The highest position she can ever hope to attain in the bureau gives her but $300 a year, and in order to achieve this she must wait years for a vacancy, and then pass a first-class examination in magnetism, electricity, and meteorology."

IT is said that if planks are cut in the direction east and west as the tree stood before cutting, they will not warp; but we think the statement doubtful.

Glass Pulleys for Railway Cars.

On page 116, Vol. XX., we described and illustrated a glass window pulley, which was claimed to possess superior advantages over any window pulley hitherto introduced. The principle of the pulley was precisely the same as the ones herewith illustrated, but important changes have been made in the *form* of the pulleys, whereby they may be more readily and cheaply applied to ordinary windows, and also to the windows of railway cars.

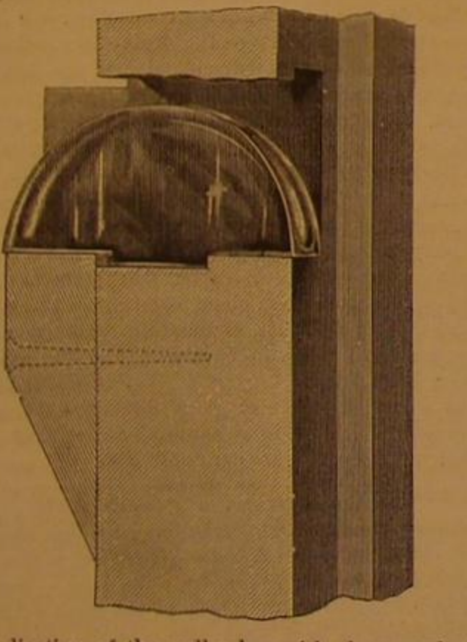
These pulleys do not turn on pivots, but are fixed, the cord sliding in a groove. Being made of glass, the friction is light, so that the sashes are easily moved, while there remains just enough friction to compensate for the imperfections of balance between the weights and the sash. This is an important point, and upon it depends the application of the pulley to car windows. Hitherto the jar, of cars in motion, would either cause the sash to ascend, or fall, according as the weights or the sash preponderated; and it has been found impracticable to so nicely adjust the balance as to prevent this, without entailing too great expense and trouble.

Fig. 1 shows the form of the pulley used for car windows, and the method of its insertion into the stile. Fig. 2 shows the way in which the weights are applied. It will be seen that the weights are suspended in boxes below the rib of the car, and above the sill; and being fitted with sufficient nicety to the boxes, they make no perceptible noise in swinging about by the rocking of the vehicle. The weights are reached through a raised panel, covering openings through which access can be had to them, each of the boxes being thus provided.

The conuenience of these pulleys will be appreciated by railway travellers, who have so often had their patience tried by broken or bent catches and spring fastenings. It is claimed that the entire cost of cords, weights, and pulleys, is no more than the cost of first-class springs; and that they are far less liable to derangement is very apparent.

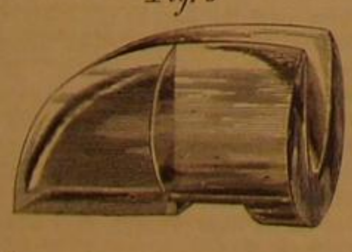
Fig. 3 illustrates the form of pulley used for windows of houses. The one formerly illustrated was flat, and its seat in the jamb required chiseling. Elegance of finish also required the use of an escutcheon, screwed over the mortise.

Fig. 1



In the application of the pulley herewith shown, only the boring of a one and a quarter inch hole, and the nailing of a supporting block to the back side of the stile, is necessary to prepare the latter for the reception of the pulley, which when inserted, gives an elegant finish. The blocks accompany the pulleys, and are bored so as to prevent splitting in nailing. In the application of the car pulley, shown in Fig. 1, the method of attaching the block is distinctly shown.

Fig. 3

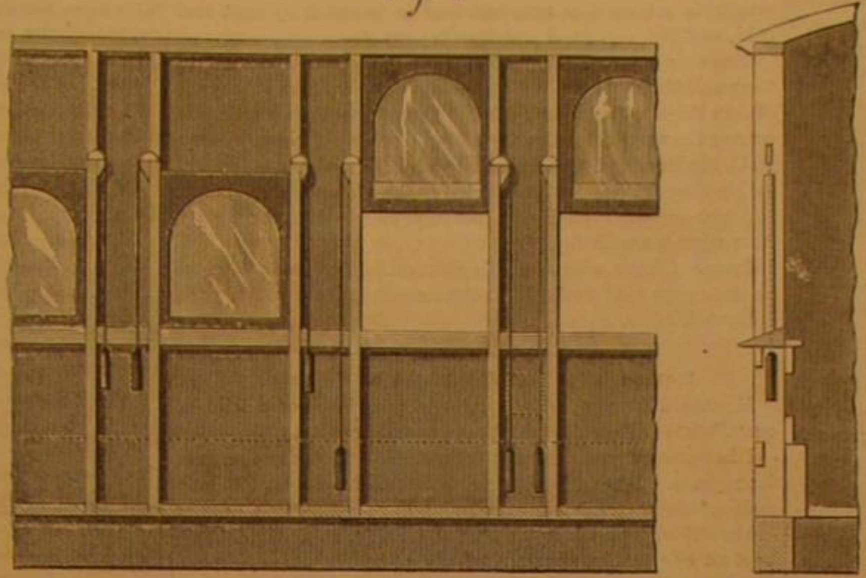


It is claimed that the saving in cost of weights will pay for the pulleys. The latter require no screws and do not rust or squeak. The only cost for repairs will be the replacing of the cord when worn, and such wearing takes place so slowly that, we are informed, cords used for three years—as much as such cords are generally used in windows frequently opened and shut—show no signs of wear.

We are informed that these pulleys have been already extensively used, and numerous testimonials have been shown us, evincing that they are held in high esteem by those who have employed them. The inventor also informs us that two first-class passenger cars are now fitted up with these pulleys on the Eastern Railroad, between Boston and Portland, and that the company are so well pleased with them that they are applying them to their cars now building in Salem.

Address, for further information, American Glass Pulley Co., 39 Bowker street, Boston, Mass. [See advertisement on another page.]

Fig. 2



BICKNELL'S GLASS-WINDOW PULLEYS.

Sheathing of Iron Ships.

At a recent meeting of the Civil and Mechanical Engineers' Society, of London, a paper was read by Mr. A. Forsyth Black.

The author first referred to the very serious evils of corrosion and fouling of the hulls of iron vessels, and the failure hitherto of compositions and paints to obviate these great disadvantages. After showing the loss to ship owners from diminution of speed, and the great cost incurred by them for frequently docking their ships, he proceeded to describe the plan of sheathing iron vessels with copper, invented by M. Roux, captain in the French navy, whose process has been applied to several of their armor plated ships. By this method, while great care is taken in the insulation of the hull of the vessel from its copper envelope, a very ingenious means is adopted for securing the sheathing to the plates of the ships. Holes are bored in rows, at about 2 inches apart, of a depth of nearly $\frac{7}{32}$ inch, and a recess is formed, of a greater diameter than the hole, by means of a spring rose bit. The rivets are formed with a base, a collar (in the middle), and a head, and a hollow set tool is employed for riveting them. To fasten one of these in its place, the head is inserted in this set tool, which bears on the collar, and the base placed in one of the holes. The head of the set is struck with a hammer, and the base of the rivet (which is of a semicircular hollow section at the bottom) fills up the recess in the hole, is firmly fixed, and the head projects. When all is prepared, the copper sheets are laid on, and the projecting heads of the rivets are riveted down.

He gave an account of the experiments that had been made by the Admiralty and others to test the efficiency of covering iron plate with zinc, and which had proved very satisfactory, especially when no insulating medium was interposed between the metals. This result might have been expected, he showed, from the position of zinc to iron in the electric scale of metals; just as iron is certain to be destroyed by contact with copper when salt water can reach both so placed, so is iron preserved by contact with zinc under the same conditions.

He then described Mr. Daft's proposed method of building ships, with a special view of providing a simple means for the attachment of zinc sheathing. That gentleman proposes to rivet all the plates of the vessel directly to the frames or ribs, and that the joints shall be made on the lap principle throughout, but in such a way that a flush surface shall be obtained. This he effects by leaving a space along the sides and ends of the plates equal to their thickness.

After the plates have been caulked against the joint strips from the outside, and then again plates from the inside of the vessel, he fills up the space with strips of compressed teak, to which he secures the sheathing with iron or zinc nails (by preference the former) of such a length that, on meeting the iron at back of the teak strips, the points turn round and are then clinched. He concluded by describing plans for applying zinc sheathing to ships built on the ordinary in and out strake system, by filling up the spaces between the out strakes by teak planks equal to their thickness. By this means a flush side is formed, and the sheathing can readily be nailed on, and the nails clinched, as shown above.

Pneumatic Tubes.

Pneumatic tubes, for transmitting small parcels, or "carriers" containing telegrams, are now in use between different offices in Paris and London. Twelve of the principal offices in Paris are connected by these tubes. The carrier consists of a brass box, shaped like a clock weight, placed inside a tightly-fitting case of hard leather. After many experiments, this form has been found the best adapted for the service. The messages are placed with addressed envelopes in the carrier, together with a list showing the number and destinations of the messages. The carrier stops at every office on the route, that messages may be taken out and others put in. Each office is furnished with a Morse instrument and line wire. There is one main circuit, 21,497 feet in length, two secondary, 17,350 feet and 16,617 feet, and a branch line 3,712 feet, making a total of 59,176 feet, or eleven miles. "The trains" start from the central station every fifteen minutes stopping at five offices.

In London, two methods have been adopted: one consists of a circuit or continuous tube, leading from the central telegraph office to the general post office, and back to the starting place; the other of single tubes leading to separate offices. These tubes are of lead, about one and a half inches in diameter, and are inclosed in iron pipes for protection. The carrier is a small cylinder of gutta percha, covered with cotton. Two, or even three, are sent at the same time. The transit occupies about one half a minute through the longest tube, 3,600 feet in length.

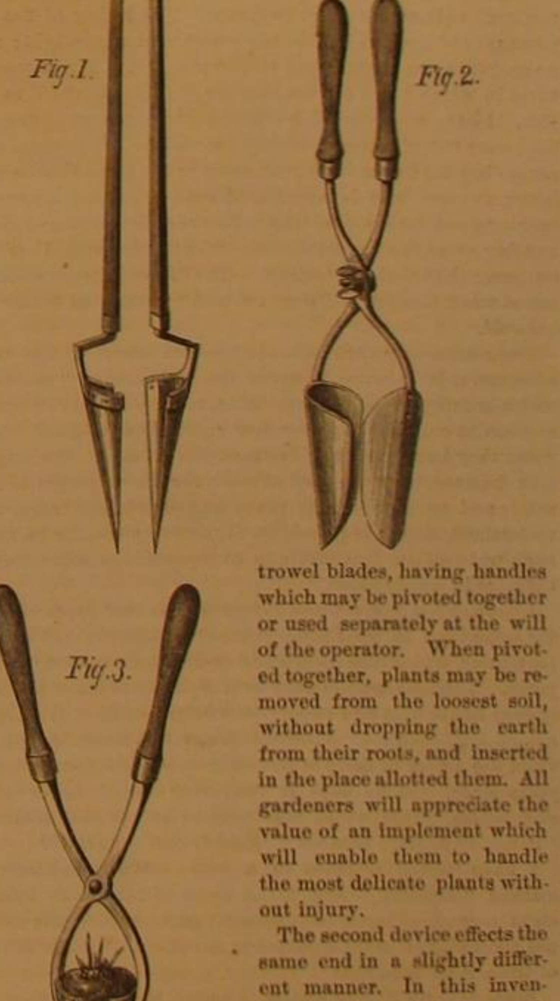
A constant movement of the carriers is kept up in the circuit in both directions; they are placed in a loop of the main pipe, which is closed, a valve is opened into the main pipe, and by the same movement a column of compressed air is let in behind the carrier, which propels it through the tube into a similar tube at the other office Another carrier can at the same time be sent from the other office, the air being exhausted from the tube.

The single tubes are operated in the same way. The carriers are sent by pressure, and returned through a vacuum. One engine only is required, which is at the central office, and works two large cylinders, one of which is used as a reservoir for the compressed air, the other for the vacuum. A nearly uniform pressure of eight pounds to the inch is maintained. The tubes are easily worked, and are tended by boys.

Occasionally, in a rush of business, they become clogged, and the whole force of the compressed air is then turned into the pipe. If that be insufficient, a head of water fifty feet in hight is added, and the carrier forced through. All communications relative to the use of the tubes are made by signals on telegraph wires.

IMPLEMENTS FOR TRANSPLANTING FLOWERS AND PULLING ROOTS.

Our engraving illustrates three useful and neat implements for the transplanting of flowers. The first is the invention of H. Carmichael, of Rochester, N. Y. It consists of two



trowel blades, having handles which may be pivoted together or used separately at the will of the operator. When pivoted together, plants may be removed from the loosest soil, without dropping the earth from their roots, and inserted in the place allotted them. All gardeners will appreciate the value of an implement which will enable them to handle the most delicate plants without injury.

The second device effects the same end in a slightly different manner. In this invention the handles are semi-cylindrical, and are held together by the grasp of the hand, or by a ring slipped over them. This implement is the invention of E. G. Nichols, of Beaufort, S. C. The third is the adaptation of a similar construction to the pulling of roots. The engraving explains itself, so that no description is needed. This implement is the invention of Baxter Wright, Cardiff, N. Y.

THE DESCENT OF MAN.—The favorers of the development theory have given us many points of similarity between men and monkeys, but our already dubious ancestry is now further complicated by Mr. Charles Darwin, who points out the identity of the "snarling" muscles in man, with those which display the teeth of a dog preparing for attack. Man no longer uses his teeth as weapons, but when he "snarls," he threatens to employ them so. This fact must have been observed by the Greeks, when they dubbed a sarcastic, bitter-tempered man a cynic, which word means doggish or doglike.

Correspondence.

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

Popular Errors regarding the Watch Chronometer Balances---Reply to R. C.

MESSRS. EDITORS:—I read in your paper of March 4th, a communication of R. C., of Cleveland, Ohio, headed "Popular Errors regarding the Watch Chronometer Balances." Knowing his statements to be erroneous in the main, I answer him, in order that your readers may not be deceived in what he has said, and also, to do an act of justice to manufacturers of watches.

I can say, from experience, that an unadjusted compensation balance is better, by far, than a plain one of any material I have seen. Platina or platinum would make the best plain one, as its expansion and contraction from the effects of heat and cold is less than that of any other metal I know of.

Some balances are made of steel, with a brass band outside the steel rim, with screws set therein, and are in every respect chronometer balances, except, instead of cutting the rim so constructed entirely apart near the arms, of which there are generally but two, they are only cut about half way through, which is no better than not cutting them at all; and such a balance cannot compensate, as it is not allowed to act. It is worse than a plain steel one, as the brass forms a part of its diameter, and so it is affected more by heat and cold.

There are other balances made of only one metal, with screws in their rims, which are, in part, so constructed to take the eye, and also to bring the watch to time in springing, by putting in lighter or heavier screws, according to the tension or stiffness of the hair spring. A true compensation balance may be, and frequently is, timed in the same manner.

I have an apparatus for testing watches, which I believe is superior to anything else in use. The warm bath or box is so arranged that it is self-regulating as to the amount of gas required to heat the box to the proper temperature. This is done by the expansion and contraction of zinc rods operating a small poppet valve, adjusted by a screw, so that any required temperature may be had, regardless of the outside temperature. The freezing box is in the form of an inverted triangle, flat back and front, with a receptacle for the watches at the lower extremity, so that the melting ice may fall towards and keep in contact with the receptacle, which is about five inches in diameter. There is an outlet at the bottom of the box to allow the water to escape. The lining of the apparatus is of zinc, as is the receptacle, and water-tight; and no moisture can possibly get at the watches. The temperatures in which I test the watches range from about 35° to 95° Fah. I have never found a compensation balance to vary in time over two minutes in twenty-four hours; while some will not go beyond ten or twenty minutes in the same time, which latter, any one who is acquainted with adjusting knows to be very good for the first trial. I have sold watches in silver hunting cases, for the small sum of $18, that would not go out more than that in testing. The balances were solid or uncut when bought, but were cut and "trued" up before being sold.

The reason why such balances are left uncut by the manufacturers, is because it saves the expense of "trueing," which is rather a tedious operation, as they fly out of round as soon as cut; and as very few appreciate a good watch when they have one, or understand much about the expansion balance, they are just as well for most people if left solid; and as there are so many bunglers in the trade, who understand little the principles of the compensation balance, such watches are less liable to be injured, the more simple they are in construction.

I have cut a great many balances that had been carried for some time in their solid rimmed condition; and one in particular, which the owner had carried for over twenty-five years. This one did not vary over eighteen seconds in twenty-four hours heat and twenty-four hours cold, of the above named temperatures. I did not adjust this balance, but advised the owner to carry it just as it was; it is now over two years since, and he says it runs very much better than ever before. This watch was marked by the manufacturer "Patent expansion balance." How is that for fraud?

I have tested watches of a well-known manufacturer marked "adjusted," and found them to vary from four to eight seconds in twenty-four hours; and some of the same, not marked, that were adjusted at another place, that ran out of truth more than that.

Since reading R. C.'s article, I tested a movement of another celebrated establishment, and it ran out of truth only fifteen seconds in twenty-four hours. This grade of movement the makers do not pretend to adjust. I also tested an English lever movement with a plain steel balance, and it ran out of truth two hundred and forty seconds, or four minutes, in twenty-four hours. These two movements were in the same test at the same time. I once tested a plain composition balance with a worse result; I believe the variation was over five minutes in twenty-four hours.

All these tests were made by one of E. Howard & Co.'s best astronomical clocks, costing six hundred dollars; and there is no reason to doubt its truth. The trouble is with watchmakers who do not understand their own business. I have seen a watchmaker who had been at the business over twenty years, who had not the first idea of the the *modus operandi* of adjusting a balance.

One of a prominent firm in the business told a brother of mine that this baking and freezing of watches "did not amount to shucks;" he has since proved the fallacy of the remark by carrying a watch of my adjusting, which has not varied over three seconds per week for several weeks; yet this watch ran out of truth over thirty seconds in twenty-four hours at the first trial in the apparatus.

There is a great deal of "fibbing" done by the owners of nice watches as to the time they keep. Some talk of two tenths of a second per day, etc. Some men seem to have "fine time" on the brain; some will write certificates to get their names in print, and to let the public know they have a fine watch, the companies who publish them not being responsible for what is said, so there are two sides to the lying and swindling, if there be any. I have seen a great many watches marked "compensation balance," etc., that were not, and others that had compensation balances that were not marked. The only fault was in the "marked" ones, as the balances were not cut entirely through the rim to allow them to act. There is only one way to tell whether a watch is adjusted or not, and that is to test it by heat and cold, and that any good watchmaker can do.

There is no company in this country which imposes upon the public in regard to the expansion balance, except when it claims them to be "accurately" adjusted, as such a thing is among the impossibilities for *all* temperatures; consequently R. C. has never seen an adjusted watch. Perfection is only to be thought of—not reached—in time-keeping machines, but perseverance and good workmanship will come pretty near what we wish for.

I hope I have adjusted this communication so as to compensate your readers for their time spent in its perusal.

Lowell, Mass. ALVIN LAWRENCE.

Potato Digging Machines a Failure.

MESSRS. EDITORS;—The article in your issue of April 1st, on "Potato Diggers," prompts me to offer my mite.

I have given that subject my entire attention for the past four years. I have built five different machines, besides making innumerable alterations. I have spent each season in the field with trial machines; and, at the same time, have kept an eye on the progress of my co-laborers, keeping on file the claims and specifications of all machines that have been patented since 1853.

It may seem a little odd, that nearly five hundred patents should have been issued for machines to accomplish a particular object, and not one of them be able to do it successfully; but such seems to be the history of the potato digger.

The subject is an exceedingly difficult one, and very poorly understood by those who have attempted it. Most of the patents have been taken on models before any working machine had been tried. The tendency, as the Commissioner observes, is to two forms: one, a modification of the shovel plow; the other, a scoop and agitator, or carrier. The first may be light and cheap, but the second must be strong enough to carry 500 pounds of dirt, and hold the strength of a good span of horses, if brought up suddenly by a solid stone or other impediment. Consequently, it must be somewhat heavy and expensive.

My first machine was a scoop and endless open belt or carrier. Its four successors have been modifications of the same—each built larger and stronger. The last is a wrought-iron frame with four feet driving wheels, five inches face, with heavy lugs to give it hold to the ground. I have worked on soils, light and heavy, stony and free, wet and dry, with potatoes in hills and in drills, with large and small, live and dead tops; and have found the greatest obstacles (not where they have been generally supposed to be, in heavy clay soils, but) in sandy loam, where there is no hard pan, where weeds and vines grow deep, and where there is not sufficient resistance in the soil to hold them so that they will not pull up and foul the scoop.

My experience convinces me that machines can be made to dig potatoes and do it in a workmanlike manner.

H. B. NORTON.

Rochester, N. Y.

Explosive Oils and Lamps.

MESSRS. EDITORS:—While the subject of explosive oils and lamps is occupying a portion of your columns, I am disposed to crave your indulgence for a few remarks of mine. I notice a great deal is written in reference to the flame going down into the lamp. Now it is a question with me whether such an occurrence ever takes place; and my doubts are the results of experiments with what are termed explosive oils, or fluids. I have tried by every inducement I could conceive, to coax flame into vessels with narrow necks, and have failed in every instance.

I have used glass lamps exclusively, in my family, for over sixteen years; and during a portion of the time, used that very explosive compound, known as "burning fluid," and am in the habit of purchasing kerosene oil of various dealers, and it would be very strange if I had not, at some time, had some of the "doctored" article; and with all my experience, the only accidents that have occurred to my lamps are the breakages of chimneys.

In our family, we have always used loose wicks, so loose that they could be raised or lowered without difficulty. Your correspondent, signing himself "Lindon Park," suggests very tight wicks, a plan which, according to my philosophy, is very dangerous. With a wick that fills the tube snugly, particularly if it becomes gummed or incrusted (which it is liable to do), the lamp becomes an almost air tight chamber, where explosive gas is generated, with but little chance for escape.

Is it a great wonder that, under these circumstances, explosions take place? It seems to me almost impossible that it should be otherwise. The lamp once exploded, then comes the flame with all its horrible consequences.

I hope, Messrs. Editors, that nothing I have written will be construed as if I were in collusion with manufacturers of inferior or dangerous illuminating oils, for I have no interest in any oils or patent lamps, except so far as I represent a small family in their use.

Worcester, Mass. N. L. COOK.

The Balloon Postal Service During the Siege of Paris.

Messrs. Letts, Son & Co., of London, have forwarded us an interesting memorial of the late siege of Paris, being a *fac simile*, except the name and address, of a letter sent by the *ballon monté "Céleste,"* and with which this firm intends to supply the leading stationers in this country. The letter bears the postmarks and stamp of its original, and even the size and weight are identical. An epitome of "Balloon Postal History" accompanies the letter, the whole constituting a very attractive memorial of one of the most important historical events of the century. From the epitome alluded to, we gather the following statistics of the balloon postal service:

Sept. 30th.—The letter alluded to was sent per the *Céleste*.

Oct. 7th.—The *Armand Barbès* took M. Gambetta and the first carrier pigeons out of Paris.

Oct. 14th.—The *Godefroy Cavaignac* took out M. de Kératry.

Oct. 27th.—The *Vauban* fell near Verdun, in the German lines.

Nov. 4th.—The *Galilée* was captured by the Germans.

Nov. 12th.—The *Daguerre* was also captured.

Nov. 21st.—The *Archimède* fell in Holland.

Nov. 24th.—The *Ville d'Orléans (ballon monté)* fell in Norway, after a most extraordinary voyage, both for speed and adventure.

Nov. 30th.—The *Jules Favre* was lost at sea.

Dec. 15th.—The *Ville de Paris* fell in Nassau.

Jan. 28th, 1871.—The *Général Cambronne* was the last officially despatched balloon.

In all, 54 official balloons (conveying 2,500,000 letters), were sent out during the siege; besides many private ones, of which there is no record.

How to Prove a Plumb Level.

MESSRS. EDITORS:—I saw in your paper an article entitled, "How do you Prove your Plumb Rule?" The writer appears to have lost sight of the question, and taken in its place the query, "How do you make a correct plumb rule?" We wish to know how to prove what we have on hand. A quick way to prove one, is to drive a nail into a wall or post, leaving one inch projecting, and in such a position that a plumb and line may swing free of obstruction. Then let a delicate line be suspended so that it will touch the most prominent part of the nail head. Then, two or three feet below the nail, and exactly under it, insert a screw, and drive it up until the delicate line, to which a bob has been attached, will just touch the most prominent points on the heads of the nail and screw, and you have two points perpendicular to one another. To these points apply your plumb rule, which, if true, will correspond. This is a quick and easy way to prove a rule.

I do not think a rule constructed on the writer's plan is even likely to be true. Compasses are generally so easily moved in their joints, or there is likely to be some spring in them, even if supplied with a stay bar and set screw, that to invariably lay off two circles of precisely the same diameter, is next to impossible. With but two points on the face of the board, the workman's plane may cut a fraction deeper at one end than at the other, so that the center marks of the compasses may not be equally distant from the edges.

Union Point, Ga. C. M. STURGIS.

[Our correspondent also gives directions for making a plumb rule, which being substantially like those given by another correspondent, are omitted.—EDS.

How to Make a Plumb Rule.

MESSRS. EDITORS:—This is the way builders should make plumb rules: Plane the face straight and out of wind. Plane one edge straight and square with the face. Run a gage mark to the proper width; plane to the mark exactly; gage to a thickness on each edge; plane to the marks. Run a gage mark through the center for the plumb or cord line. Saw a hole in the bottom for the bob. Cut a saw cut in the top of the line for the cord; and a slanting saw cut each side of the center one, to fasten the cord into. Geometrically it is correct to "strike a circle at each end, and to plane so as to touch the sides of the circle;" practically, it is next to impossible to touch the circle exactly and have the rule exactly straight between them. If any do not believe this, let them try it. Theoretically the "circle way" is very pretty; practically, it would not do to "swear by;" at least, if some of the carpenters and builders here had to make their rules on the "tangent" principle, they would not do to swear by, and some of them I would not like to swear by, no matter on what principle they were made.

Paterson, N. J. JOHN HENRY.

THE EFFECT OF ELECTRICITY UPON BLOOD.—Professor Newman, of Königsberg, in studying the action of electricity upon the animal organism, has recently found that under the influence of powerfully induced currents, the white blood corpuscles of the frog swell up. Between their walls, which become very smooth, and the interior granular nucleus, a free space is left, and the granules of the nucleus manifest rapid movements.

THE HUM OF INSECTS.—The sound produced by insects has never been observed to possess any varied tones, or other peculiarities which would entitle it to be considered music. The Cicadæ, common in Greece and Italy, which can be heard for a mile, are cultivated and caged by the Chinese, a race whose ignorance of and want of taste for music of all kinds is strangely at variance with the rest of their national character.

To Tint Photographs Slightly.

The following easy method for tinting photographs is well adapted for persons who have little leisure for the other and more artistic manner.

Having prepared the photograph in the usual way, take a little pink madder or carmine, and lay it on the cheek with a clean pencil. Soften it carefully all round the edges, blending the tint into the face. Repeat the process once and again, until you have obtained nearly as much color as necessary; I say nearly as much, because you have to pass the general flesh wash over it, which has the effect of darkening it considerably. For the purpose of softening, it will be as well to have two pencils on one holder. It might appear that putting on the color of the cheek at once, and softening it, would suffice; but you will get it far softer by doing it with a very pale tint two or three times, than you possibly can by making it at once as powerful as necessary; besides, it is impossible to soften a strong color so well as a pale tint. When the color is quite dry, go over the whole of the face with the flesh tint, then put in the hair, eyes, eyebrows, and lips; round off the forehead with gray, and apply the same to those parts of the face where you observe it to be in nature. If your photograph be a very dark one, you will not require so much gray in it as if it were a light impression. Next wash in the background, and proceed with the draperies, etc.

Return now to the face: strengthen the carnations, grays, and shadows, by hatching delicate tints over them; put the light in the eyes, and the spirited touches about it, and the eyebrows, mouth, etc., and finish off the hair. In dark photographs, you will require to lay the lights on the hair with body color, as it is generally much darker than it appears in nature. Make out the linen with a gray, deepening it in the darkest parts, and lay on the high lights with constant or Chinese white. Proceed next to shadow the drapery, and when you have obtained the required depth, scumble in the high lights, using a bare pencil and a very gentle hand, as before directed. Give the background another wash, if requisite, and your photograph is finished; or make up a tint of orange vermilion and white, according to the complexion, and lay it smoothly over the face and hands; then put on the carnations with rose madder, and shadow up the face with orange tint, and proceed as above to finish. If the backgrounds and draperies appear dead, you may take a piece of very soft washing silk and rub them up a little, which will have the same effect as if they had been hot pressed. Whenever body color has been used, the rubbing will be ineffective. Neither rubbing nor hot pressing will give a shine to any but transparent tints. If there be metal buttons chains, or epaulettes, they must be laid over the dress with body colors; a very good ground for them is red chrome and gamboge, shadowed with burnt umber, and hightened on the lights with lemon chrome and Chinese white. By the foregoing methods, it will be unnecessary to hatch or stipple a great deal; for you will find that the face will come out very soft and round without it, but the effect is far inferior to that produced by the other process.—*Photographer's Friend.*

Shellac Varnish for Furniture Etc.

This varnish has been employed by cabinet makers upon their ware, but not generally as a finishing varnish. It has generally been employed, when much diluted, for the purpose of filling the pores of the wood to form a good body, previous to the application of copal or finishing polish. Shellac is prepared from a gummy substance deposited upon trees by an insect. Seed lac is more costly and better than shellac, being the select parts from the trees, free from many impurities which exist in the latter. Either kind forms a varnish when dissolved in alcohol, which alcohol should be a good article, say 0.80 to 0.85 sp. gr. This is the kind of varnish most frequently used by pattern makers, etc., but is hardly suitable for furniture or other similar articles, on account of its containing a yellowish coloring matter which injures the appearance of the surfaces to which it is applied. Cabinet-makers, therefore, employ a bleached solution of shellac, particularly for white or light-colored woods. The bleaching of shellac is generally effected on a large scale by chlorine or some of its compounds, or by sulphuric acid; the bleached article costs about 50 cents per pound, and the unbleached less than half this sum. The bleached shellac is frequently dissolved in spirits of wine, for use as a varnish by cabinet-makers. This varnish is quite apt to stain any inlaid metallic ornament upon the furniture, or any metal attached to it, in consequence of the varnish retaining a small proportion of the bleaching compound in solution. Another process of bleaching may be adopted, which renders the varnish free from this objection, and very much reduces the cost of the bleached article of shellac or seed lac. This process consists in the use of animal charcoal as a bleaching powder. It is prepared in the following manner: Any quantity of yellow shellac, previously broken in small pieces, is conveyed into a flask, alcohol of 0.83 sp. gr. poured upon it, and the whole heated upon the hob, or, in the summer, in the sun, until the shellac is dissolved; upon this so much coarsely powdered animal charcoal is added to the solution that the whole forms a thin paste; the flask is closed, not quite air tight, and left so for some time, exposed to the sun; and in eight to fourteen days a small sample is filtered, sufficient to ascertain whether it has acquired a light yellowish brown color; and whether it yields a clear, pure polish on light colored woods. If this be the case, it is filtered through coarse blotting-paper, for which purpose, it is best to employ a tin funnel with double sides, similar to those employed in filtering spirituous solutions of soaps, opodeldoc, etc. The portion which first passes through the filter may be preserved separately, and be used as a ground or first polish. Then some more spirit is poured over the charcoal upon the filter, and the solution used as a last coating. The solution of shellac purified by animal charcoal has a brown yellow color, but it is perfectly clear and transparent; when diluted with alcohol, the color is so slight that it may be used in this state for polishing perfectly white wood, such as maple, pine, etc., without the wood acquiring the least tint of yellow.

Shellac can be dissolved by an alkali, but it is rather a saponaceous compound, and it does not make a good varnish for resisting water. It is best to dissolve it in alcohol, in order to get a good varnish, and one that will combine with coloring matters for various purposes. By adding some lamp-black to alcoholic lac varnish, a beautiful varnish for black leather is produced.

Pennsylvania Iron Ore Beds.

The *U. S. Railroad and Mining Regiser* says: An important discovery has been recently made in Morrison's Cove, Blair county, in the southeastern corner of Central Pennsylvania, known by the local name of Leather-Cracker Cove. The Cambria Iron Company purchased, last year, a range of ore rights, on which shafts had developed a nearly vertical bed of solid brown hematite iron ore, from 22 to 26 feet thick, the outcrop of which runs along the outer edge of the limestone (Lower Silurian) formation which forms the bottom or central area of the cove, where the slates begin to form the base and slope of Tussey Mountain. The discovery of this stratum of ore was in itself of great importance, and cast new light on the vexed question of the law of our brown hematite deposits; helping much to explain the appearance of large bodies of ore in similar situations in other parts of the State, for example at Mount Pleasant mines, in Path Valley west of Chambersburg; and giving us a very sure clue to the discovery of other deposits, on the same geological horizon, now entirely concealed.

One of these shafts was 52 feet deep. To drain it, a tunnel was commenced at the creek in the bottom of the cove, 250 yards distant, and driven towards the shaft, which it struck at a depth of 45½ feet from the top, or surface. For 213 yards this tunnel passed through a succession of limestone rocks, standing nearly on edge. It then suddenly entered a mass of ore, wholly unexpected. For 72 feet it passed through this ore, so hard that gunpowder was used all the way. To learn more of this mass, a 37½ feet deep air shaft was dropped from the surface to the tunnel. The first 18 feet of the shaft went through loose ore; the rest was as solid as that passed through in the tunnel. After passing through the ore, the tunnel was driven 5½ feet through yellow clay and then entered the 26 feet ore bed, to drain which it had been originally projected. Here, then, we have a double bed of solid brown hematite iron ore of the amazing thickness of 103½ feet, with a parting of 5½ feet of yellow clay.

This gigantic ore bed descends, with regular walls, at a nearly vertical inclination, and to an unknown distance, under the roots of the Tussey Mountain. If continued eastward, between the limestone and the slate formations, it must rise, between the limestone and the slate, in Path Valley and the great valley of Chambersburg. This it actually does at the Mount Pleasant furnace mines. There is good reason then to believe that it underlies the whole intervening country, but at depths which are sometimes enormous. For, under the Broad Top coal region, it must lie at a depth of four or five miles that being the space occupied by the Lower Silurian, Upper Silurian, Devonian slate, and sandstone and limestone formations from No. III to No. XII. Whether the ore holds any like its Leather-Cracker size the whole distance, will never be known; but all analogy teaches us that its thickness will vary all along the line, and vanish to nothing under certain areas. Whether this remarkable deposit runs underground in a straight and narrow belt from Leather-cracker Cove to Path Valley, or spreads about in all directions under Broad Top, Huntington and McConnellsburgh country, ramifying and reuniting like the water lagoons in a swampy district, we shall never learn: for the ground, for the central portions of the ore area, lies far below the reach of boring tools. But the outcrops of the ore around the sides of Morrison's Cove, and the outcrop of ore for twenty miles in Path Valley, show that the belt of deposit is a broad one; while the presence of great deposits of ore, in exactly the same geological position, as far away as the country between the Schuylkill and Lehigh rivers, proves the immense outspread of the general deposit.

It may help our readers who love the iron science to get rid of the old "pocket" prejudice respecting brown hemaite ore, if we add one more item to our description of the Leather-Cracker bed. On the opposite side of the Cove, the limestones and slates turn over and go down nearly vertically in the opposite direction, that is west. Here shafts have been sunk to the depth of a hundred feet on the 26 feet ore bed, and it is found quite regular. Several miles further south the dip turns, and the bed comes up again all right. Search is now being made for the great lower member of the bed on that side.

IN the chief operating room of the Western Union Telegraph Company, New York, and performing part of its regular routine service, is an operator only fourteen years of age. He was educated by Mr. Westbrook, of Wilmington, Del. when only eleven years of age, and at that age was placed in the service at Cape May. From thence he took charge of the office at Princeton, N. J., and during the strike went to Washington, D. C., performing there the full service of a veteran operator. This boy, whose name is Benjamin Johnson, is an easy and rapid penman, can transmit easily 2,000 words an hour, has the manner of riper years, and has a pleasant courteousness which is indicative of self-respect and companionliness.—*Journal of the Telegraph.*

Magnetic Engines---Their possible Duty.

In view of the recent extravagant claims made by persons interested in Payne's new magnetic motor, to which the attention of our readers has been called, the following calculation, from the "Journal of the Franklin Institute," will be of interest:

Attention has been drawn lately, in some of the public prints, to one or more forms of magnetic or electric engines, claiming to develop an available and economic motive power. It may be, therefore, of interest, or even of use, to put before our readers, in a few words and figures, the possibilities of invention and improvement in this direction.

The total mechanical equivalent of a pound of pure carbon, consumed with oxygen, is 7,900 × 1,390 — 10,891,000 foot-pounds; or, in other words, one pound of pure coal burned in one minute would, if applied with absolute economy to the development of motion, exert a force of 10,891 ÷ 33 — 332-horse power during one minute; or, if burned during an hour, would exert 332 ÷ 60 — 5·5-horse power during the hour; or, again, each horse power would require 1 ÷ 5·5 — ·18 of a pound of coal per hour, nearly, or say ⅕ pound. Now, as a matter of fact, a good engine and boiler does develop a horse power for each 5 pounds of coal consumed, being about $\frac{1}{25}$th, or say 4 per cent of what it might do if a perfect machine. This shows us that there is a large margin for improvement in reference to the duty of our steam motors, and that if, in any other manner, chemical force be converted into motion in a less wasteful way, some increase in the costliness of the fuel may not be inconsistent with economy. But this, like any other problem, has its limits, and these it is our purpose to define.

The total mechanical equivalent of zinc is 1,301 × 1,390 — 1,808,390, or, in other words, a pound of zinc consumed with oxygen in one minute would, if applied with absolute economy to the production of motion, develop a force of 1,808,390 ÷ 33,000 — 55-horse power during that time; or, during one hour, 55 ÷ 60 — ·91, or, say, 1-horse power.

Or, in other words, zinc, being consumed in such a way that its total useful effect should be applied without any loss whatever, would, weight for weight, be about five times as effective as coal in its present wasteful manner of consumption. When, then, zinc is less than five times as costly as coal, and a perfect battery and electric engine have been invented, these will compete favorably with the steam engines of the present day.

With reference to some statements that have been published, it may be interesting to note that, from the above data, it is evident that with a perfect battery and engine, to develop 2½-horse power for ten hours, would demand the consumption of 27·4 pounds of zinc.

The same journal also has the following article on

THE MAXIMUM OF MAGNETIC POWER EVOLVED BY A GALVANIC BATTERY.

A curious succession of papers on the above subject has appeared lately in the *Chemical News*, from the Rev. H. Highton, in which that gentleman attacks no less important a principle than the conservation of force, and maintains no less difficult a thesis than the possibility of what is technically called perpetual motion, or the development of power without a corresponding expenditure of force. The subject would hardly be worthy of our notice but that, strange to say, these opinions have gone, so far, unchallenged in the pages of our learned cotemporary; and, in connection with schemes alluded to in the above item on galvanic motors, seem to have led astray some investigators.

The theory of the daring author above named, is briefly thus: A battery current, passed through a given electro-magnet, will lift a given weight; if, now, we double the cross section of the wire of said electro-magnet, and also its length, the resistance of the circuit remaining the same as before, the current developed by the battery and the consumption of zinc will remain as before, and yet the lifting power of the magnet will be doubled. Or, in place of increasing the size and length of wire, several similar electro-magnets may be so introduced into the circuit as to produce the same effect. Such a process continued indefinitely would, of course, enable us to develop any amount of magnetic force from a given battery.

So far, well; but we have not yet come to the development of power, which implies motion. For this, it is evident that the electro-magnet must be charged and discharged, and here comes the compensating condition. To charge a double length of wire will take just twice the time, and therefore cause a double expenditure of zinc in the battery.

Our author, in fact, notices this, but remarks that "the electric current is so rapid that this difference of time is inappreciable within any practical limits." Without doubt, to advocates of perpetual motion, but not to those who can see that two millionths of a second are as much twice one millionth as two centuries are twice one; or to the zinc, which, having to work twice as long at each effort, will be doubly exhausted when a given number of actions has been completed.

A CASE of elephantiasis is trying the skill of the medical faculty at Waterville, Me. In this disease, which is very rare in this country, the patient's legs are swollen to an enormous size, the skin becoming hard and rough, and suggestive of the lower extremities of an elephant.

THE WILLIAMS COLLEGE scientific expedition to Central America has been quite successful, and brings back valuable contributions to nearly every department of natural history. Among the most important of their collections are three hundred new specimens of birds and four hundred of insects.

Improved Animal Power for Churning, Etc.

Domestic animals, such as sheep, dogs, and the like, may be made to perform much useful labor, by the use of proper appliances. It is obvious, however, that a machine, designed for light animals of this kind, should itself be so constructed as to consume the least possible amount in friction, and enable the animal employed to exert its strength to the best possible advantage. Simplicity, durability, and cheapness are also indispensable in a machine designed for general use; and if, with these advantages, portability be also combined, such a machine might, we think, secure a large market among agriculturists, who can find many uses, about the farm, for such a machine, beside that laborious one of churning, for which such a power would find its most important place. A machine which seems to possess these requisites is shown in the accompanying engraving.

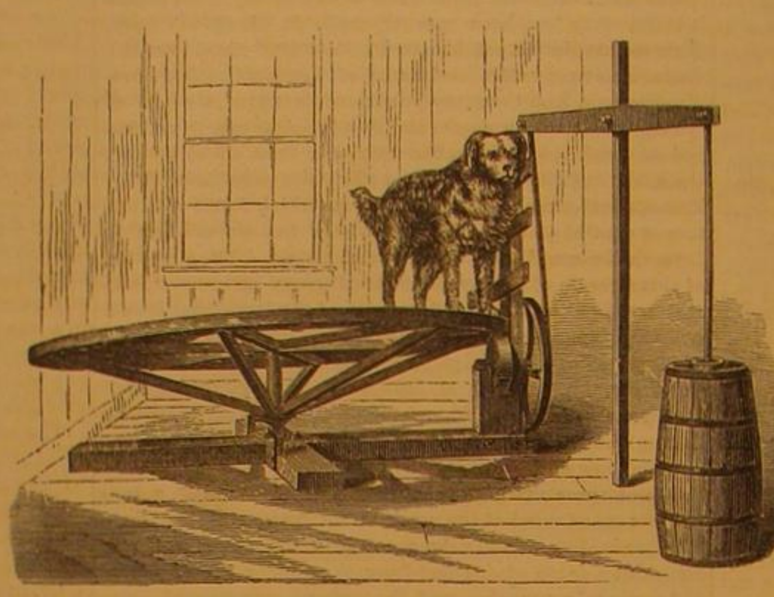
It consists of a wide rimmed wheel upon which the dog, sheep, or goat travels, its central bearing being a sleeve, which runs on an inclined spindle. The inclination of the spindle may be adjusted to the weight of the animal, as its foot is a cross-bar resting in slotted supports, which may be raised or lowered at will, and set so as to incline the cross-bar.

The edge of the wheel rests upon a friction wheel, as shown, or it may be toothed, to drive a pinion if desired.

To the shaft of the friction wheel, or pinion, is affixed a fly wheel, and from a crank pin on this wheel, the power is transmitted to the churn.

The whole can be taken to pieces, and packed in a very small space for transportation. When wanted for use, it can be set up in a very short time.

A patent on this machine was issued to J. H. & G. Hawes, of Monroeton, Pa., January 10, 1871, through the Scientific American Patent Agency. For further particulars, address the patentees as above.



SMALL ANIMAL POWER FOR LIGHT PURPOSES.

Death of Professor Augustus de Morgan.

We regret to have to announce the decease of one of the most eminent mathematicians and logicians of the present century. Augustus de Morgan was the son of an officer in the East India Company's service, and was born in India, in the Madras presidency. He entered at Lincoln's Inn, London, with the intention studying law, but abandoned the idea, as the mathematical chair in University College was vacant; and he obtained the honor of the appointment in 1828, he being then twenty-two years of age. He resigned a few years ago, in consequence of the university authorities refusing to install Professor Martineau, as professor of logic, on the ground of his religious belief.

As a teacher and writer on all branches of mathematical science, Augustus de Morgan's reputation was world wide; and he was well known as an actuary of extraordinary talent, although he had never been connected with any life office. Moreover, his knowledge extended to every field of science and literature, and his mind and memory were prodigiously acute. He recently published, in the London *Athenæum*, a series of papers entitled "A Budget of Paradoxes," in which he demolished crowds of circle squarers, perpetual motion seekers, and other monomaniacs, with a scathing wit and humor, and a power of logic and learning, illustrated by quotations from and references to writers of all ages, from the oriental Shasters and Egyptian hieroglyphics down to the smallest ephemeral writers of our day. He was a member of all the chief scientific societies in his own country, and was well known and honored on the continent of Europe. His place in the world of science and in literature will not easily be filled.

SPITTOON FOR INVALIDS.

This is a very convenient and useful appliance for the sick room, invented by J. M. Cayce, of Franklin, Tenn. The improvement consists in providing the handle with a system of levers by which the lid is opened. The hand, in grasping the handle, presses the button on the first of the series of levers which operates the lid, and the lid falls shut by its own weight when the button is released from pressure.

Names of our Children.

It appears from calculations, that two thirds of all the children in England and Wales are called by one of the following twenty-five names, in the following order:

Order.	Name.	No.	Order.	Names.	No.
1	Mary	6,819	14	Jane	1,697
2	William	6,930	15	Ellen	1,631
3	John	6,250	16	Emily	1,615
4	Elizabeth	4,617	17	Frederick	1,604
5	Thomas	3,876	18	Annie	1,580
6	George	3,630	19	Margaret	1,546
7	Sarah	3,602	20	Emma	1,540
8	James	[illegible]	21	Eliza	1,507
9	Charles	2,823	22	Robert	1,535
10	Henry	2,060	23	Arthur	1,2 7
11	Alice	1,925	24	Alfred	1,282
12	Joseph	1,780	25	Edward	1,770
13	Ann	1,718			

Total No. of children (out of 100,000) registered under the above twenty-five names.......65,892

Add "Richard," "Peter," "Charlotte," "Lucy," and one or two more, and we shall have the whole list of names with which the masses of the English people are familiar. They have not apparently, in all these years, invented, so to speak, one name of their own, as the Germans have "Hermann," and the French "Jacques," but have been content to name almost everybody after the Virgin, or a saint or two, or some English king, or king's son or daughter. No English forname is distinctly of the people. Nothing so quaint as the adoption of the Old Testament names in the way in which Connecticut has adopted them has ever been popular among them; they have liked no Roman names, have forgotten all British names, have, in fact, stuck to their usual text, that some big person must use a name before they can find the courage to do it. "Alice" seems as old as English history, "James" occurs in Doomsday Book, "Robert" is Teutonic, and very old, and "Mary" of course is the pre-eminently Catholic name; but for the rest, every name seems to have derived its popularity either from some saint or some English king.

HOSE REEL FOR FACTORIES.

The accompanying engraving shows a hydraulic apparatus, recently patented in England, and designed to be fixed in public buildings or manufactories, for extinguishing fires.

As will be seen, it is very simple. A drum is mounted on a frame, and a hollow axis is brought through the center of the same into a gland or stuffing box. It may also be connected to steam and other fire engines, or used in connection with waterworks, force pumps, etc. The advantages claimed for the apparatus are, that any quantity of water and piping can always be kept ready for use in a building, while the annoyance and delay of uncoiling and connecting the pipe together, when every minute is of great importance, is obviated.

Flexible Rock--Itacolumite (Articulite).

The attention of scientists has recently been again directed to the structure of this singular flexible rock, by an article in the *Chemical News*, from the pen of Prof. A. M. Edwards. The labor of Prof. E., of which the article in question is a summary, was undertaken mainly to examine and confirm the results obtained in 1867 by Prof. C. M. Wetherill, after a microscopic examination of the rock. The last named investigator determined the flexibility of the itacolumite to be due to "small and innumerable ball and socket joints, which exist throughout the mass of the stone very uniformly," and proposed for it the name of "Articulite." Prof. Edwards' examination resulted unfavorably to this view of the subject; and it is in reply to his paper, above referred to, that Prof. Wetherill published another note on "Itacolumite" of which the following is an abstract, given in the *Journal of the Franklin Institute*:

In respect to the joints, it may be said that:

1. Each ball and socket does not admit of a great play, and is not smooth and perfect like that of the joint of a limb; it is, notwithstanding, perfect in principle of motion.

The stone is built up of grains and congeries of grains loosely coherent, and forming irregular cavities, in which are engaged projecting parts of other congeries of grains of sand which are susceptible of a slight motion in the cavity—in some cases in one direction, and in others in several or in all directions. This freedom of motion is of the true quality of a ball and socket joint.

2. The motion is *not* most "marked in a direction at right angles to the lamination." It is certainly so if a piece be taken of which the thickness is small in proportion to the other dimensions; but that is not the method by which the true motion is shown. A properly made section is susceptible of as much motion in the plane of lamination as at right angles to such a plane.

3. The proof of the nature of the joints does not rest solely upon the microscope, although that alone is sufficient. The motions of the cylindrical rod afford an independent and equally convincing demonstration of its ball and socket character. There is no other kind of joint which could explain the motions of which this rod is susceptible, namely: "It can be *compressed* and *elongated* in the direction of its axis, the extent of motion being a little over ½ a millimeter. When one end is fixed, the other end may describe a circle of 34 millimeters diameter, and may be made to touch every point in the area of the approximate spherical zone. The rod can also be twisted about its axis, the torsion being 10°. I may add that, by shaking the rod near the ear, one may hear the clicking of the joints, as the motion is arrested at the limit of their greatest play.

The nature of the curve (nearly a catenary) when the rod is supported by its ends, agrees with the joints which I have described, and confirms also the revelations of the microscope.

I have never seen anything so wonderful as this rod of itacolumite. When held by one end upward, it totters in all directions, so that no one, seeing it at a short distance, believes that it is a stone. A gentleman from California, to whom it was shown, suggested jocularly that it would do well to build houses with, in his earthquake shaken State.

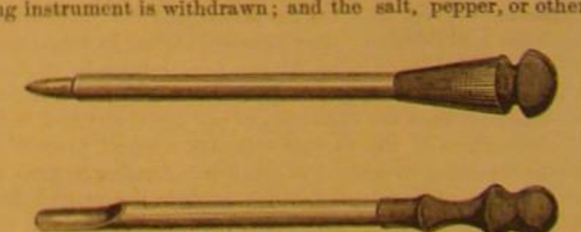
Indeed, I have no doubt that a sufficiently high and thin well built wall would be susceptible of a decided motion before cracking. The height of wall, so much greater than its thickness, would permit the play of the innumerable small joints, existing from the bottom to the top, to be perceived.

In order to see the joints, a thin section, supported at one or at both ends, may be moved, while under the microscope, with a needle point; by changing the position of the section, a part may be reached at which the play of the joints may be perceived. They can also be seen by dissecting a flexible piece of the mineral, using either a fragment or a surface rubbed flat. The surface to be examined is inverted, tapped, and as far as practicable, brushed from loose grains. It is then examined under the microscope with a power of 40 to 60 diameters.

The attention of the observer is first attracted by the irregular pits or depressions formed by grains of sand. By very delicate touches with a fine curved needle point, the surface may be investigated; loose grains of sand are seen and removed. Touching other grains and congeries of them delicately with the needle, proves that some have motion in a cavity formed of grains of sand cemented together. These are dissected out, and other movable groups are found. Some have less motion than others, and some are immovable By patient investigation of the mineral in this way, the observer will rise satisfied that it is made up of joints of the character described.

DEVICE FOR SALTING AND SEASONING MEATS.

Cooks have experienced the difficulty of uniformly seasoning large joints of meat. While the outside will be incrustated with salt, the interior is often so fresh as to be quite insipid. The device herewith engraved, is constructed somewhat on the principle of a surgeon's trocar. It consists of a sheath, containing a puncturing instrument. The whole being thrust deeply in the meat to be seasoned, the puncturing instrument is withdrawn; and the salt, pepper, or other



seasoning can be conveyed to the interior of the joint through the sheath.

This device was patented by Warren Sadler, of Lockport, N. Y., in April, 1867.

Porcelain Process and Collodion.

A correspondent of the *Photographer's Friend* says: Coat a porcelain plate with collodion, sensitise in the negative bath, the same as proceeding with an ordinary negative, place it, when coated, in the plate holder, then take any negative you wish to make a picture from (one not too intense is best). Curtain a window with dark paper or cloth, and cut a small opening the right hight for the camera. Put your negative in the opening cut from the curtain, and make a picture on your porcelain plate, as the case may require, large or small, the same as if copying a picture; develop, then wash, fix with cyanide, and tone with gold, mercury, or sulphuret. Wash, dry, color, and varnish. Exposure from five to thirty seconds.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE SUEZ CANAL.

When the Suez Canal was opened to traffic, there were numerous prophets throughout the world, who predicted it would prove a commercial failure, and there were not wanting those who prophesied that the drifting sands would obstruct the passage so much that engineering skill would be taxed to its utmost to keep the channel clear, at a cost within the receipts from tolls.

The canal has now been in active operation a year, and, it is stated, its receipts exceed its expenditures by $160,000 in gold, which, although it would make only a small dividend on the capital invested, is still a profit, and the fact is significant of permanent success, especially when considered in connection with the increasing steamer traffic.

For some reason, sailing vessels do not favor this route as yet, and the receipts are almost wholly from steamers. The opening of the canal has given rise to the construction of a large number of the latter named vessels, especially designed for the Suez route.

During the period for which the canal has been used for trade, there have been no serious obstructions whatever. The supply of water has been ample: the banks have maintained their integrity, and, in short, the entire category of ills, so confidently predicted by the sceptical, have not yet manifested themselves.

But while the canal has proved an engineering success, and, to an encouraging extent, a commercial success, it is still laboring under the burden of serious financial embarrassment.

The situation financially possesses some peculiar features. Its owners are of four kinds or classes: the shareholders, holding £8,000,000 of stock; the Khedive, holding £4,000,000; a small class, holding a kind of preferred stock under peculiar conditions, which we need not dwell upon here; and the debenture holders, whose debentures are £4,000,000, and guaranteed a dividend of five per cent. This dividend, amounting to £200,000, has only £32,000 to meet it, and the directors are in the condition of the breathless German flute player, who did not know where the wind was to come from.

More money must be raised somehow. France has none to spare, and England seems the only source whence it can be obtained. If M. Lesseps triumphs over the present difficulties of the situation, the world will accord him the honor of being the best financier, as well as one of the best engineers of his time.

But how is the money to be got from England? The present profits of the canal do not make it a desirable investment; the prospective profits *may*, provided the canal be made the means of enlarging the British possessions.

There is not a shadow of a doubt that this thought is taking daily more and more definite form in the minds of far-seeing Englishmen; and we are prepared to see the great Suez canal become substantially British property, notwithstanding any objections the Khedive may make, or any feeling the French government may have against such a scheme.

A KNOWLEDGE OF COMMON THINGS.

It is not a knowledge of abstruse and difficult questions that we need, so much as a familiarity with the every-day affairs of life. The number of persons who attain to eminence by the extent of their information is necessarily small. Their heads tower above others, like the peaks of mountains, and their names are in every person's mouth. They are the exceptions, and not the rule. It will be observed in studying the history of the world, that the great mass of people, who represent the valleys, have been raised by the progress of discovery and invention, until the common man has, at the present age, attained a hight that was formerly considered inaccessible, except to the scholars by profession. The man who excels must go vastly higher now than he was compelled to do in the time of Plato and other philosophers, about whom our learned pundits tell such marvelous stories. In fact, Liebig says: "Our children have more accurate perception and understanding of nature and natural phenomena than Plato had, and they can laugh at the mistakes made by Pliny." But there is no denying the fact that a knowledge of common things is sadly needed in every community; and we must take care that children of a future generation do not turn the laugh on us. We are led to these reflections by the occasional receipt of letters asking questions, the answers to which ought to be known to the veriest tyro in science. We are always glad to answer questions, and many of our correspondents favor us with valuable information, or start topics that lead to important investigations. Now and then some one asks a question, very much as if he were to inquire if water commonly runs up hill, or something equally absurd. We receive specimens of minerals, such as quartz or rock crystal or feldspar, desiring an analysis to be made, and inquiring if they contain precious metal? We are asked if a perpetual motion be possible? What are the constituents of water? Can it be rendered combustible by being passed through iron grates? Does the air have any weight? Can water be compressed? And so on through a long list of questions, upon subjects that ought to be common property with every one who has attended public school.

We think that teachers and professors commit the mistake of aiming their instruction too high. They take it for granted that their pupils know more than they really do, and omit just the common things about which we are complaining that there is too much ignorance. If we begin at the top, and raise the roof of a house, that does not help the foundation. It is better to see first to the cellar and basement, and build up strongly from the bottom; we can then add to the structure as much as we please, and those who have the leisure and the means may go up as high as their inclinations may lead them. Arithmetic must precede algebra, mineralogy properly introduces geology, spelling goes before composition; things ought to be taken in their natural order, and jumping over the "Slough of Despond," or tunneling the "Hill of Difficulty," will not do.

The merchant who introduces a new style of goods must, first, by advertising and in various ways, create a demand for what he has to sell. People must learn to appreciate and value the new articles. It requires very little preliminary education to accomplish this, but the invention of a new machine, involving a knowledge of the first principles of science often meets with great obstacles on account of the ignorance of the community. Such an inventor is said to live before his time. If he had been born a hundred years later, he would have had no difficulty in introducing his invention. The best illustration of this argument is afforded in the history of the steam engine that Papin tried to induce the Government of Hanover to permit him to apply to vessels navigating the river Weser, at a period when there were probably not half a dozen men on the globe who possessed enough knowledge of physics to appreciate the invention. At the present time, a school boy can buy for a dollar a more complete engine than the wisest mechanic could have constructed a hundred years ago. A knowledge of the properties of steam has become universal at the present time, and Papin would have the whole nation to sustain his demand, were he to return to earth and make it now.

The question arises: Are there not probably Papins of the present day? The list of patents published by us affords to the reflecting mind abundant material for inquiry. Some one who is in advance of his fellows makes a discovery, and offers it to the world for a reasonable sum. His offer is not accepted for the reason that the small amount of knowledge, required to appreciate it, is wanting. He must wait, or, as is frequently the case, has the mortification of seeing his discovery appropriated by some one else.

We spoke of quartz crystals as having been sent to us for examination and report. Now, it ought to be known that the crust of the earth is more largely made up of silicon than of any other element excepting oxygen; and yet more information can be obtained in our text books about such rare elements as selenium or tellurium, than about silicon. The commonest stone we have, the element silicon that is everywhere disseminated, is a profound mystery, and we do not apply it in the arts on account of our ignorance of common things. The alloy of silicon with copper is said to be harder than steel, but not more than two or three chemists have ever made it. Here is a metal that we stumble over every time we take a walk, and yet common as it is, no one knows how to use it.

What we want is evidently not so much an increase of knowledge as the universal dissemination of facts already known. All scientific men will bear testimony to this. If no new discovery were to be made for the next ten years, the world would not stand still, but would have time to take an account of stock, and to apply the many useful things that are now slumbering in the hands of the few who know about them.

We say to our friends the teachers and writers: Do not soar too high, but keep down to the level of the masses, and help us to a knowledge of common things.

BISULPHIDE OF CARBON.

Thirty years ago a pound of bisulphide of carbon cost $5; it is now manufactured in France at 5 cents a pound. The uses of this important article have increased in the same ratio as its cost has diminished. It is now made in perpendicular retorts, built of the same material as the glass-house pots. These are glazed inside by a mixture composed of 20 parts soda and 12 parts boracic acid. They are 1·8 meters high, and ·5 meter interior diameter. A bench of four retorts is put in each furnace, and generally lasts, with careful usage, six months.

Every three minutes, 155 grammes of sulphur is introduced, which, in the course of twenty-four hours, amounts to nearly 50 pounds. The sulphur burns, in glowing coals, to form a vapor, which is condensed into a liquid in zinc coolers, and is collected under water. A cherry red heat is required for its formation, and the crude product is further rectified by distillation in a steam bath.

The bisulphide of carbon is a liquid at ordinary temperature, while the corresponding binoxide of carbon, or carbonic acid, requires great pressure and cold to reduce it to a liquid. The bisulphide of carbon has recently been converted into a snow white solid, by passing a rapid current of dry air over its surface. The sudden evaporation thus produced has proved sufficient to solidify it, although it has hitherto resisted even so low a cold as —90° C.

In the course of manufacture a good deal of sulphur goes over, and is dissolved in the bisulphide; and sometimes as much as 15 per cent is reclaimed by rectifying the product. The manifold uses to which the bisulphide of carbon has been applied of late years have made it one of the most important of our chemical products. It is the best agent for extracting oil from press cake or from any other source. Near Berlin are extensive oil factories, where the extraction is accomplished by this chemical means. The most extensive application of the bisulphide has been in the vulcanization of india-rubber; it is used for this purpose in association with a small quantity of chloride of sulphur. Linen rags which have been used to wipe machinery, are cleansed, and the oil saved, by digesting in the bisulphide of carbon. Its effects upon the lower forms of life are analogous to those of carbolic acid. It destroys the larvæ of insects, and has hence been extensively used to destroy vermin. For the extermination of the weevil in wheat, a small quantity of the liquid, put in a saucer and placed on a beam in the granary, is found to be very efficacious. It is a valuable solvent for sulphur, iodine, and many substances not soluble in water. Dr. Gibbs recommends a solution of phosphorus in bisulphide of carbon as the best liquid for filling prisms in experiments upon light, as it possesses high refracting power, much superior to the best flint glass.

The bad odor of bisulphide of carbon can be removed by distilling it off scraps of metal, and repeated rectification; it is then very much like an ether, and can be used to extract the principle from pepper, ginger, coffee, and spices, in the manufacture of condensed food. It could be employed in the preservation of meat, if it were not for its disagreeable odor.

EFFECT OF COLD ON IRON AND STEEL.

The researches of Joule, Fairbairn, Spence, and others upon this subject have excited considerable discussion, and attracted much attention. Mr. Joule, whose experiments were somewhat severely criticised as puerile in character, being performed with nails, darning needles, etc., has publicly replied to his critics: that he believes the size of the bars experimented with, has nothing to do with the principles involved.

Mr. Spence has been performing further extended experiments, being led to do so by the indecisive character of all the experiments brought to the notice of the Manchester Literary and Scientific Society, through the papers referred to in our recent article upon this subject. The new experiments of Mr. Spence were deemed by him as fully corroborating all his former statements upon the increase of strength in iron bars through the effect of cold.

Mr. Spence has, however, in these experiments, laid himself open to even severer criticism than Mr. Joule was subjected to. In fact, though the experiments were very elaborately performed, there is not the slightest doubt in our minds that they are utterly valueless, as throwing any more light upon the point in dispute.

From a paper detailing the particulars of his experiments, read by Mr. Spence before the above-named society, at a later meeting than the one named in our former article, we derive the following account of them:

As I was not trying the absolute strength of any sort of cast iron, I did not see the force of Mr. Brockbank's objection to my using one half inch bars instead of the orthodox one inch bars. I could obtain from one half inch bars equally good castings, and the machinery for breaking them was more manageable, and in my opinion more exact. A firm at Newton Heath made for me 50 bars, each three feet long by one half inch square, all out of one ladle, and of No. 3 Glengarnock pig and Kirkless Hall common pig—I name these although it does not seem of importance; all I wanted was good, sound, clean, and equal castings; and knowing the purpose for which they were intended, with great care they turned them out so well that not one of those sent to me was rejected. I now cut each of these bars in three lengths of one foot each, making nearly 150 pieces. They were now taken and all their ends covered with paint, in order that the new fracture might be examined as they were broken. The heap was then brought into the laboratory, having thus had three chances of perfect mixing. A boy of 11 years of age now handed me the pieces singly from the heap, and as I received them I placed them alternately one by one in two lots, until I had got 70 pieces in each lot. One of these was now taken and put into a cask capable of holding 2 cwt. to 3 cwt. of freezing mixture, composed of pounded ice and chloride of sodium (which instantly reduces the temperature to zero), and being surrounded with sawdust, they were kept there for nearly 48 hours. The other 70 were now put into the water at 70° Fah., and this was done chiefly in order that they might be broken wet, as they would necessarily be when taken out of the freezing mixture. The mode of breaking was this; I put a bar on the suspending wedges, then hooked on the weight scale, and with a number of weights much under the breaking load, raised the loose end of the plank by the screw jack, so as to bring the weights to bear. I now added single pounds or 2-pound weights till 15 pounds were put on; these were then taken off and a 14-pound weight was placed, and single pounds again put on, thus regularly adding till the bar snapped; I then recorded the breaking weight, my assistant meantime putting on another bar. I spent nearly eight hours in breaking these 70 bars, and every one got an equal amount of care. On opening up the freezing mixture 44 hours after enclosing it, I found it in perfect condition, little solution and no increase of temperature having taken place. The bars were taken into the laboratory in small lots, and immersed in another freezing mixture from which they were withdrawn singly with pliers. Having seized one piece with too firm a grasp, I found that my fingers grew white and produced an intense pain, as if burned. Some of the freezing mixture was spread on each bar with a spatula, while on the machine, so that every one was broken at a temperature within one or two degrees of zero. The mode of breaking was exactly similar to that employed with the other lot, and equal care was given to every bar. This I can affirm, as every one of them was broken by myself, and all entries made by myself. The results are before you, and to me it was a matter of surprise, when both sets were completed and added up, to find that they almost exactly corroborated my previous experiments, which I do not think were fallacious in their character, but merely defective in their not covering a sufficient amount of ground to give certainty to the result. I have, however, so much confidence in those now detailed, that I have no hesitation in giving it as an ascertained law, that a specimen of cast iron, having at 70° Fah. a given power of resistance to transverse strain, will, on its temperature being reduced to zero, have that power increased by 3 per cent.

A tabulated statement accompanied the paper, which shows the percentage of gain, in strength of iron at zero, over that of iron at 70°, claimed by Mr. Spence.

These results were, upon the reading of the paper, immediately excepted to by Mr. Carrick, on the ground that the breaking weights, given in Mr. Spence's table, showed such an excessive range in quantity, as to clearly indicate a want of homogeneity in the iron, which rendered any deduction from the experiments invalid. This range, in some cases, exceeded twenty-five per cent of the greatest breaking weights of one of the bars.

To Mr. Carrick's criticism, *Engineering* adds another of equal force, namely, that Mr. Spence appears not to have taken any care to insure that the bars tested were exactly ½ inch square. The force of this objection will be realized by all practical founders and machinists, who know what variations in size might be justly expected in bars made in the manner described.

It is evident that there is a present determination to settle this question finally; and the sharp criticism, which the experiments hitherto performed have met, indicates that nothing short of scientific certainty will be accepted. Any experimenter who does not cover all ground of objection need expect no tolerance for any opinions or conclusions he may arrive at.

THE ACCUMULATION OF WEALTH.

The present construction of society fixes no limit to the amount of property which individuals may amass, and as it also makes wealth the prime instrument in the attainment of luxurious living, and one of the most important rungs in the ladder by which men climb to political and social power, it is, to the majority of people, the most desirable of all earthly things.

In the United States all citizens stand on a common level of political equality so far as possibilities external to themselves are concerned. Ambition is stimulated and money sought with an avidity perhaps unequaled in any other part of the civilized world. We are a nation of money-getters, and every youth before he leaves his primary school books has had his dreams of future wealth and his aspirations for superior station and power. On reaching the age of majority, or in many cases even before, he has plunged into the mad race for wealth; and to make money fast, too often seems more important than to make it surely and honestly. His blood is fired with the fever of speculation. He takes large risks, and hesitates not at losses others may sustain, in case his schemes fail. He cannot complacently look upon a sure and safe method of doing business that would not only support him in comfort through life, but at the age of fifty or sixty years provide him with an independence upon which he might live through the remainder of his life in peaceful retirement. His mind pictures to itself the delights that wealth would purchase for a man of forty in the full flush of physical power. The splendid mansions, the fast horses, too often the fast women, the champagne suppers, the display which can be made by those mushrooms of fortune, who dazzle by their splendid equipages, fascinate him, and he gradually begins to feel that it matters little how he gets money provided he gets it quickly.

By and by you shall see him on 'Change, speculating in fancy stocks, or as the president of some stock company, the object of which is purely and simply to feather the nests of its promoters,. If he go up at all, it will be like a rocket; if he come down, it will be like a stick.

It may happen, however, that he will prove to have the brain to stay up; if so, he will grasp and control enormous railroad interests, and perhaps become the king of the *Bourse*. But what sort of man is he then? Is he in any sense a man who has reached the proper end and purpose of living? Has he, in his splendid mansions, his sumptuous feasts, his rich apparel, and dazzling equipages, reached the fountain of true happiness, and attained that which, when age shall paralyze, and disease rack with pain, will comfort, and solace, and sustain? When his powers shall fail him in the race, and active life must be relinquished, will his wealth appease the hunger of a mind unstored, give rest to weary limbs, or solace a soul from which sentiment has been banished, and in which there is little to win and keep that affection which is in old age so essential to happiness?

But were the evil effects of money greed confined to the accumulators of colossal fortunes, we might well leave them to themselves. The fact is, however, that enormous concentration of wealth in the hands of a few, is only another name for absorption of the substance which would otherwise be distributed among the masses.

We are not of those who believe that rates of interest or the like can be controlled by special enactment. Our usury laws are and always have been a farce, but surely all political economists will agree, that when any social system permits those who neither produce anything nor aid in the production of anything, and are mere drones and burdens upon society, to amass fortunes impossible to the industrious and frugal, a premium is offered against industry and good morals. What change can be made that will offer to honest industry and trade a better chance of pecuniary reward than is given to speculation, stock jobbing, and political manipulation, such as by which individuals known as "The Ring" have enriched themselves in this city, is a problem it is high time to grapple with.

TUBING THE EAST RIVER.

We have always maintained that tunnelling the East River was the true way to establish cheap, rapid, and safe transit between the cities of New York and Brooklyn. Such transit is all that is wanted to virtually consolidate the two cities into one. Tunnels will be cheaper than bridges of any kind possible to erect in such a manner as not to impede navigation. They can be constructed more rapidly, and can be placed at such points as will best accommodate the traveling public. Many avenues of communication rather than one trunk line will, we maintain, best subserve the interests of the public.

We are glad to see something, at last, which looks like work in this direction. General Slocum has introduced a bill in Congress which, if passed, will incorporate the Brooklyn and New York Submerged Tubular Bridge Company, the corporators named being Jacob Voorhees, John S. Harris, Henry M. Williams, Silas Herring, O. B. Latham, Francillo G. Daniels, Alexander McCree, Charles B. Smith, John Johnson, Adon Smith, John Evers, Jas. B. Floyd, and William C. Kingsley.

The tube or tunnel is designed to be large enough to accommodate a carriage way, footpaths, and a railway with one or more tracks. The tolls named are not to exceed one cent per foot passenger, three cents per head for cattle and horses, two cents per head for sheep, five cents for each saddle horse and rider, six cents for each single wagon and horse, twelve cents for each double wagon and horses, eighteen cents for each cart, and twenty-four cents for each loaded double wagon with two or more horses attached. The capital stock is not to be less than $3,000,000.

As many of our readers will recollect, a bill was passed by the New York State Legislature, some three years ago, incorporating a company for this purpose; but it has been thought (whether justly or not, we will nct pretend to say) that the company obtained the franchise in the hope of selling out to a working company, rather than with the view of proceeding with the work on its own account. Be this as it may, nothing practical has resulted from its organization. The men named in General Slocum's bill are such as give hope that this company intend to really construct the subway for which they solicit a franchise.

There is nothing impracticable in the scheme. The tube may be laid either in sections or with flexible joints, after the manner described in articles which have appeared from time to time in this journal. It may be kept clean, dry, and airy, and if once laid will, in our opinion, demonstrate the value of this means of communication for New York and Brooklyn.

The great suspension bridge now building will probably not be completed within ten years from the date of its commencement. Such a tunnel as is proposed might be constructed and opened for traffic in twelve months.

To cure scratches on horses, wash the legs with warm, strong soap suds, and then with beef brine. It is said that two applications will cure the worst case.

SCIENTIFIC INTELLIGENCE.

DEATH OF BECQUEREL.

Paris papers announce the death of Antoine Cesar Becquerel, the celebrated electrician. He died in Normandy, while the siege of Paris was progressing, and very likely the sad event was hastened by the fatigue of his hasty flight from the capital. As nearly all of the members of the French Academy of Sciences remained at their posts to assist the Committee of Defence, the departure of the Becquerels, father and son, was much criticised; but the advanced age of the senior afforded a good excuse for the step he decided to take.

Becquerel was born March 8, 1788, and at the time of his death was, therefore, in his 84th year. He was three years older than Faraday, and during his long life, had been a contributor to the same department of knowledge as the great English philosopher, whose death we had occasion to announce in 1867. Between the years 1834 and 1840, he published his great treatise on electricity and magnetism, in seven large octavo volumes. This was followed by "Physics in its Relations to Chemistry," in two volumes; and the number of his contributions to the proceedings of the Academy, and to the journals of science, has been very great. He was one of the most prolific of French writers, and retained a remarkable vigor of intellect to the last. His son, Alexander Edmond Becquerel, born in Paris in 1820, is a worthy representative of the father, and is the author of many investigations on electricity and magnetism. The similarity of the name has lead to much confusion, and much of the younger Becquerel's work has been credited to the father. Another son, Alfred, is an eminent physician, and the author of valuable papers in his department of science.

COMPARISON OF THE CARRÉ AND WINDHAUSEN ICE MACHINES.

In the spring of last year, Dr. R. Schmidt, of Berlin, was requested to make a comparative examination of two of the most prominent inventions for the artificial production of ice. He selected the systems of Carré and Windhausen, both of which have been fully described in this journal. Experiments were made during half a year, or 150 days—the day estimated at twelve hours—and for each horse power 96 pounds of coal were taken. There were also consumed 110 pounds of sal-ammoniac and 110 pounds of chloride of calcium. The results were as follows: A Carré machine, producing hourly 400 pounds of ice, cost in Berlin $5,200; and the daily expense of producing 400 pounds of ice is set down at 1½ cents a pound. The Windhausen machine costs $5,800, the running expenses are one third more, and the cost of the ice is nearly 2 cents a pound. Preference is therefore given to the Carré machine, in which the condensation of ammonia is employed as the refrigerating agent. Similar results have been obtained in this country, and in New Orleans it is thought that all the ice required for the consumption of the city will hereafter be made by the ammonia method.

SALT WELLS IN PRUSSIA.

The great success of the Stassfurt mines in Germany has been the occasion of numerous borings in various parts of the country, not unlike the search for petroleum wells in the United States. About thirty miles south of Berlin, a salt deposit was reached at a depth of 280 feet; and, at last accounts, although a depth of 3,242 feet had been attained, the bottom of the bed had not been found; this shows a layer of salt over 2,962 feet in thickness. Similar borings ought to be made in this country, as the indications in several localities point out deposits of nearly equal dimensions. The cost of salt in the United States is unpardonably great, and a little more wholesome competition would be better for all concerned.

CULTIVATION OF THE CINCHONA TREE.

The cultivation of the cinchona tree, from which quinine is obtained, has been successfully prosecuted on the island of Jamaica since 1860. Some of the plants have been raised from the seed, and notwithstanding the drought, they are growing in the most satisfactory manner, and more than 20,000 good sprouts have been obtained. As all attempts to make quinine artificially have failed, the next best thing is to raise plantations of the tree, and to observe some precautions in stripping the bark. The scarcity of bark has induced a great increase in the demand for the invaluable fever remedy, and the culture is one that, from every point of view, must commend itself to the attention of agriculturists who live in the zone where the cinchona tree will flourish.

A NEW USE FOR BAMBOO.

Since the Board of Education has positively forbidden the *a posteriori* application of bamboo as an aid to mental discipline, and since the agitation of the St. Domingo question, much attention has been paid to one production of the now famous island; and we hear that the fiber of the bamboo is likely to be extensively used as a substitute for shoddy in the manufacture of clothes. We have been shown some of the fiber dyed and woven into the texture of cloth, which only an expert could distinguish from wool. As a material for the manufacture of paper, the bamboo is also strongly recommended, and as it is a waste product in San Domingo, some good may finally result from the vexed question of annexation.

THE MEDICINE OF A PATENT.—One of our clients, to whom we recently sent the good news of the allowance of his patent, writes back to us as follows: "I must confess this has been a perfect surprise to me, and I am somewhat inclined to think that the good news of my success in obtaining this patent, through your kind efforts, has *hastened my recovery* from a severe spell of sickness."

THE PRESENT AND THE PAST.

NUMBER VIII.—RECONSTRUCTION—(*Continued.*)

We have now the materials for reconstruction dispersed over the sea bed. Omitting the deposits forming in mid-ocean, we see that those materials are laid down in a zone of greater or less width around the coasts; and within that zone, are so dispersed that the coarsest portions are nearest the land, and the finest at the extreme limit of the carrying power of the off-shore currents. And if we, moreover, take note of the animal life that is associated with these deposits, we shall find that it likewise is distributed according to fixed rules. Every fisherman knows this fact by practical experience, and recalls it when in search of some favorite bait, or casting for any particular fish or shellfish. The rocky coasts swarm with numerous characteristic species, the mud flats abound in others, while numbers confine their lives to the sandy shoals. Certain species live semi-amphibiously, between tide-marks, others never venture into that region, unless driven in by fear or stress of weather; many beautiful forms, and some that are equally hideous to our eyes, are altogether pelagic in their habits, thriving only in the waters removed from land,

> The joyous playmates of the buxom breeze,
> The fearless fondlings of the mighty seas,

or dwelling in darkness in the very abysses of the ocean. Coral reefs, too, are singularly rich in peculiar and often gaily colored kinds, not merely of the minute creatures which erect these vast monuments that mark where continents lie buried, but of almost every great group of marine animals. Show a collection of animals, from any region of the sea, to an expert zöologist, and he will tell you the character of the sediment, and the zone of depth from which they were obtained.

If these deposits, and the relics they contain, of the animals that lived among them, are preserved by being converted into rocks and eventually exposed above the level of the sea, it is evident that in such rocks, formed heretofore, we have an important portion of the history of the region in which they were laid down; and we know that the greater part of the crust of the earth, accessible to our investigations, is composed of successions of such deposits of ancient seas. Thus, in geological formations, or in groups of rocks classified together because of the more or less close relationship of the creatures that lived during the period of their accumulation, we have successive stages in the history of the physical geography of the earth.

In order to learn the way to read this history aright, let look at one or two examples of geological formations.

First, let us take a group from the palæozoic series of formations, and we find the deposits of the Niagara period, represented by the following series of rocks in descending order: The Niagara limestone, the Clinton shales, the Medina sandstone, the Oneida conglomerate; and these names indicate, in a general manner, the lithological character of the successive strata, as found over a very extensive area. We have here pebbles, sand, clay, and limestone deposits preserved; but, observe, not arranged side by side as on the bed of one sea, but superposed vertically as successive accumulations. Again, let us take another example: In the great cretaceous formation that forms so large a portion of the structure of the western part of the Old World, we have above, at the top of the series, the chalk, then the chalk-marl (an earthy chalk), resting upon the greensand, which is, in its general character, as its name imports, a sand. Here, again, we have calcareous, argillaceous, and arenaceous deposits, arranged in superposed strata; and if we trace these out over a very wide area, we shall find them always retaining this order. The greensand will always be below the chalk.

In this vertical arrangement of deposits, lies a difficulty that has greatly bewildered geologists. It is quite impossible that sand should be laid down by the same current, at the same time, far as well as wide; just as impossible as it would be for a cannon ball to strike an object with equal force at the distance of five miles as at the distance of one, and for a similar reason. And yet we have, in the instances given above, sands laid down over areas extending perhaps hundreds of miles, both north and south, and east and west. It is therefore clear, that neither all parts of the greensand, in the one case, nor of the Medina sandstone in the other, can be, throughout their horizontal extension, of the same age. Their accumulation must have been gradual over the surface as well as in depth. The same may be concluded of the argillaceous beds in the two sections, and of the conglomerate in the first. Again, while the sand in these cases was being deposited, when were the accompanying finer materials laid down? Is it possible that these vertically arranged, and, therefore, apparently successive strata, represent deposits in reality formed side by side on the bed of one sea? The idea thus expressed seems paradoxical. Let us, however, consider what would be the effect, upon deposits, of a gradual alteration of the level of sea and land accompanying their deposition. Imagine our eastern coast gradually subsiding beneath the waters of the Atlantic! Pebbles are lying where the forests once grew; the depression continues, and the waters gradually creep further over the land; sand is laid down over the pebbles, and, as the movement continues, and the shore recedes from the spot we are watching, finer argillaceous sediment covers up the sand, until, finally, if the subsidence continue to a sufficient extent, the deep sea Atlantic ooze will overgrow all, and we shall thus eventually have formed a vertical series of chalky limestone, clay, sand, and pebbles, in descending order. We thus arrive at the very important conclusion that a series of deposits, forming at one time, will, by a gradual shifting of conditions brought about by an alteration of level, be converted into a series of strata; and, conversely, that an unbroken series of strata at one point must represent a series of deposits that were once forming simultaneously over a wider area. According to this view, the greensand is the along-shore deposit, and the chalk, the deep-sea ooze of one and the same cretaceous sea; and, so far from the overlying chalk, as a whole, being of later date than the underlying greensand, they must both have been, from the first, in process of formation together; and, in fact, the chalk deposits of one locality may be absolutely of earlier date than the greensand of another. Nay, the recent explorations of the bed of the Atlantic ocean, revealing, as still in existence in its depths, conditions quite cretaceous in their characters, suggest that a formation may continue in one sea, not merely long after it has ceased elsewhere, but even geologic ages after some portions of it have been upheaved into dry land, and converted into extensive continental surfaces and high mountain ranges.

Prussian Staff Organization.

Prussia settles the dispute as to which is the more important, the study of theory or devotion to practice, by uniting the two in harmonious proportions, giving the practical education, however, the first place in the order of succession. All candidates for commissions, excepting the cadets, are required to go through a course of practical service before obtaining theoretical instruction. And all Prussian military authorities agree in considering this preferable to the opposite system adopted in France and England, as well as the United States, of giving the theoretical instruction before the practical. It is maintained in Prussia that theory can be more readily understood if based on a groundwork of actual practical knowledge, and that officers of the age of twenty-three or twenty-four, with a practical knowledge of their duties, derive more advantage from study than youths of seventeen or eighteen, who have no previous acquaintance with the subject of their studies.

Some one hundred and twenty young officers present themselves yearly for admission into the war academy at Berlin, to go through the curriculum of studies necessary for admittance into the staff. About a third are accepted, the other two thirds are returned to their regiments, the entry being secured by competitive examination of the candidates.

The professors of the academy yearly designate to General Moltke, the head of the staff, those officers who, having completed their course, have proved themselves most studious and efficient. Out of these, the General selects a certain number, according to the probable wants of the service and vacancies during the coming year, taking care to choose some from each branch of the service. The selected ones are recalled from their regiments, and sent to serve for nine months in a branch of the service other than their own. The most zealous are appointed to the staff at Berlin, and spend a year and a half under the immediate supervision of General Moltke himself, who by this means makes himself thoroughly acquainted with the character and special turn of mind of the best officers of the staff. The General himself gives lectures. The young staff officers write treatises on certain given subjects, and General Moltke reads or criticises them before all the rest, without, however, making known the name of the author.

Again are these officers sent back to their regiments, and in the course of the next six months, those whom General Moltke has finally selected are gazetted as captains of the staff, and at last are entitled to wear the uniform.

Once gazetted, General Moltke selects the best out of the good, to join the "great staff" at Berlin. The others are appointed to the staff of army corps and divisions. General Moltke rigidly excludes from the staff any officer who is physically incapable of being a first rate horseman, no matter how excellent may be his aptitude in every other respect.

We doubt whether such thoroughness as this is possible to any but the patient German race; but what would not such a staff have done for us in our war of the rebellion, when a lot of boys fresh from civil life, and ignorant of the first principles of military science, were our chief dependence for the difficult and delicate duties of staff officers? It is marvellous that they did as well as they did, with no other preparation than the few weeks' study of the regulations, tactics, and such works on the art of war as came most readily to hand.—*Army and Navy Journal.*

An Electric Joke.

Some weeks ago, one of those illegitimate sons of science, the vagrant electric men, opened out at Fourth and Market streets, with his dial for testing how much torture his voluntary victims could stand. To stimulate trade, he kept a standing offer to pay $5 to whomever could stand as much electric fluid as his machine would furnish. One day, a boy presented himself and announced that he had come to win that $5. The man handed him the "handles," and started the machine. The boy stood it wonderfully. The operator turned the crank faster, and asked the boy how it felt. The boy said it did not feel at all. The man thought something must be the matter, and commenced an elaborate tightening up of the screws, and then commenced another series of swift revolutions, which ought to have produced a current sufficient to kill the boy; still he laughingly assured the fellow that he did not experience the slightest sensation. Out of patience, the man demanded to see his hands, and then the secret was explained. The boy belonged to the telegraph office, and had picked up one of the pieces of insulated wire now being put up inside the office, and had passed it up one sleeve of his coat, around his shoulders, and down the other sleeve, and then uncovered the ends of the wires in each hand. Thus armed, he had gone to the electric man; of course, the uncovered ends of the wire, pressed against the metallic handles, presented a better medium than the boy's body, and the current simply passed to them and along the insulated wire around the boy's body, without touching him. That "electrician" was very mad, and all the more so as the crowd drawn together thought it a good joke, and took the boy's part. The man was so laughed at that he left town.

Enameling Photographs.

The beautful gloss called enameling is produced as follows: "After the prints have been toned and washed in the usual way, trim to the right size by means of a cutting shape; then immerse in a warm solution of gelatin (which must be kept, whilst operating, nearly as possible of an equal temperature) of about the same consistency as collodion. Care should be taken always to filter the solution before using. When thoroughly impregnated with the same, the prints are taken out and laid, face down, on collodionized glass plates (preparation of which is given below), care being taken that all air bubbles between the paper and glass are carefully pressed out and removed. Afterwards, a sheet of stout white paper, somewhat larger than the prints, is cemented to the back of each photograph—a precaution for protecting the pictures in the event of their spontaneously leaving the glass on drying. The plates are allowed to remain for ten or twelve hours (say over night) in a dry locality, and, at the end of that time, the portraits may be separated from the glass by making an incision of the film all round the paper. The superfluous paper should be trimmed off previously to the pictures being mounted upon the cards.

Many of the manipulations may be slightly modified if desired; for instance, instead of cementing a piece of paper to the back of the prints, the card itself, if not very thick, may be at once attached, the margin of which will be gelatinized in the same way as the picture. Some photographers add a small quantity of sugar candy to the gelatin in order to prevent the sizing solution drying too rapidly, and to render the finished card more plastic and impressionable to the cameo embossing press, which apparatus gives to these pictures a most beautiful and pleasing effect.

To Prepare the Collodionized Plate.—Glass plates of a suitable size, say, $8\frac{1}{2}$ by $6\frac{1}{2}$ or 10 by 8, and which have been carefully cleaned, as if to serve for taking negatives upon, are rubbed over with finely powdered pumice stone or Tripoli powder, which is afterwards thoroughly removed by means of a soft dusting brush. The plates are then coated with a four per cent normal solution of collodion, and placed to dry in a spot free from dust; they are then ready for use."

Effects of the Bombardment of Paris.

The correspondent of the London *Times* gives the following account of the effects of the bombardment on the Jardin des Plantes: No fewer than eighty-three shells had fallen within this comparatively limited area. On the nights of January 8th and 9th, four shells fell into the glass houses and shattered the greater part of them to atoms. A heap of glass fragments lying hard by testified to the destruction, but the effect of the shells was actually to pulverize the glass, so that it fell almost like dust over the gardens. The consequence was that nearly the whole of this most rare and valuable collection was exposed to one of the coldest nights of the year, and whole families of plants were killed by the frost. Some of the plants suffered the most singular effects from the concussion; the fibers were stripped bare, and the bark peeled off in many instances. All the Orchids, all the Clusiaceæ, the Cyclantheæ, the Pandaneæ, were completely destroyed, either by the shells themselves, or by the effects of the cold. The large palm house was destroyed, and the tender tropical contents were exposed to that bitterly cold night; yet, singularly enough, although they have suffered severely, not one has yet died.

All through the whole of the fortnight during which these gardens were subjected to this rain of shells, MM. Decaisne, Chevreuil, and Milne-Edwards remained at their posts, unable to rest; and have since, at their own expense, repaired the damage done, trusting that whatever form of government France may choose, it will not repudiate its debts of honor. M. Decaisne is making out a list of his losses, a large proportion of which might possibly be supplied from Kew, while owners of private collections might also be glad to testify their sympathy and interest in the cause of science, by contributing whatever they may be able to spare, as soon as the amount and nature of the loss is ascertained.

The animals fared better than the plants. Not only have none of them been eaten by the population of Paris, as the latter fondly suppose, but, although several shells burst among them, they have escaped uninjured. Of course, when food was so scarce for human beings, the monkeys and their companions were put upon short allowance. This fact, coupled with the extreme rigor of the season, increased the rate of mortality among them, and one elephant died, but was not eaten. The two elephants and the camel that were eaten belonged to the Jardin d'Acclimatation, and had been removed in the early stage of the siege from their ordinary home in the Bois de Boulogne, for safety, to the Jardin des Plantes, where, however, it would appear, it was not to be found. The birds screamed, and the animals cowered, as the shells came rushing overhead and bursting near them, as they do when some terrific storm frightens them; latterly, they seemed to become used to it.

Of the many chewers of tobacco in these days, there must be many who wish to relinquish the habit. We are informed that a little coarsely cut gentian root, well masticated (the saliva being swallowed), taken after every meal, will soon take away all desire for the chewing of tobacco.

Dentition of Babies, Lambs, and Colts.

The pain and difficulties of dentition in the infancy of human beings are well known, and the troublesome paroxysms of pain and fits, to which infants are subject, are usually relieved by lancing the gums, by giving the child a hard substance to bite, or otherwise removing the membrane which covers the nascent tooth, and which the tooth pulls at and stretches, till the little patient can bear it no longer. Lambs and colts suffer from exactly the same cause, in the same manner; and many valuable animals may be saved to the stock breeder by employing the lancet to remove the integument. "S. B.," in the *Medical Investigator*, states that he has often employed the lancet on babies as well as on cattle, and argues that the sweeping denunciation of its use, by doctors of a certain school, is erroneous, and that medicine alone will not remove all the troubles of retarded and imperfect dentition.

New Textile Fiber.—The pestiferous weed called Indian mallow is too well known to Western farmers as an almost ineradicable and irrepressible enemy. But everything in nature has its use; and we hear that the fibers of the obnoxious plant are strong, fine, easily bleached, and can be separated from the woody substance of the stalk without hacking. The *Springfield Register* states that the fibers are from seven to ten, sometimes twelve, feet in length, and that the plant will yield a ton of them to the acre. Those who have tried to exterminate it well know that it will grow anywhere; and its powers of flourishing under difficulties will soon force themselves into notice.

The Philadelphia "Scientific Journal"

Says that "Messrs. Geo. P. Rowell & Co., of New York, are so well and extensively known, all over this continent, that to name them and explain the nature of their business would be superfluous. No Newspaper Advertising Agency has ever displayed more energy and skill in the transaction of this delicate and tact-requiring business."

A Most Excellent Wringing Machine.

Some people are now buying Clothes Wringers which have cog wheels on one or both ends of the shaft; yet these cog wheels play entirely apart when wringing larger clothes, and are then no better than the cheap machines without any cog wheels. We can recommend to our readers the "Universal," as it has cog wheels with very long teeth, which are prevented from throwing entirely apart by a "patent stop," which is an important improvement for the durability of the machine.—*Mass. Ploughman.*

Business and Personal.

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

Answers to Correspondents.

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

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

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

Molds for Medals.—Let J. E. W. take a thin piece of wood, of the thickness of the cast around the edge. Then cut a hole and fit in the medal perfectly. Dampen some soft newspaper, and spread over the face. Beat to a pulp about one eighth inch thick all over one face of the medal, and about one half inch around on the wood. Now spread some more over without beating, and clamp fast to the wood. Dry by the fire perfectly. That will remove when dry. Then operate with the other side in the same manner. He will then have molds more perfect than can be made in any other way I know of, except they are made of metal. Let him take out the medal, and place the papers in position, making a vent through the wood for air and gases. He need not be afraid of the paper's burning.—B. D. S., of Omaha.

Tempering Cold Chisels Made from Old Files.—Let your querist be sure to grind out all marks of the teeth before forging; forge at a dull red heat. Heat them a little hotter to harden, and draw them nearly or quite down to blue. Harden them in pure water, if possible; if not, add salt to the water; if that will not do, add sulphuric acid to the salt and water; if that will not do, harden them in pure sulphuric acid. Steel that will not harden in cold water will be hardly worth time in working into cutting tools.—S. G. B., of Conn.

Springs of Iron Wire.—I make a good spiral spring, of iron wire, in the manner following: After winding the wire around the mandrel, I take the latter out and replace it with a rod of common rough iron, large enough to quite fill the spring, as after the spring has been cut off, it will unwind enough to increase the diameter considerably. Then I take the rod with the spring on it, and heat to a cherry red, after which I sprinkle it with prussiate of potash. I repeat this two or three times. After putting on the salt for the last time, I heat again and plunge into cold water, and I have a spring as brittle as glass. Then I put oil on it, retaining the spring on the rod, and I heat till the oil burns off with a blaze.—A. G. B., of Mass.

H. R. K., of Pa.—You may make cotton cloth both air and water tight by the following process: Make a dough by dissolving india-rubber in coal naptha, in the proportion of 1½ pounds naptha to 1 pound of best rubber. Spread this dough on your calico as thin and as evenly as possible; put on five coats; double the cloth together, having the rubber inside, and you will find it will be thoroughly air proof and water proof.

C. C. L., of Ind.—A mandrel is not necessarily a straight cylinder; it may have a taper, and still be properly called a mandrel. In feeding water to your boiler, there will be no gain in heating it, unless you heat by gases from the uptake, by exhaust steam, or from some source in which the heat would be otherwise wasted. In heating by either of these means, the gain in raising the water 125° Fah. from 32° Fah. would be a little more than ten per cent.

S. S., of Va.—From your description of the cement purporting to be hydraulic cement, the manner of using it, and its crumbling after it was used, we think the cement is not a good article; we cannot see any fault in the method of applying it. We judge the cement is deficient in alumina.

D. C. B.—If not a practical chemist, you will not be likely to make a very successful analysis of iron ore. We cannot give you, in such space as we can spare here, such directions as would enable you to make such an analysis. If you wish a reliable result, you had better apply to some skilled chemist.

N. J., of Colo.—The patent of Charles Goodyear in soft rubber expired in 1865. His hard rubber patent, having been extended seven years from expiration of original grant, will not expire till May 5, 1872.

N. L. C., of ——.—The salts of nickel, used in electro plating, are soluble in water. See articles on pages 181 and 298, Vol. XXII., of the Scientific American.

W. Y., of Va.——The pressure on the fulcrum of any lever, exclusive of the weight of the lever itself, is the sum of the pressures exerted by the power and the weight or resistance to be overcome.

O. S. M., of Va.—Workmen in color factories can do much to prevent injury through absorptive poisoning if they will, and we think they pretty generally know it. We do not think they could wholly avoid injury. The same remarks apply to workmen in quicksilver mines, etc.

C. H. J., of N. Y.—Your communication contains information we have already recently published. Hope to hear from you again on other practical subjects.

Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.]

1.—Tempering Volute Springs.—How can I best temper volute springs made of plate 5-16 of an inch thick, 6 inches wide, and 70 inches in length?—J. V. R.

2.—Preparation for Muslin.—I would like a recipe for preparing paper or muslin, so that it could not be printed on with ordinary printer's black ink. This preparation must not injure the paper or muslin. Changing the color of it is immaterial.

3.—Gray Opaque Varnish.—Is there any kind of gum that, when melted, will incorporate with linseed oil and turpentine (or naphtha), to produce an opaque varnish, not darker than a granite gray, and which will not be transparent when applied, even upon glass? or is there any material that, mixed with varnish, will remain suspended (and not precipitate in time) that will produce the same effect? Chemical action upon the oil has been the trouble I have experienced with light materials suspension.—L. C. B.

4.—Tempering Carriage Springs. Flux for Welding Cast Steel.—Please to inform me what ingredients I shall use, and what proportion of each, with oil for tempering carriage springs? And also, what kind of flux is best for welding cast steel?—S. B.

5.—Plating Iron.—Does it require much skill and experience, or costly and expensive apparatus, to plate iron on a small scale? Is there any work treating specially this subject? Will some practical plater answer these queries, and give me directions for plating iron with silver, etc.?

6.—Dyeing Cotton Aniline Black.—I wish a practical method of dyeing cotton black with aniline.—S. E. M.

7.—Bronzing.—Will some of your numerous readers give me a good preparation for bronzing small malleable iron castings?—W. C. J.

8.—Small Castings for Models.—What alloy that melts at a much lower temperature than brass would be suitable for castings designed for small models of machinery?—T. C. A.

9.—Cement for Marble.—What cement can I use to mend a broken marble statuette, without showing an unsightly white or colored seam?—C. H. P.

10.—Cutting Small Wheels.—Can the teeth of small wheels be cut, with any degree of accuracy, in a small engine lathe? Is there any simple attachment that can be applied to do this in a small way?—B. B. L.

11.—Paint the Color of Gold.—What paint can I use that will nearest resemble gold, and will match gilding?—J. K. P.

12.—Imitation of Ebony.—How can a good imitation of ebony be made, say with pear, apple tree, or other fine, close-grained hard wood?—E. E. B.

13.—Leaky Faucets.—What is the best method of grinding faucets that leak, so as to make them tight again? I have tried oil and emery, but it does not work well; it cuts in streaks, and bites into the metal, so that it cuts unequally.—C. H. K.

NEW BOOKS AND PUBLICATIONS.

Over the Ocean; or, Sights and Scenes in Foreign Lands. By Curtis Guild, Editor of the *Commercial Bulletin*. 1 vol., crown 8vo, pp. 559.

This volume embraces a series of letters written to the above journal, and extends over a seven months' tour through various parts of Europe. They are lively sketches, and generally very faithful to all the facts which arrest the attention of tourists.

The April number of the *American Builder*, Chas. D. Lakey, Editor and Publisher, 151 and 153 Monroe street, Chicago, Ill., is in every way a credit to American technical journalism. Its illustrations are first class, its matter both entertaining and instructive, and its typography unexceptionable. It is by far the best publication devoted to architecture and art issued on the American continent, and we are not in the least surprised that it has secured a large and increasing circulation. There is no publication among our exchanges more heartily welcomed to our table, and our readers who have had a taste of its quality in some extracts selected from time to time for our paper, will need no proof of the practical, as well as theoretical value of its contents.

Leffel's *Illustrated Mechanical Monthly* is the name of a new periodical published at Springfield, Ohio, by James Leffel & Co., manufacturers of the celebrated turbine water wheel which bears their name. It is a very creditable quarto of eight pages, devoted to science and the mechanical and industrial arts and illustrated by engravings.

Recent American and Foreign Patents.

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

BRAKE FOR WAGONS AND CARS.—R. A. Dement, Hudson, Ill.—This invention relates to a new self-locking brake, which is applicable to all kinds of wheeled vehicles, such as wagons, carriages, car trucks, etc., and consists in the combination of a series of pivoted shoes, with a sliding yoke and eccentric disk, and the brake stem, all operating so that by carrying the wrist pin in the eccentric ahead of or behind the axis of the stem, the shoes will be locked in their respective positions.

SPINDLE FOR WRINGER ROLLER.—T. E. McDonald, Trenton, N. J.—The present invention relates to a new and improved spindle for wringer rollers, the nature of which consists in dovetailing the spindle longitudinally so that the rubber, when rolled over the same, may be pressed into the said dovetailed grooves, and thereby serve to lock and hold the rubber roller to its spindle.

MACHINE FOR MANUFACTURING COMPOSITION ROOFING.—J. J. Wiggin, New York city.—This invention relates to a new apparatus for applying roofing compounds to paper, felt, canvas, or other fabric, and consists in the use of a movable vehicle carrying a distributing trough and suitable rollers, for feeding and laying the paper to and upon the compound that has rom the trough been discharged upon a bed of sand, gravel, or other material.

SHAWL STRAP.—G. B. Broad, Waterville, Maine.—This invention has for object to furnish a neat, simple, and convenient device for confining a shawl or other bundle for carriage.

FRICTION CLUTCH FOR MOWING MACHINES.—G. S. Reynolds, Lebanon, N. H.—This invention relates to a new friction clutch, to be used on mowing and reaping machines, in place of the ordinary pawl and ratchet connection between the driving wheel and the driving axle. The invention consists in the employment of a slotted pawl, which has a grooved face that fits a projecting rim on the wheel to which it is to impart motion.

SOFA BED.—C. C. Schmitt, New York city.—This invention relates to a new sofa bed, which is so arranged that the sofa lining will not be occupied for supporting the bed, and that the length of sofa will constitute the breadth of the bed.

MACHINE FOR PRINTING OIL-CLOTH AND OTHER FABRIC.—Charles Rommel, Elizabeth, N. J.—This invention relates to a new machine for grinding oil-cloths, wax cloths, and other fabrics, and has for its object to permit the successive printing, by one cylinder, of the several colors which are to be applied to the same fabric.

SKATE.—W. H. Barker, Windsor, Nova Scotia, Canada.—This invention relates to new and useful improvements in skates whereby they are more securely fastened and more readily adjusted to the foot than skates of ordinary construction.

SHOW CASE.—G. A. Hearn, Jr., New York city.—This invention relates to a new and useful improvement in show cases for merchants' use, more especially designed for the dry goods trade, and for the more costly varieties of goods, as kid gloves, laces, silks, etc.

BIT BRACE.—J. T. Lynam, Jeffersonville, Ind.—The object of this invention is to provide a bit brace with a mechanism whereby it can be used like a ratchet drill, that is to say, oscillated in either direction, in order to impart intermittent rotary motion to the bit.

WINE PRESS.—A. H. Wyker, South Easton, Pa.—This invention has for its object to furnish an improved press for pressing wine, lard, sausages, etc., which shall be strong, durable, effective, and not liable to get out of order.

WEATHER-BOARD GAGE.—Matthew Newlove, Burlington, Iowa.—This invention has for its object to furnish an improved instrument for gaging weather siding, or clapboards, as they are applied to the building, so that all the boards may have the same width of surface exposed to the weather; which shall support the board securely in place while being scribed and nailed, and which shall at the same time be simple in construction and convenient and effective in use.

COMBINED COTTON SEED PLANTER AND CULTIVATOR.—J. A. Wright, Marietta, Ga.—This invention has for its object to furnish an improved machine, which shall be simple in construction and effective in operation, being so constructed that it may be used for planting the crop, and afterwards cultivating it, doing its work easily and well in either capacity.

ANTI-ROCKING ATTACHMENT FOR RAILROAD CARS.—J. R. Crabill, La Crosse, Ill.—This invention has for its object to furnish an improved device for attachment to the adjacent ends of railroad cars, to diminish or stop the vibration or rocking of the cars independent of each, so that the rocking or vibration of each car may be resisted and counteracted by the inertia or weight of all the other cars of the train.

BARN-DOOR HANGINGS.—George Rumsey, Watkins, N. Y.—This invention relates to a hanging for suspending sliding doors to the walls of barns or other outbuildings, said hanging being used in combination with a track having a flange or web projecting to each side, and being also made up in part of a hanger, having an offset that gives room for the said flanges, as the hanger travels past them during the sliding of the door.

SLEEVE AND CHEMISE BUTTON.—G. A. Schultz, Louisville, Ky.—This invention consists in a peculiar arrangement of a rigid and a loose revolving spring arm, with a disk or plate provided with notched lugs, in which the spring arm engages, thereby securing the button to the clothing.

DENTIST'S INSTRUMENT STAND.—John J. Ross, Hernando, Miss.—This invention has for its object to facilitate the work and save the time of dentists, and it relates to a stand having a rotary top set on an upright, said top being divided, on its upper side, into separate compartments for the reception of the different sorts of dental instruments.

PERFUMING AND DISINFECTING APPARATUS.—Otto Boldemann, New York city.—This invention relates to improvements in evaporating perfuming, disinfecting, or other fluids, and it consists in subjecting them to the action of a metallic platinum burner, suspended in or above a vessel containing a quantity of alcohol, or other liquid containing hydrogen, with which the perfuming, disinfecting or other liquid to be evaporated is mixed.

BALANCED SLIDE VALVES.—A. G. Barrett, Barrett, Kansas.—This invention relates to improvements in balanced slide valves, and consists in an arrangement of the valve and steam passages, by which the steam is caused to act upon the valve alike above and below, except a slight preponderence of pressure above, due to the absence of upward pressure at the exhaust ports, so that the valve will be balanced, or nearly so.

STALLS FOR HORSES.—D. M. Dennison, Savannah, Ga.—This invention relates to improvements in stalls for horses, and it consists in two or more stalls, having sides of boards, slats and posts connected to an end part at the head, in which racks and a feeding trough are placed, the sides being arranged oblique to each other, and each alternate stall reversed so that the sides between stalls are connected at each end to one head part, and thereby constitute self-sustaining stalls, which may be placed on the ground or floor, without other support, and the sides and ends are to be detachably connected together, so that they may be readily set up or taken down.

WINDOW REGULATOR.—John F. Dingee, Bedford Station, N. Y.—This invention relates to a new and improved method of holding and regulating the sashes of windows, and it consists in the application and adjustment of a roller, whereby the sash is held from falling, or is locked.

FISH NET SUPPORTER.—Benjamin Ryder, Jr., South Orrington, Me.—This invention relates to a new and useful improvement in the method of taking fish in tidal waters, and consists in attaching the net to a frame anchored to the bottom of the river or water, in such a manner that its position and that of the net will be governed by the flow of the tide.

BENCH VISE.—William P. Harwood, Cambridge, N. Y.—This invention has for its object to improve the construction of bench vises, especially the bench vise patented by Mason Prentiss, March 17, 1868, so as to enable the vises to hold tapering articles vertically, and it consists in the self-adjusting piece imbedded in the face of the jaw of the vise.

WATER WHEELS.—John H. Staples, Wells, Me.—This invention relates to a new manner of constructing the buckets and top plates of water wheels, for the purpose of preventing loss of power by an unprofitable presentation of surface to the moving water, and consists in making the inner surfaces of the buckets slope concavously toward and against the core of the wheel, and in the same manner providing a gradual descent toward the said core or center of the projecting top plate of the wheel. The outer face of each bucket, and the top surface of the wheel, remain straight, as heretofore.

SLEEPING CARS.—Benjamin F. Marrier, Green Island, N. Y.—This invention relates to improvements in sleeping cars, and it consists in suspending the outer edges of the frames of the upper berths, which are pivoted at the inner edges to the side of the car, by machine chains, wire ropes, or the like devices, which will not stretch to any material extent, and counterbalance weights, so arranged that the weights, coming against suitable stops when the berth is turned down, will hold it in the position in which it is required to be for use, without the intervention of any other supports, the weights being so adjusted that when the berth is down in the horizontal position, its gravity, being thereby taken off the pivots to a considerable extent, will overbalance the weight and hold it down; but when turned up against the top of the car, as such berths are when not in use, and the gravity shifted on to the pivots to a greater extent, the weights will overbalance the berth, and hold it up securely without the aid of other fastening.

SELF-ACTING SHIPS' PUMPS.—D. A. Dunham, Pilatka, Fla.—This invention relates to improvements in the construction and arrangement of ships' pumps, actuated by a weighted pendulum, suspended so as to maintain a vertical line while the ship rolls, and swing the pump relatively to the pendulum, and it consists in a pendulum provided near the point of suspension, with rigid radial arms, preferably four in number, from the outer ends of which vertical rods, connected with pump pistons below, are suspended, the said pendulum being suspended on a portable frame of peculiar construction.

STEAM ENGINES.—Nathan E. Nash, Westerly, R. I.—This invention relates to improvements in steam engines, and it consists in an arrangement of four cylinders, radially, in a four or eight sided, or circular piece of metal, and a connection of the pistons, in pairs, with the wrist pin of the crank, by one yoke or slotted bar, to which the two coincident piston rods are connected; and it also consists of a novel arrangement on the crank shaft, and with the ports of a notched rotary disk, for opening and closing the ports.

PICKET CUTTER.—James W. Clark, Outville, Ohio.—This invention relates to a new and improved machine for cutting the pickets near the ends, for making the ornamental tops, and it consists in a broad thin cutter of steel, shaped in cross sections to correspond with the line to which it is required to shape the picket on each side, and a corresponding bed plate or cutter, the first mentioned cutter being mounted on a vertically reciprocating cross-head, arranged in suitable guides and provided with a hand lever for operating it, said hand lever being connected by a rod with a clamping lever on the bed plate, under which, at one end, the picket is placed, and clamped for holding it in place while the cutting is done, the said clamping being effected by the power applied to the lever for effecting the cutting.

Official List of Patents.

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FOR THE WEEK ENDING APRIL 11, 1871.

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113,478.—MANUFACTURE OF PEAT FUEL.—David Aikman, Montreal, Canada.
113,479.—TICKET HOLDER.—A. F. R. Arndt, Cleveland, Ohio.
113,480.—PITCHING BARRELS.—William Anheuser, St. Louis, Mo.
113,481.—FIRE CHAMBER FOR PUDDLING, STEAM BOILER, AND OTHER FURNACES.—W. F. Beecher, Pittsburgh, Pa.
113,482.—COMBINED PLOW AND SEEDER.—W. C. Bibb, Madison, Ga.
113,483.—LET-OFF MECHANISM FOR LOOMS.—E. B. Bigelow, Boston, Mass.
113,484.—PLOW.—Jerome Blanchard, Iowa Falls, Iowa.
113,485.—ELASTIC CEMENT FOR LINING PETROLEUM BARRELS.—J. J. K. Boote and W. A. Gibson, Cleveland, Ohio.
113,486.—MANUFACTURE OF RUBBER BELTING.—A. O. Bourn, Providence, and I. F. Williams, Bristol, R. I.
113,487.—EDGING MACHINE.—Henry Bradt, Manistee, Mich.
113,488.—MACHINE FOR REDUCING WOOD FOR THE MANUFACTURE OF PAPER PULP.—James Bridge, Augusta, Me.
113,489.—TURBINE WATER WHEEL.—McK. A. Brooks, La Porte, Ind.
113,490.—JOURNAL BOX.—A. G. Brown, Wareham, Mass.
113,491.—FILTER.—James Brown (assignor to I. D. Thompson), San Francisco, Cal.
113,492.—HEATING STOVE.—Esek Bussey, Troy, N. Y.
113,493.—WASHING MACHINE.—J. E. Carroll and John Lord, Philadelphia, Pa.
113,494.—JOURNAL BOX.—W. T. Carroll, Medway, Mass., assignor to George Draper & Sons.
113,495.—CORN HUSKER.—E. H. Carver, Humberstone, Canada, and G. M. Baker, Buffalo, N. Y.
113,496.—HASP LOCK.—W. N. Chamberlain, Denton, Mich.
113,497.—CRADLE.—J. B. Charlton, Kalamazoo, Mich.
113,498.—SEWING MACHINE.—Milton Chase, Haverhill, Mass.
113,499.—LOCK FOR HAND-CUFFS.—H. H. Cheney, East Saginaw, Mich.
113,500.—WEATHER STRIP.—F. A. Coats, Kelloggsville, Ohio.
113,501.—PLATE BUTT HINGE.—J. J. Crooke, Southfield, and Lewis Crooke, New York city.
113,502.—PREPARATION OF PAPER PULP AND MANUFACTURE OF PAPER.—Julien Denis, Stamford street, Blackfriars, Great Britain. Antedated March 24, 1871.
113,503.—COMPRESSION COCK.—William Dinnen (assignor to the Detroit Novelty Works), Detroit, Mich.
113,504.—CARRIAGE SEAT AND TOP.—L. Z. Dodds, South Bend, assignor to himself and J. B. Moulton, La Porte, Ind.
113,505.—PRESERVING AND TRANSPORTING FRESH MEAT.—William Dugan, Chicago, Ill.
113,506.—DRAWER-PULL LABEL HOLDER.—J. A. Evarts and Pietro Cinquini (assignors to Bradley & Hubbard), West Meriden, Conn.
113,507.—HYDRANT.—James Fernan, Cleveland, Ohio.
113,508.—CONSTRUCTION OF STEAM HAMMER STANDARDS.—O. C. Ferris and F. B. Miles, Philadelphia, Pa.
113,509.—FIRE ESCAPE.—William Gardner, Boston, Mass. Antedated March 30, 1871.
113,510.—RAILROAD SPIKE.—Charles Gaylord, Washington, D. C. Antedated March 29, 1871.
113,511.—CULTIVATOR.—Julius Gerber and Horace Brown, Rockford, Ill.
113,512.—MACHINE FOR TAPPING NUTS.—J. L. Gill, Jr., Columbus, Ohio.
113,513.—GASOLINE ATTACHMENT FOR COOKING STOVES.—Frederick Hainsworth, Chicago, Ill.
113,514.—BRICK MACHINE.—Enoch Hallett, Hillsdale, Mich
113,515.—FLY TRAP.—C. R. Hardy, Lexington, Ind.
113,516.—FITTER.—Birdsill Holly, Lockport, N. Y.
113,517.—REGULATING AND SAFETY VALVE.—Birdsill Holly Lockport, N. Y.
113,518.—BALE TIE.—John Holmes and J. C. H. Slack, Manchester, England.
113,519.—FINGER GUARD.—Levi Holmes, Greenpoint, N. Y.
113,520.—CULTIVATOR.—Almon Hunt, Macomb, Ill.
113,521.—KING BOLT FOR CARRIAGES.—Dwight Hyde and E. H. Andrews, Bridgeport, N. Y.
113,522.—SEED DRILLING MACHINE.—Oliver Hyde, Oakland Cal.
113,523.—BALANCE VALVE FOR STEAM ENGINES.—Nelson Jenkins, Detroit, Mich.
113,524.—PACKING TUBE FOR VAPOR LAMPS.—W. E. Jervey New Orleans, La.
113,525.—THILL COUPLING.—D. A. Johnson, Boston, Mass.
113,526.—SOAP FOR POLISHING METALS, ETC.—E. A. Johnson (assignor to himself and Alexander Warfield), Philadelphia, Pa.
113,527.—CHIMNEY TOP.—M. S. Kavanaugh, Detroit, Mich.
113,528.—SPARK ARRESTER FOR LOCOMOTIVES.—Francis Kearney, and L. F. Tronson, Newark, N. Y.
113,529.—PLATFORM SCALE.—Michael Kennedy, New York city.
113,530.—LIGHTNING ROD.—Lewis King, East Cleveland, Ohio.
113,531.—SAWING MACHINE.—P. F. King and E. H. King, St. Louis, Mo.
113,532.—DOLL.—Jacob Lacmann, Philadelphia, Pa.
113,533.—STEAM GENERATOR.—E. D. Lacy (assignor to B. C. Sears, Rockford, Ill.
113,534.—GRINDING MILL.—F. H. La Port, Clarinda, Iowa.
113,535.—BASE-BURNING STOVE.—S. H. La Rue (assignor to himself and W. J. Hoxworth), Allentown, Pa. Antedated April 1, 1871.
113,536.—DEPURATOR.—F. C. Leland and S. W. Poland Mass.
113,537.—WINDOW SCREEN.—C. F. Linscott, Chicago, Ill.
113,538.—BUREAU TRAVELING TRUNK.—Hector McKinnon, Cleveland, Ohio.
113,539.—BERTH FOR SLEEPING CARS.—B. F. Manier (assignor to himself and T. R. Smith), Green Island, N. Y.
113,540.—BRICK AND OTHER MOLDS.—Henry Martin, Brooklyn, N. Y.
113,541.—HARNESS SADDLE-TREE.—J. H. Martin, Columbus Ohio.
113,542.—NEEDLE SETTER AND THREADER.—C. F. Martine, Boston, Mass.
113,543.—WEIGHING ATTACHMENT TO WAGONS.—W. H McCormick (assignor to himself and J. T. Williams), Muncie, Ind.
113,544.—SPINDLE FOR WRINGER ROLLERS.—T. E. McDonald, Trenton, N. J.
113,546.—MACHINE FOR TRIMMING THE SOLES OF BOOTS AND SHOES.—Daniel McLaughlin, Baltimore, Md.
113,547.—PACKING PISTON OF STEAM ENGINES, ETC.—J. C. Merriam, Olneyville, R. I.
113,548.—FOLDING TABLE TOP.—C. W. Mills, Chicago, Ill.
113,549.—FIRE POT FOR STOVES AND FURNACES.—Edward Mingay, Boston, Mass.
113,550.—CORN PLANTER.—William Morrison, Carlisle, Pa.
113,551.—CARRIAGE STEP.—Francis B. Morse (assignor to H. D. Smith & Co.), Plantsville, Conn.
113,552.—HORSE HAY RAKE.—William A. Myers, York, Pa.
113,553.—STEAM ENGINE.—Nathan E. Nase, Westerly, R. I.
113,554.—WEATHER-BOARD GAGE.—Matthew Newlove (assignor to himself and George Giebrick), Burlington, Iowa.
113,555.—HOISTING APPARATUS.—C. R. Otis and N. P. Otis, Yonkers, N. Y.
113,556.—COOKING STOVE.—Daniel E. Paris, Troy, N. Y.
113,557.—METAL SCREW AND NUT.—Henry G. Pearson, New York city.
113,558.—PEN HOLDER.—Oliver A. Pennoyer, Washington, D. C.
113,559.—FRAME FOR WIRE MATTRESSES.—Geo. C. Perkins, Hartford, Conn.
113,560.—DOVETAILING MACHINE.—David Pomeroy (assignor to Elander Heath) San Francisco, Cal.
113,561.—PADDLE WHEEL.—Elijah Pratt, New York, assignor to himself, David Mundell and Alfred Mundell, Brooklyn, N. Y.
113,562.—ARTICLE FOR FOOD FROM ALGÆ OR SEA MOSSES.—William J. Rand, Jr., Brooklyn, E. D., N. Y.
113,563.—CLOTHES-LINE CONDUCTOR.—David Reed and Amos Shaeffer, Medway, Ohio.
113,564.—GRAIN DRILL.—Daniel Rentchler, Belleville, Ill.
113,365.—MACHINE FOR SAWING STAVES.—Assaria Rewrick San Francisco, Cal.
113,566.—FRICTION CLUTCH.—George S. Reynolds, Lebanon N. H.
113,567.—GAS HEATER.—Orlando McKnight Reynolds and David Tuttle Kitchell, Oil City, Pa.
113,568.—WHIFFLETREE.—Joseph H. Riggs, Chelsea, Mass.
113,569.—MEDICAL COMPOUND.—Joseph A. Robbins, Medford, Mass.
113,570.—OILCLOTH PRINTING MACHINE.—Charles Rommel, Elizabeth, N. J.
113,571.—DENTIST'S INSTRUMENT STAND.—John J. Ross, Hernando, Miss.
113,572.—FISH-NET SUPPORTER.—Benjamin Rider, Jr., South Orrington, Me.
113,573.—SPRING FOR VEHICLES.—Cyrus W. Salladee, St Catharines, Canada.
113,574.—SPRING FOR VEHICLES.—C. W. Saladee, St. Catharines, Canada.
113,575.—RING SPINNING MACHINE.—J. H. Sawyer, Lowell Mass.
113,576.—SOFA BED.—Charles C. Schmitt, New York city.
113,577.—BUTTON.—Gustav Adolph Schultz, Louisville, Ky.
113,578.—KINDLING MATERIAL.—Theodore Schwartz, New York city.
113,579.—FEED CUTTER.—Joseph Seaman, Chicago, Ill.
113,580.—CHURN.—Abryham Shaffer, Vandalia, Mich.
113,581.—FLY BRUSH.—David Shankland and E. B. Hopkinson, Nevada City, Cal.
113,582.—WASH BOILER.—John H. Siebcke, Ann Arbor, Mich.
113,683.—REFINING IRON AND STEEL.—A. H. Siegfried, South Bend, Ind., assignor to himself and G. B. Garmon.
113,584.—PROCESS AND APPARATUS FOR THE PRODUCTION OF CAST STEEL FROM ORES.—C. W. Siemens, Westminster, England.
113,585.—HOISTING APPARATUS.—Thomas Silver, New York city.
113,586.—CURRENT WATER WHEEL.—H. B. Sinclair, Paw Paw, Mich.
113,587.—MANUFACTURE OF STEEL.—Fred. J. Slade, Trenton, N. J.
113,588.—ROOFING COMPOSITION.—J. H. Smyser, Pittsburgh, Pa.
113,589.—ELECTRO-MAGNETIC BURGLAR ALARM.—J. P. Snyder, Brooklyn, N. Y.
113,590.—APPARATUS FOR EVAPORATING CANE JUICE, ETC.—Ebenezer Sperry, Chicago, Ill.
113,591.—LIQUID AND GAS METER.—D. B. Spooner, Syracuse, N. Y.
113,592.—WATER WHEEL.—John H. Staples (assignor of one half his right to John H. Ferguson & Samuel Clark, and one half to Samuel Clark), Wells.
113,593.—SEWING BOOTS AND SHOES.—Michael J. Stein, New York city.
113,594.—SPINNING WHEEL.—Joseph Strain, Artemesia Canada.
113,595.—KING BOLT FOR WAGONS.—L. T. Swartwout, Locke N. Y.
113,596.—BED BOTTOM.—Joseph Tinney, Westfield, N. Y.
113,597.—WATER METER.—Wm. Van Anden, Poughkeepsie, N. Y.
113,598.—AXLE GAGE.—Richard K. Vestal, Santa Cruz, Cal.
113,599.—OIL RESERVOIR FOR AXLE BOXES.—E. Von Jeinson and J. M. McDonald, San Francisco, Cal.
113,600.—BALANCE VALVE.—Alexander Wanich, Philadelphia, Pa.

113,601.—Combined Thimble and Locket.—William A. Wansleben, Washington, D. C.

113,602.—Smoke House.—Asa Waterman, Providence, R. I.

113,603.—Bottle Fastening.—E. D. Weatherbee, Worcester, Mass.

113,604.—Machine for the Manufacture of Composition Roofing.—Jay J. Wiggin, New York city.

113,605.—Fender or Cushion for Furniture.—George R. Willmot, Meriden, Conn.

113,606.—Pivot for Seats.—John J. Wilson, New York city.

113,607.—Bracket Seat.—John J. Wilson, New York city.

113,608.—Buffer Head and Draw Bar for Railway Cars.—John T. Wilson (assignor to himself, William D. Berry, and John A. Courtney), Pittsburgh, Pa.

113,609.—Wine Press.—Abraham F. Wyker, South Easton, Pa.

113,610.—Attachment for Sewing Machines.—Enoch S. Yentzer, Ottowa, Ill.

113,611.—Machine for Scraping Iron.—Christopher Zug, Pittsburgh, Pa.

113,612.—Electroplating with Nickel.—Isaac Adams, Jr., Boston, Mass.

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113,614.—Pipe Elbow.—William Austin and Wm. Obdyke, Philadelphia, Pa.

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113,616.—Balanced Slide Valve.—A. G. Barrett, Barrett, Kansas.

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113,619.—Perfuming and Disinfecting Apparatus.—Otto Boldemann, New York city.

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113,630.—Faucet.—John S. Clute, Henry W. Trissler, and Walter D. Trissler, Cleveland, Ohio.

113,631.—Machine for Splitting and Skiving Leather.—Alexander Cochran, Athens, Ohio.

113,632.—Harvester Rake.—Otis B. Colcord, Greenville, Ill.

113,633.—Connection for Railway Car.—Joseph R. Crabill, LaCrosse, Ill.

113,634.—Metallic Cartridge.—Silas Crispin, New York city.

113,635.—Machine for Cutting Lozenges, etc.—William Edward Demant, West Hoboken, N.J., assignor to himself and William Hessin, Toronto, Canada.

113,636.—Wagon Brake.—Robert H. Dement, Hudson, Ill.

113,637.—Stall for Horses.—Daniel M. Denison, Savannah, Ga.

113,638.—Attachment to Oil Well Tubings.—William W. Dewy, Tidioute, Pa.

113,639.—Buck Saw Frame.—Jerome C. Dietrich, Rochester, N. Y.

113,640.—Cotton Chopper.—Charles Bryant Douglas, Montgomery, Ala.

113,641.—Ship Pump.—David A. Dunham, Pilatka, Fla.

113,642.—Mold Board for Plows.—Isaac T. Dyer, Macon, Ga.

113,643.—Cooking Stove.—James Easterly (assignor to himself and James Gray), Albany, N.Y.

113,644.—Nail and Tack Plate Feeder.—David J. Farmer, Wheeling, W. Va.

113,645.—Non-freezing Water Pipe.—Valentine Fogerty, Boston, Mass.

113,646.—Pneumatic Signaling Apparatus.—William Foster, Jr., New York city.

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113,650.—Combined Lamp and Reflector.—Henry J. Goff, Dubuque, Iowa.

113,651.—Turning and Boring Mill.—George A. Gray, Jr., Cincinnati, Ohio.

113,652.—Life Preserving Mattress.—Jas. Durell Greene, New York city.

113,653.—Machine for Facing T-Heads.—John Griffith and George W. Wundram, New York city.

113,654.—Toy.—John Hamilton Harbison, Philadelphia, Pa.

113,655.—Dumping Car.—William Henry Harding and Geo. Frederic Morse, Portland, Me.

113,656.—Vise.—William P. Harwood (assignor to James F. Hall and John L. Marshall), Cambridge, N. Y.

113,657.—Farm Gate.—Henry P. Haskin, Roscoe, Ill.

113,658.—Boot and Shoe Heel Burnishing Machine.—Gardner C. Hawkins and Albert G. Mead, Boston, and Vivian Kimball Spear, Lynn, Mass.

113,659.—Shirt.—James Hayden, Philadelphia, Pa.

113,660.—Showcase.—George A. Hearn, Jr., New York city.

113,661.—Canal Lock Valve.—George Heath, Little Falls, N. Y.

113,662.—Chair and Bed Combined.—Gabriel D. Heathwole, Bridgewater, Va.

113,663.—Staple Machine.—Benjamin Hershey, Erie, Pa., assignor to himself, E. Geer, Richard Dudley and Richard F. Gaggin.

113,664.—Rubber Spring for Wagons.—Aaron Higley, Cleveland, Ohio.

113,665.—Attaching Plow Points.—George W. Hildreth, Lockport, N. Y.

113,666.—Machine for Sapping Timber for Shingles.—George M. Hinkley, Milwaukee, Wis.

113,667.—Fire Escape.—Joseph Hoeflinger, Carrollton, Mo.

113,668.—Surface Condenser.—Birdsill Holly, Lockport, N. Y.

113,669.—Ruffle Guide and Band Holder for Sewing Machines.—Elijah Leavitt Howard, Malden, assignor to George Augustus Whiting, Charlestown, Mass.

113,670.—Machine for Sharpening Horseshoe Calks.—Hamilton Howell, Salem, Ohio.

113,671.—Cotton Planter.—John Hughes, New Berne, N.C.

113,672.—Machine for Dressing and Punching Slates.—Julius Jaeger, Tompkinsville, N. Y.

113,673.—Sash Holder.—Morton Judd, New Haven, Conn.

113,674.—Coffee Pot.—Richard H. Kuper, Lockport, N. Y.

113,675.—Machine for Covering Cord.—Reuben Lewis, New York city.

113,676.—Millstone Exhaust.—Jacob Lingenfelter, Bloody Run, Pa.

113,677.—Shot Cartridge.—Charles W. Lovett, Jr., Boston, Mass.

113,678.—Slate Frame.—Peter Lugenbell and William A. Ford, Greensburg, Ind.

113,679.—Lubricating Wool during the Process of Manufacture.—John James Lundy, Leith, near Edinburgh, Great Britain. Antedated April 4, 1871.

113,680.—Bit Brace.—John T. Lynam, Jeffersonville, Ind.

113,681.—Axle Skein.—Lorenzo Mayhew, Greenfield, N. Y.

113,682.—Wheel for Vehicles.—Robert W. McClelland (assignor to himself and John McCreery), Springfield, Ill.

113,683.—Extensible Shelf.—Sophia H. Merser, Washington, D.C.

113,684.—Heel Trimming Machine.—John Q. Moulton, Lynn, Mass.

113,685.—Lubricating Pivot for Turn Table.—John W. Murphy, Philadelphia, Pa.

113,686.—Machine for Cleaning Grain.—Moses T. Nesbitt, Colora, Md.

113,687.—Mechanical Movement.—Archibald Nimmo (assignor to himself, Thomas Moran, and Valentine Stausse), Philadelphia, Pa.

113,688.—Pulley Block.—Joseph W. Norcross, Boston, Mass.

113,689.—Tackle Hook.—Joseph W. Norcross, Boston, Mass.

113,690.—Milk Cooler.—Albert Northrop, Elyria, Ohio.

113,691.—Excavator.—Jason C. Osgood, Troy, N. Y.

113,692.—Combined Bedstead, Bureau and Stand.—Anna Parker and Lewis A. Parker, Girard, Kan.

113,693.—Self Recording Barometer.—David Peelor, Johnstown, Pa.

113,694.—Stovepipe Drum.—William L. Phillips, Normal, Ill.

113,695.—Glove.—John H. Putman, Gloversville, N. Y.

113,696.—Whiffletree.—S. L. Reynolds and J. W. Reynolds, Pittsburgh, Pa.

113,697.—Sliding Door Hanger.—Geo. Rumsey, Watkins, N. Y.

113,698.—Sawing Machine.—S. S. Sherman and H. B. Gunn, Eau Claire, Wis.

113,699.—Die for Taking Impressions from Cloth, etc.—John Joseph C. Smith, Somerville, assignor to Metallic Art Works, Boston, Mass.

113,700.—Cotton and Hay Press.—Reuben Stallings, Louisburg, N. C.

113,701.—Variable Eccentric for Steam Engine Governor.—Samuel Stanton, New York city.

113,702.—Manufacture of Pneumatic Gas for Illuminating, etc.—John W. Stow, San Francisco, Cal.

113,703.—Sawing Machine.—Jerome B. Sweetland, Pontiac, Mich.

113,704.—Sewing Machine for Umbrellas and Parasols.—W. J. Tate (assignor to W. A. Drown & Co.), Philadelphia, Pa.

113,705.—Carriage.—Chauncey Thomas, Boston, Mass.

113,706.—Preserving Wood.—N. H. Thomas, New Orleans, La.

113,707.—Leather-rounding Machine.—James H. Tizzard, Easton, assignor to himself and S. B. Tizzard, Dayton, Ohio.

113,708.—Roll for Rolling Hoop, Bar, and Rod Iron.—James Tranter and Joseph Kinsey, Cincinnati, Ohio.

113,709.—Shovel Handle.—H. C. Trask, Vienna, Me.

113,710.—Wagon Spindle.—J. M. Walters, Schwenksville, Pa.

113,711.—Stove Utensil Holder.—Stewart Watt, Barnesville, Ohio.

113,712.—Wash Boiler.—W. A. Wells, St. Paul, Minn., and L. P. Converse, Milwaukee, Wis.

113,713.—Medical Compound or Bitters.—S. R. Whitlow, Limestone township, Ill.

113,714.—Reed Organ.—G. W. Woodruff (assignor to John Farris), Hartford, Conn.

113,715.—Trunk.—John Young, Buffalo, N. Y.

113,716.—Surface Blow-off Pipe for Boilers.—James Perkins (assignor to himself and Jacob Brandt, Jr.), Baltimore, Md.

113,717.—Corn Planter.—G. W. Lewis, Winchester, Ky.

113,718.—Combined Planter and Seeder.—Samuel Hiestand, Hillsborough, Ohio.

REISSUES.

4,328.—Printing Photographs.—Joseph Albert, Munich, Bavaria.—Patent No. 97,336, dated Nov. 30, 1869.

4,329.—Division A.—Water Wheel.—Joel T. Case, Bristol, Conn., assignor to The National Water Wheel Co.—Patent No. 108,757, dated Nov. 1, 1870.

4,330.—Division B.—Water Wheel.—Joel T. Case, Bristol, Conn., assignor to The National Water Wheel Co.—Patent No. 108,757, dated Nov. 1, 1870.

4,331.—Division A.—Lantern.—W. H. Bonnell (assignor to himself and Horace Parmalee), Buffalo, N. Y.—Patent No. 96,772, dated Nov. 16, 1869.

4,332.—Division B.—Lantern.—W. H. Bonnell (assignor to himself and Horace Parmalee), Buffalo, N. Y.—Patent No. 96,772, dated Nov. 16, 1869.

4,333.—Tool Holder.—W. W. Draper, Greenfield, Mass.—Patent No. 22,635, dated January 18, 1859.

4,334.—Stem-setting Watch.—Jules Jurgensen, Locle, Switzerland.—Patent No. 61,307, dated January 15, 1867.

4,335.—Car Spring.—Albert Hebbard and John P. Onderdonk, Buffalo, N. Y., assignees of Albert Hebbard.—Patent No. 53,222, dated March 13, 1866.

4,336.—Stock Car.—Lee Swearingen, Grafton, W. Va., assignor to the National Cattle Car Co., Salem, Ohio. Patent No. 28,517, dated May 29, 1860.

4,337.—Air-compressing Apparatus.—John S. Patric, Rochester, N. Y.—Patent No. 47,328, dated April 18, 1865.

4,338.—Faucet.—James Powell, Cincinnati, Ohio.—Patent No. 25,349, dated Sept. 6, 1859.

4,339.—Car Coupling.—W. B. Snedaker, Phœnix, N. Y.—Patent No. 108,404, dated October 18, 1870.

4,340.—Cattle Car.—John W. Street, Marshalltown, Iowa.—Patent No. 96,362, dated Nov. 2, 1869.

4,341.—Wheelbarrow Frame.—Beckwith W. Tuthill, Oregon City.—Patent No. 110,698, dated January 3, 1871.

DESIGNS.

4,773.—Bottle.—T. A. Atterbury, Birmingham, Pa.

4,774.—Ornamentation of Glassware.—Mary B. Campbell (assignor to Campbell, Jones & Co.), Pittsburgh, Pa.

4,775 to 4,778.—Carpet Pattern.—R. R. Campbell (assignor to Lowell Manufacturing Co.), Lowell, Mass. Four patents.

4,779.—Burial Casket.—E. L. Cooke and J. H. Whitmore, Hartford, Conn.

4,780.—Handle for Stop Cocks.—W. S. Cooper (assignor to Cooper, Jones & Co.), Philadelphia, Pa.

4,781 to 4,787.—Carpet Pattern.—Albert Cowell (assignor to James Humphries & Sons), Kidderminster, England. Seven patents.

4,788.—Fork or Spoon Handle.—John M. Culver (assignor to Hall, Elton & Co.), Wallingford, Conn.

4,789.—Bitter Tube.—John L. Dawes, Pittsburgh, Pa.

4,790.—Hinge.—Thomas Drake, Cincinnati, Ohio.

4,791.—Flange and Crank.—W. W. Eastman, Meadville, Pa.

4,792.—Printed Fabric.—Thomas Hardcastle, of the Bradshaw Works, near Bolton, England.

4,793.—Puzzle Block.—Samuel Loyd, New York city.

4,794.—Steam Engine Governor Case.—J. A. Lynch, Boston, Mass.

4,795.—Watch Plate.—Eugene Marcile, New York city.

4,796.—Box.—A. H. Mershon, East Saginaw, Mich.

4,797.—Clock Case.—Nicholas Muller, New York city.

4,798.—Carpet Pattern.—E. J. Ney, Dracut, Mass., assignor to Robert Beattie & Sons, Little Falls, N. J.

4,799.—Watch Plate.—E. H. Perry, Boston, Mass.

4,800.—Revolving Grate.—John D. Vance (assignor to himself and F. M. Eddy), Cincinnati, Ohio.

4,801.—Printed Material for Aprons.—Wm. H. Walton, Brooklyn, N. Y.

4,802.—Printed Material for Gored Skirts.—Wm. H. Walton, Brooklyn, N. Y.

4,803.—Hand Stamp.—Frank Waters (assignor to Thos. W. Starr), Philadelphia, Pa.

4,804 to 4,808.—Ornament for Fountains, etc.—Jonathan Moore and William Wilkinson (assignors to Jonathan Moore and A. Horton), Brooklyn, N. Y. Five patents.

4,809.—Fountain Vase.—Jonathan Moore and Wm. Wilkinson (assignors to Jonathan Moore and A. Horton), Brooklyn, N.Y.

TRADE MARKS.

216.—Thrashing Machine.—James Brayley, Buffalo, N. Y.

217.—Plow.—Bucher, Gibbs & Co., Canton, Ohio.

218.—Bitters.—Dr. S. B. Hartmann & Co., Lancaster, Pa.

219.—Stationers' Hardware.—T. S. Hudson, East Cambridge, Mass.

220.—Cotton Goods.—B. B. & R. Knight, Providence, R. I.

221.—Whisky.—B. K. Reynolds, Boyd's Station, Ky.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

762.—Burnishing the Heels of Boots and Shoes.—V. K. Spear, Lynn, Mass. March 21, 1871.

783.—Grinding, Pulverizing, and Levigating Solid Substances, and Mixing and Agitating Liquids, or Liquids and Solids together.—W. J. Menzies, New York city. March 22, 1871.

789.—Tap or Faucet for Bottles.—W. C. Ireland, Boston, Mass. March 23, 1871.

791.—Fiber for Paper Pulp, Textile Fabrics, Yarns, etc.—Henry Von Phul, Hannibal, Mo. March 23, 1871.

796.—Lubricator.—N. Siebert, San Francisco, Cal. March 23, 1871.

814.—Sewing Machine Attachment for Buttonholing and Overseaming.—J. K. Prayn, New York city, residing at 53 Chancery Lane, London, Eng. March 25, 1871.

821.—Garter.—Frank Armstrong, Bridgeport, Conn. March 27, 1871.

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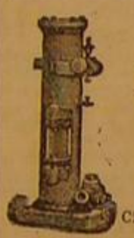

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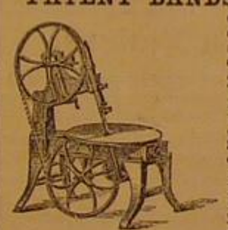

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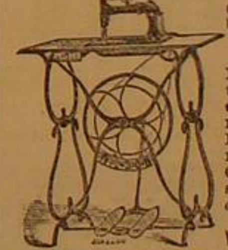

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Vol. XXIV.--No. 18. [NEW SERIES.] NEW YORK, APRIL 29, 1871. $3 per Annum. [IN ADVANCE.]

Improved Excavator.

While there is probably an ample supply of skilled labor to perform the nicer mechanical and industrial work of the country, there is a lack in agriculture and the ruder operations of railway and canal construction, which keeps wages at a high figure, and compels contractors to adopt any and all practical means to lessen their burdens in this respect.

Excavating for railways and canals has hitherto been generally performed by hand labor. Although there have been machines invented for this purpose, they have not been generally introduced.

Our engraving illustrates a new machine of this kind for which superior advantages, over all that have preceded it, are claimed.

In place of the ordinary crane, a boom is employed, having its lower end attached by a joint to the foot of a short mast, to which the turntable is fastened.

The upper end of the boom is supported by a chain controled by the dipper tender. The end of the dipper handle is firmly attached by a joint to the boom. By raising or lowering the upper end of the boom, the position of the dipper is changed. If it be wished to work carefully to a certain grade in light cutting, by lowering the boom as the engineer winds up the dipper chain, the dipper passes over a long distance, and leaves the surface uniform, working, it is claimed, rapidly, and moving no more material than is required. As considerable distance from the body of the machine can be reached, frequent moving is avoided.

In excavating hard material, other machines have difficulty in holding the mouth of the dipper with sufficient power against the hard surface to make it take hold. In this machine, the forward truck wheels are jacked up slightly from the truck, which holds the body of the machine from retreating, and the dipper holds itself against hard banks, and can be governed to cut just the depth that the power will carry it through.

If the dipper strikes a rock or hidden obstruction that resists removal, the boom is raised and the dipper chain slacked to free it.

The inventors have also an attachment, used in place of the dipper and handle shown, by which hard pan is readily broken up, and prepared for the action of the dipper when the latter is replaced.

When this machine is placed upon a boat, it is claimed to be a first class dredge, and, if required, will, with a short boom, dredge under canal bridges.

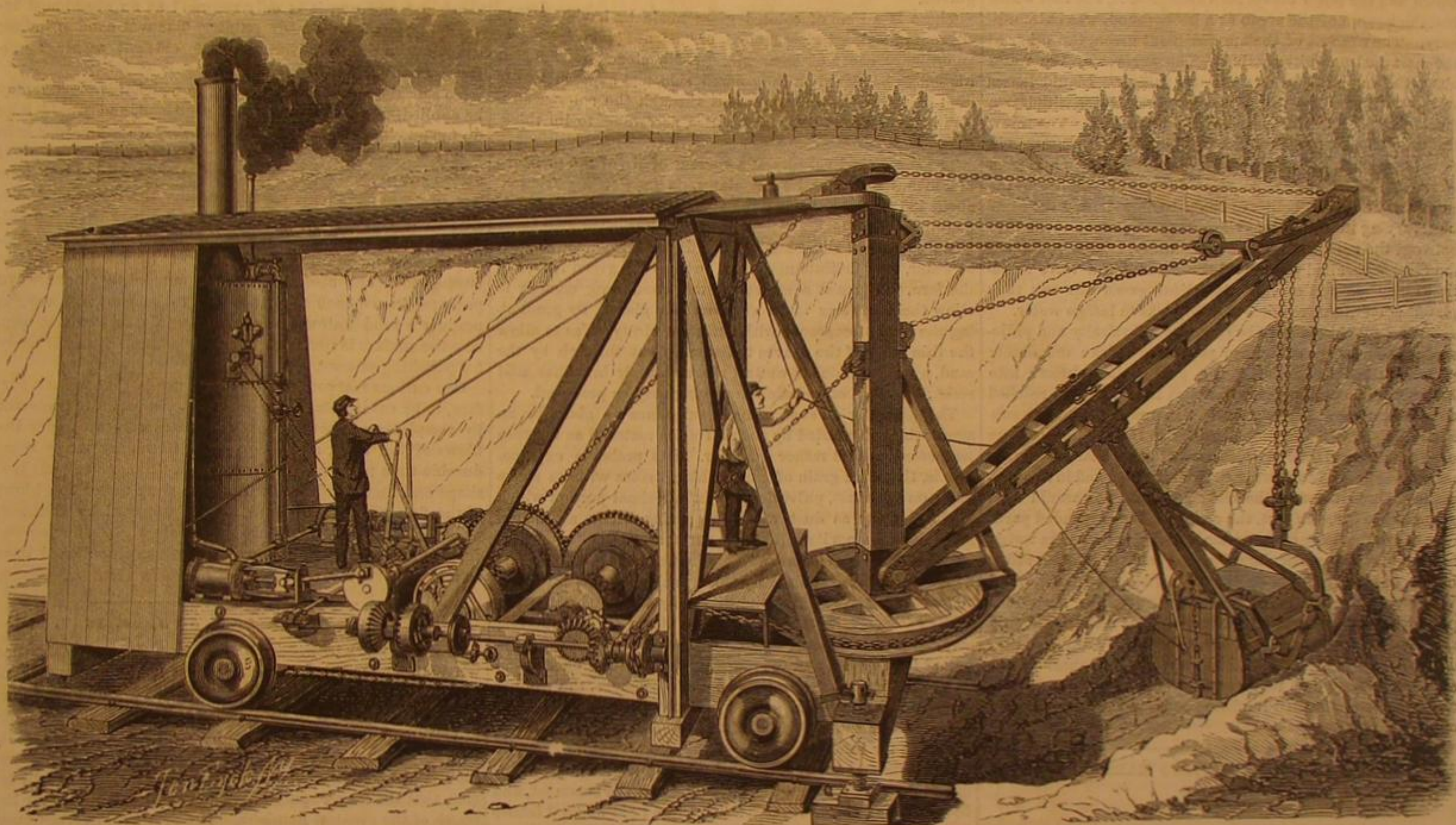
When placed upon a pier with a long boom and mast, it will work in deep water to a long distance, depositing the excavated material upon the pier.

It is claimed to be a cheaper machine than any other of the same power. Small sizes can be handled on common roads without removing the machinery. They have been built of weights varying from eight to twenty-four tuns.

We are informed that a coal company has used one with much satisfaction for handling coal, and that another is working very satisfactorily dredging on a southern river. Several are now working in railway excavations.

Expansive friction clutches are used, which obviate shocks to the machinery. The engine is provided with a governor, and other appliances for the economical application of the power.

This machine was patented November 29, 1870, by Clinton H. Sage and Samuel B. Alger. For further information, address the manufacturers, John King & Co., Oswego, N. Y.



SAGE & ALGER'S PATENT EXCAVATOR AND DREDGING MACHINE.

COLORS OF THE SEA.

Two distinct series of observations have been brought before you, the one consisting of direct observations of the color of the sea, conducted during the voyage from Gibraltar to Portsmouth; the other conducted in our laboratory below stairs. And here it is to be noted that, in the home examination, I never knew what water I had in my hands. The labels, which had written upon them the names of the localities, had been tied up as you see them here, all information regarding the source of the water being thus precluded. The bottles were simply numbered, and not till all the waters had been examined did I open the labels, and ascertain the locality and sea colors corresponding to the various specimens. I must, therefore, have been perfectly unbiassed in my home observations, and they establish beyond a doubt the association of the green color of sea water with fine suspended matter, and the association of the ultramarine color, and more especially of the black indigo hue of sea water, with the comparative absence of such suspended matter.

Color, you know, resides in white light, appearing generally when any constituent of the white light is withdrawn. Here is a liquid which colors a beam sent through it purple. It cuts out the yellow and green, and allows red and blue to pass through. The blending of these two colors produces the purple. Does the liquid allow absolutely free passage to the red and blue? No. It enfeebles the whole spectrum, but attacks with special energy the yellow and green colors. By increasing the thickness of the stratum traversed by the beam, we cut off the whole of the spectrum. Through the deeper layer, which I now place in the path of the beam, no color can pass. Here, again, is a blue liquid. Why is it blue? Its action on the spectrum answers the question. It first extinguishes the red; then as the thickness augments, it attacks the orange, yellow, and green, in succession; the blue alone finally remains, but everything might be extinguished by a sufficient depth of the liquid.

And now we are prepared for a concentrated but tolerably complete statement of the action of sea water upon light, to which it owes its blackness. Here is our spectrum. This embraces three classes of rays—the thermal, the visual, and the chemical. These divisions overlap each other; the thermal rays are in part visual, the visual rays in part chemical, and *vice versâ*. The vast body of thermal rays is here beyond the red and invisible. They are attacked with exceeding energy by water. They are absorbed close to the surface of the sea, and are the great agents in evaporation. At the same time the whole spectrum suffers enfeeblement; water attacks all its rays, but with different degrees of energy. Of the visual rays the red are attacked first, and first extinguished. While the red is extinguished, the remaining colors are enfeebled. As the solar beam plunges deeper into the sea, orange follows red, yellow follows orange, green follows yellow, and the various shades of blue, where the water is deep enough, follow green. Absolute extinction of the solar beam would be the consequence if the water were deep and uniform, and contained no suspended matter. Such water would be as black as ink. A reflected glimmer of ordinary light would reach us from its surface, as it would from the surface of actual ink; but no light, hence no color, would reach us from the body of the water. In very clear and very deep sea water this condition is approximately fulfilled, and hence the extraordinary darkness of such water. The indigo, to which I have already referred, is, I believe, to be ascribed in part to the suspended matter, which is never absent, even in the purest natural water, and in part to the slight reflection of the light from the limiting surfaces of strata of different densities. A modicum of light is thus thrown back to the eye, before the depth necessary to absolute extinction has been attained. An effect precisely similar occurs under the moraines of the Swiss glaciers. The ice here is exceptionally compact, and owing to the absence of the internal scattering common in bubbled ice, the light plunges into the mass, is extinguished, and the perfectly clear ice presents an appearance of pitchy blackness.

The green color of the sea, when it contains matter in a state of mechanical suspension, has now to be accounted for, and here, again, let us fall back upon the sure basis of experiment. This white plate was once a complete dinner plate, very thick and strong. It is, you see, surrounded securely by cork, and to it a lead weight is fastened. Forty or fifty yards of strong hempen line were attached to the plate. With it in his hand, my assistant, Thorogood, occupied a boat fastened as usual to the davits of the *Urgent*, while I occupied a second boat nearer to the stern of the ship. He cast the plate as a mariner heaves the lead, and by the time it had reached me, it had sunk a considerable depth in the water. In all cases the hue of this plate was green, and when the sea was of the darkest indigo, the green was the most vivid and pronounced. I could notice the gradual deepening of the color as the plate sank, but at its greatest depth in indigo water, the color was still a blue green.

Other observations confirmed this one. The *Urgent* is a screw steamer, and right over the blades of the screw there was an orifice called the screw well, through which you could look from the poop down upon the screw. The surface glimmer which so pesters the eye was here in a great measure removed. Midway down, a plank crossed the screw well from side to side, and on this I used to place myself to observe the action of the screw underneath. The eye was rendered sensitive by the moderation of the light, and still further to remove all disturbing causes, Lieutenant Walton had the great kindness to have a sail and tarpaulin thrown over the mouth of the well. Underneath this I perched myself and watched the screw. In an indigo sea the play of colors was indescribably beautiful, and the contrast between the water which had the screw blades for a background, and that which had the bottom of the ocean as a background, was extraordinary. The one was of the most brilliant green, the other of the most lustrous ultramarine. The surface of the water above the screw blade was always ruffled. Liquid lenses were thus formed, by which the colored light was withdrawn from some places and concentrated upon others. The screw blades in this case replaced the plate in the former case, and there were other instances of a similar kind. The hue from an indigo sea was always green at a certain depth below the surface. The white bellies of the porpoises showed the same hue, varying in intensity as the creatures swung to and fro between the surface and the deeper water. In a rough sea the light which had penetrated the summit of a wave sometimes reached the eye. A beautiful green cap was thus placed upon the wave when the ship was in indigo water.

But how is this color to be connected physically and philosophically with the suspended particles? Take the dinner plate which showed so brilliant a green when thrown into indigo water. Suppose it to diminish in size until it reached an almost microscopic magnitude. It would still behave substantially as the larger plate, sending to the eye its modicum of green light. If the plate, instead of being a large coherent mass, were ground to powder sufficiently fine, and in this condition diffused through the clear sea water, it would send green to the eye. In fact, the action of the suspended particles, which the home examination revealed in green sea water, is in all essential particulars like the plate, or like the screw blades, or like the foam, or like the bellies of the porpoises. When too gross, or in too great quantity, the suspended particles thicken the sea itself visibly. But when sufficiently small, but not too small, and when sufficiently diffused, they do not sensibly interfere with the limpid greenness of the sea it elf. They then require the stronger and more delicate test of the concentrated luminous beam to reveal their presence.—*Tyndall.*

TILGHMAN'S PROCESS OF CUTTING HARD SUBSTANCES.

BY COLEMAN SELLERS.

How to cut or carve, mechanically, hard substances, such as stone, glass, or hard metals, in an expeditious, accurate, and economical manner, has always engaged the attention of engineers. At the present time, the rapidly increasing cost of manual labor makes improvements in this direction more needful. The discovery and utilization of opaque crystalized carbon, cheaper than transparent diamonds, but perhaps equally durable, has gone far in this direction. Now, Mr. B. C. Tilghman, of Philadelphia, comes forward, and shows that a jet of quartz sand thrown against a block of solid corundum will bore a hole through it 1½ inches in diameter, 1½ deep, in 25 minutes, and this with a velocity obtainable by the use of steam as the propelling power, at a pressure of 300 pounds per square inch—a remarkable result, when we consider that corundum is next to and but little inferior to the diamond in hardness.

At the stated meeting of the Franklin Institute, held February 15, 1871, the resident secretary, Dr. W. H. Wahl, introduced this invention, illustrating his description of it by practically cutting or depolishing the surface of a plate of glass by a sand blast of very moderate intensity. Various examples of hard substances cut, depolished, and carved into shape, were displayed. In the discussion which followed the presentation of this very remarkable discovery, Mr. Robert Briggs, in his interesting remarks on the subject, took occasion to say that it had been long remarked that window glass, exposed to the wind-driven sand, near the seashore, soon loses its polish, and cited some other well known examples of the erosion of surface when exposed to a continued stream of moving particles. When we think of the many such examples, and consider that engineers have had continually to make provision against this well known cutting effect, it seems surprising that it should not have been turned to some good account before this.

Mr. Tilghman's attention seems first to have been directed towards cutting stone, or hard metal, by a jet of sand impelled by steam escaping under high pressure. His early experiments were, I believe, with very high pressure, but as he progressed in the knowledge of results obtainable with various velocities, a great use for this process seemed to develope itself in sand driven by moderate air blasts, and applied to grinding or depolishing glass for ornamental purposes.

For grinding glass he uses a common rotary fan 30 inches in diameter, making about 1,500 revolutions per minute, which gives a blast of air of the pressure of about 4 inches of water, through a vertical tube 2 feet high by 60 inches long, and 1 inch wide.

Into the top of this tube the sand is fed, and falling into the air current, and acquiring velocity from it, is dashed down against the sheets of glass, which are slowly moved across, about an inch below the end of the tube. About 10 or 15 seconds exposure to the sand blast is sufficient to completely grind or depolish the surface of ordinary glass; so that sheets of it, carried on endless belts, may be passed under this one inch wide sand shower at the rate of 5 inches forward movement per minute. In the machine in use for this purpose, the spent sand is reconveyed to the upper hopper by elevators, and the dust made by the sand blast (which might otherwise be a source of annoyance to the workmen) is drawn back into the fan, and thence passes with the wind into the blast, and again mingles with the shower of sand upon the glass.

By covering parts of the glass surface by a stencil or pattern of any tough or elastic material, such as paper, lace, caoutchouc, or oil paint, designs of any kind may be engraved.

There is a kind of colored glass made by having a thin stratum of colored glass melted or "flashed" on one side of an ordinary sheet of clear glass. If a stencil of sufficient toughness be placed on the colored side, and exposed to the sand blast, the pattern can be cut through the colored stratum in from about 4 to 20 minutes, according to its thickness.

The theoretical velocity of a current of air, of the pressure of 4 inches of water, he calculates, is (neglecting friction) about 135 feet per second; the actual velocity of the sand is doubtless much less.

If a current of air of less velocity is used, say about 1 inch of water, very delicate materials, such as the green leaves of the fern, will resist a stream of fine sand long enough to allow their outlines to be engraved on glass. By graduating the time of exposure with sufficient nicety, so as to allow the thin parts of the leaves to be partly cut through by the sand, while the thicker central ribs and their branches still resist, the effect of a shaded engraving may be produced.

The grinding of such a hard substance as glass by an agent which is resisted by such a fragile material as a green leaf, seems at first rather singular. The probable explanation is, that each grain of sand which strikes with its sharp angle on the glass, pulverizes an infinitesimal portion which is blown away as dust, while the grains which strike the leaf rebound from its soft elastic surface.

The film of bichromatized gelatin, used as a photographic negative, may be sufficiently thick to allow a picture to be engraved on glass by fine sand, driven by a gentle blast of air.

For cutting stone, the inventor uses steam as the impelling jet; the higher the pressure, the greater is the velocity imparted to the sand, and the more rapid its cutting effect.

In using steam of about 100 pounds pressure, the sand is introduced by a central iron tube, about $\frac{1}{16}$ inch bore, while the steam is made to issue from an annular passage surrounding the sand tube.

A certain amount of suction of air is thus produced, which draws the sand through the sand tube into the steam jet, and both are then driven together through a tube about 6 inches long, in which the steam imparts its velocity to the sand, and finally strike on the stone, which is held about an inch distant from the end of the tube.

At the spot struck a red light is visible, as if the stone were red hot, though really it is below 212° Fah. The light is probably caused by the breaking up of the crystals of the sand and stone.

The cutting effect is greatest when free escape is allowed for the spent sand and steam. In making a hole of diameter but slightly greater than that of the steam jet, the rebounding steam and sand slightly interfere with and lessen the efficiency of the jet.

Under favorable conditions, using steam which he estimated as equal to about 1¼ horse power, at a pressure of about 125 pounds, the cutting effect per minute was about 1¼ cubic inches of granite, or 3 cubic inches of marble, or 10 cubic inches of soft brown sandstone.

By means of flexible or jointed connecting tubes, the blast pipe is made movable in any direction; grooves and moldings of almost any shape can thus be made, or, by means of stencil plates, letters or ornaments can be cut either in relief or intaglio, with great rapidity in the hardest stone.

At a high velocity, quartz sand will cut substances much harder than itself, as before stated. With a steam jet of 300 pounds pressure, a hole 1½ inches in diameter was cut through a piece of corundum, 1½ inches thick, in 25 minutes.

A hole 1 inch long and ¼ inch wide was cut through a hard steel file, ¼ inch thick, in 10 minutes, with a jet of 100 pounds steam.

A stream of small lead shot, driven by 50 pounds steam, wore a small hole in a piece of hard quartz; the shot were found to be only very slightly flattened by the blow, showing their velocity to have been moderate.

Among the curious examples of glass, cut by this sand blast, was shown a piece of ordinary window glass, which, having been partially protected by a covering of wire gauze, had been cut entirely through, thus producing a glass sieve, with openings of about $\frac{1}{8}$ of an inch, the intervening glass meshes being only $\frac{1}{16}$ of an inch wide. This seems to have been produced more as a curiosity than for any practical purpose. Should such a sheet of perforated glass be required, it is questionable if it could be produced for a solid sheet by any other method.

A microscopic examination of the sheet glass, depolished by this process, shows a succession of pits formed by the blows of the impinging grains of sand, and looks more uniform than do surfaces ground by any rubbing process.

This steam sand jet has already been introduced to clean cast iron hollow ware, previous to tinning the interior. Heretofore, the interior surface has been turned, it having been found necessary to remove a thin shaving in a lathe to obtain a clean surface. The surface is cleaned more rapidly by the sand blast, and even more perfectly, because it penetrates into any holes or depressions which the turning tool could not reach. It is also probable that the sand striking the particles of plumbago, which separate the particles of metallic iron in ordinary gray cast iron, will remove them, and thus expose a continuous metallic surface to take the tin.

In this relation I might note, that about twenty-five years ago, some experiments were made in Cincinnati, at the establishment of Mr. Miles Greenwood, by my brother, Mr. George Escol Sellers, with a view to making tinned hollow ware of ordinary gray iron. He made a machine for scouring the inside of the pots and kettles with sand and water; afterwards the still wet, scoured surfaces passed into the chloride of zinc solution, and thence into the molten metal, and were uniformly turned. For some reason, the process was not continued, and now it is only recorded as an abandoned invention, never before made public. The wet sand grinding could not, in this case, have been so efficient as Mr. Tilghman's sand blast.

To speculate on the various uses to which this process may be applied, would not serve any good end, and would take up too much space. With this discovery we can hardly help recurring to the works of the ancients, and wondering if some such process could have aided the workers in the stone age, or could have been used in carving the Egyptian hieroglyphics. It has been noted by those familiar with the cutting or dressing of stone, that some materials, such as granite, are very much injured or "stunned" by the blows of the cutting tool, and after being hand dressed, a thickness or perhaps from ⅛ inch to ¼ inch has to be ground away, to produce a solid uniform surface. By this sand cutting process the surface is not injured, is not "stunned," and is ready for polishing at once.

One curious fact connected with its use is, that when a surface, to be cut in intaglio or otherwise, is partially protected by templates of metal, these templates curl up under the blows of the sand, so that paper patterns are really more durable than patterns cut from brass. Sheet steel, cut into shape and then hardened, will also curl up under the blows of the fine particles of sand, unless protected by sheets of yielding material. Fine lace will protect glass during the depolishing process, and leave its designs in polished lines on a ground surface.—*Journal of Franklin Institute.*

The Great Sun Spot of June, 1843.

Prof. Daniel Kirkwood, in *American Journal of Science*, writes that one of the largest and most remarkable spots ever seen on the sun's disk, appeared in June, 1843, and continued visible to the naked eye for seven or eight days. The diameter of this spot was, according to Schwabe, 74,000 miles; so that its area was many times greater than that of the earth's surface. Now it has been observed, during a number of sun spot cycles, that the larger spots are generally found at or near the epoch of the greatest numbers. The year 1843 was, however, a *minimum* epoch of the eleven year cycle. It would seem, therefore, that the formation of this extraordinary spot was an anomaly, and that its origin ought not to be looked for in the general cause of the spots of Schwabe's cycle.

As having a possible bearing on the question under consideration, let us refer to a phenomenon observed at the same moment, on the first of September, 1858, by Mr. Carrington, of Redhill, and Mr. Hodgson, at Highgate. "Mr. Carrington had directed his telescope to the sun, and was engaged in observing his spots, when suddenly two intensely luminous bodies burst into view on its surface. They moved side by side through a space of about thirty-five thousand miles, first increasing in brightness, then fading away. In five minutes they had vanished. . . . . It is a remarkable circumstance, that the observations at Kew show that on the very day, and at the very hour and minute of this unexpected and curious phenomenon, a moderate but marked magnetic disturbance took place; and a storm, or great disturbance of the magnetic element, occurred four hours after midnight, extending to the Southern hemisphere."

The opinion has been expressed by more than one astronomer, that this phenomenon was produced by the fall of meteoric matter upon the sun's surface. Now this fact may be worthy of note, that the comet of 1843, which had the least perihelion distance of any on record, gradually grazed the solar atmosphere about three months before the appearance of the great sun spot of the same year. The comet's least distance from the sun was about 65,000 miles. Had it approached but little nearer, the resistance of the atmosphere would probably have brought its entire mass to the solar surface. Even at its actual distance, it must have produced considerable atmospheric disturbance. But the recent discovery that a number of comets are associated with meteoric matter, traveling in nearly the same orbits, suggests the inquiry whether an enormous meteorite, following in the comet's train, and having a somewhat less perihelion distance, may not have been precipitated upon the sun, thus producing the great disturbance observed so shortly after the comet's perihelion passage.

The locomotive which George Stephenson constructed in 1814 would travel only four miles an hour. In 1825, six miles an hour was the standard speed.

SOMETHING ABOUT SEEDS.

BY W. W. BAILEY.

The seed of Asclepias, milkweed, is thin, flat, and of a brownish tint. The embryo is devoid of that store of albumen which many plants provide for the early sustenance of their young. It, with its fellows, is imbricated upon a papery placenta, its plumy tufts reposing in gill-like processes of the same until the perfection of the fruit, when they become disengaged by the lightest touch, and waft the attached seed to its destined resting place. Nothing can be more soft and satiny than is the so-called coma of Asclepias. Under the microscope the hairs are found to be exceedingly smooth and regular in outline, and undistinguished by the spiral twisting which characterizes many similar fibers. The evident design of the plumes, as in other cases where seeds are provided with such appendages, is to assist in the wide spread distribution of the species. Many seeds probably fall quite near the parent plant, but chance breezes often carry others to a very great distance.

As every one knows, the dandelion (Taraxacum), the groundsel (Senecio), the thistle (Cirsium and Onopordon), and many other genera of Compositæ, the willows (Salicaceæ), some of the buttercups (Ranunculaceæ), the evening primrose family (Onagraceæ), together with members of many other orders, are similarly endowed with silky tufts to assist the seed in its migrations. The execution may differ in diverse species, but the plan remains the same. This is the commonest, yet other methods are adopted to obtain the same end, as we notice in the key like samara of the maple and the wing-seeds of the trumpet creeper (Tecoma radicans), of the pines and the elms. All these are charming objects when viewed by the unassisted eye, or more closely examined by means of the microscope.

Some plants, like the balsam (Impatiens) and the geranium by a sudden contraction of portions of the capsule, expel the contents with a jerk, which often throws them to a considerable distance. Others are provided with little hooks, claws, fine hairs or some other mechanical means of attaching themselves to moving objects and availing themselves of their involuntary aid. There is no American botanist, probably, but has expostulated mildly with the chain like pods of Desmodium, which will persist to adhering to one's clothing, and the removal of which is no small task. The barbed achenium of Bidens frondosa is another pest to man, as are the burrs of Lappa major or burdock, to sheep and cattle, but we must bear in mind that in the case of these plants, we are merely mediums of conveyance, and have temporarily resigned our proud position at the head of nature.

Animals and birds often distribute seeds which have passed through the system undigested; currents of water in the ocean bear them from one island or continent to another, while commerce, often unintentionally, scatters them over distant lands. In this latter way, many of the most pernicious weeds have spread from Europe into Australia, America and India, where they make themselves perfectly at home and evince frequently even more vitality than the native plants. To take one or two instances of the peculiar method of spreading, the Rudbeckia hirta is said to have come into New England with hay seed from the West, and is evidently increasing; while in New Brunswick I have heard it claimed that the white weed (Leucanthemum vulgare) has spread with other Yankee notions from the neighboring states. It has certainly proved a successful invader and has taken possession of half the cultivated country.

I cannot refrain from inserting here a note from Sir J. E. Tennent's "Ceylon," in relation to the curious seeds of *Spinifex squarosus*, the "water pink" as it is sometimes called by Europeans.

"The seeds of this plant are contained in a circular head, composed of a series of spine like divisions, which radiate from the stalk in all directions, making the diameter of the whole about eight or nine inches. When the seeds are mature, and ready for dispersion, these heads become detached from the plant, and are carried by the wind with great velocity along the sands, over the surface of which they are impelled by their elastic spines. One of these balls may be followed by the eye for miles as it hurries along the level shore dropping its seeds as it rolls, which speedily germinate and strike root where they fall. The globular heads are so buoyant as to float lightly on the water, and the uppermost spines acting as sails, they are thus carried across narrow estuaries to continue the process of embanking on newly formed sand-bars. Such an organization irresistibly suggests the wonderful means ordained by Providence to spread this valuable plant along the barren beach to which no seed devouring bird ever resorts; and even the unobservant natives, struck by its singular utility in resisting the encroachments of the sea, have recorded their admiration by conferring on it the name of Maha-Rawana-raewula, 'the great beard of Rawana or Rama.'"

As to the duration of seeds, there are many conflicting accounts. All are familiar with the old story of the grain found with Egyptian mummies, which vegetated after its disinterment and gave rise to a peculiar kind of wheat. This was a pleasant tale with which to point a moral, but it is now discredited by those most familiar with the facts. Still, it holds its place in many popular books, and shows the ease with which incorrect statements may gain credence, and with what difficulty they are refuted when once proclaimed. That some seeds do live for a long time cannot be doubted, but no such extreme limit is authenticated as that cited for the mummy wheat. There are too many opportunities for error and even fraud, where a story is received at second hand from the Arabs. The largest of the accepted statements look a mite apocryphal. With most seeds the principle of life is evanescent, and it is with extreme difficulty that many can be transported from one climate or country to another. Even those that preserve their appearance unchanged and remain suitable for food, are often found to have lost their power of germination. The conditions necessary for the retention of vitality are not as yet certainly known, but it is thought that a particular amount of dryness together with the exclusion of light and air, are essentials to success.

The total amount of seed produced by some plants is very remarkable. Linnæus says that a single stem of tobacco yields forty thousand seeds, and we all know how well provided with them are our commonest plants.

With the beautiful colors often assumed by seeds, all are of course acquainted who in childhood have arrayed the gaily tinted beans in military order. Nearly all the primary colors are brought into play to ornament the different seeds, while some, more regal in their fancies, are bedecked with bronze and gold.

There are many seeds that are not edible, and others that are extremely noxious. The most deadly substance known, perhaps is prepared from the seed of *Strychnos nux-vomica*.—*American Naturalist.*

Co-operative Cheese Making in the United States.

At a recent meeting of the Swindon (England) Chamber of Agriculture, Mr. W. F. Parsons said that "dairy farming in America represents a capital of more than six hundred millions of dollars. The year 1841 was the first in which cheese was imported in any quantity from the United States. It is now nearly 500,000 cwts. It was then looked on with contempt by English makers, who confidently predicted that it would never successfully compete with the best quality here.

"The idea of associated dairying seems to have originated in Switzerland. Swiss peasants, each owning one or two cows, unite them in a herd, employ a herdsman, who takes them to the mountain passes of the Alps, watches them, and with the help of assistants makes cheese from their milk, which, at the close of the season, is divided among the owners of the cows, according to the number furnished by each. Only on such a system could cheese be made from one or two cows.

"Associated dairying, as it exists in America, is a widely different affair. What distinguishes the system there, is the constant effort to reduce the pursuit to a science. The popular method of organizing factories, and one that seems to give the greatest satisfaction, is to make them joint-stock affairs. The ground is selected, an estimate made of buildings, machinery, and fixtures, then the whole cost is divided up into shares of $50 or $100 each (£10 to £20). The neighboring farmers, or those favorable to the movement, take stock in proportion to the number of cows from which they are to deliver milk. Officers are chosen, and the company managed on the joint-stock principle. Usually, some one of the party is selected as salesman, who makes sale of cheese at best prices, makes up dividends, and pays over shares to 'patrons' whenever a sale is effected, deducting, of course, the price of manufacturing, which is fixed at a point to cover any expenses, including 10 per cent on cost of buildings and fixtures. A good cheese manufacturer is employed either at a salary or at a certain price per pound of the cheese made. The milk is weighed at the factory as it is delivered, as experience has shown that every 10 pounds of milk will, on an average throughout the season, make one pound of cured cheese. The manager is employed with the understanding that he is to make a good article, and his product is examined from time to time by committees of the company and experts, and by farmers when they deliver milk, if they choose, and hence any mismanagement is soon discovered. There is another method by which one man, or a company, erects buildings, and is at the expense of running the factory, charging by the pound for manufacturing. The advantages of the plan under discussion to-day are—first, economy of production; and, secondly, superiority of produce. According to Dr. Voelcker, by utilising whose scientific teachings the Americans have attained their success, 'an ordinarily careful and active manager ought to be able to make good cheese under all circumstances, no matter from what kind of pasture the milk came, in what weather the cheese was made, or in what part of England the factory was situated.'"

A long discussion ensued on Mr. Parsons' paper, the general tone of which appeared favorable to the opinions therein enunciated, and eventually a vote of thanks was accorded to that gentleman for bringing the subject forward.

Fog Signals.

At a recent meeting of the Institution of Civil Engineers, in London, a paper was read "On Phonic Coast Fog Signals," by Mr. A. Beazeley, M. Inst. C. E. Of this paper, the following is an abstract, taken from *Engineering:*

The coasts of these islands being liable to fogs and mists, it was surprising that the subject of fog signals, for the guidance and warning of the mariner under such circumstances, should have received so little attention; and beyond an occasional notice or a brief suggestion among scientific journals, there were no traces of systematic research and experiment. It was by some supposed, that great power and long range of sound were not essential to fog signals, inasmuch as it was said that fogs usually occurred in comparatively calm weather. This, however, was not the case, so far, at least, as regarded the coasts of Great Britain; for in the years 1868–69, fogs prevailed on the Yorkshire coast fifty-one times, at the entrance of the Bristol Channel one hundred and twenty-five times, and near Holyhead one hundred and seventeen times, with a total duration of 254¾, 713¾, and 698¼ hours respectively, when the strongest winds were from the seaward, and varied in force from a mean of 4·55 and a maximum of 8 on the eastern coast, to a mean of 4·47 and a maximum of 9 on the western coast. But even where fogs were not usually attended by high winds, the necessity of power and range in fog signals was in no way diminished; for a heavy snow storm, a thick driving sleet and rain, which often accompanied a gale of wind, were quite as blinding and bewildering as the densest fog.

In 1863, a Committee of the British Association memorialized the President of the Board of Trade, with a view to induce him to institute a connected series of experiments as to the effect of fog upon various sounds. It was then shown that the laws which governed the action of fogs in deadening sound were at present so imperfectly understood, that such a thorough and scientific inquiry was much to be desired, and was, in fact, essential to any real addition to the knowledge of the subject; without which, all investigations of isolated cases were little better than a vague groping in the dark. It was also pointed out that experiments during clear weather could not be accepted as affording satisfactory evidence of the value of any signal during fog.

It was stated that the instruments in use for fog signals were gongs, bells, guns, whistles, and trumpets—the two latter sounded either by steam or by condensed air—and a detailed description was given of these several appliances—whether in use or proposed—and of the experiments that had been tried to ascertain their efficacy.

In conclusion it was remarked that upon a review of the various fog signals which had been mentioned, it was found that the whistle and the trumpet stood out prominently as regarded power and manageableness. Guns, besides their heavy working expenses, had the disadvantage of requiring a longer interval between the signals, and of entailing continuous work upon the attendant. It appeared, therefore, that it was to the improvement and the augmentation of power of the two former, that a more efficient instrument must at present be chiefly looked for. Whatever might be the fog signal adopted in practice, power of sound and certainty of action were indispensable conditions. Better, it had been said, no signal at all, than one that could not be relied upon; and, undoubtedly, if the mariner were led to expect a signal at a certain place, and at a sufficient range to insure time to act upon its warning, it ought to be so heard with unfailing certainty. Among existing signals there were some which, in ordinary fog and moderate weather, would fulfil these requirements: but it was doubtful how far they would act to windward against a heavy gale. The howling of the wind, the groaning and creaking of the hull and spars, the shock and roar and thunder of the sea, the drenching, blinding spray, the fierce blast, the thick mist—those were the antagonists against which the fog signal would have to try its powers; and powerful indeed must be its voice, if it afforded in time a friendly warning.

One difficulty in the way of employing, at rock lighthouses, any fog signal but a bell, or such other instrument as could be sounded by the application of simple clockwork, was the unsuitableness of such buildings for the reception and working of a steam or caloric engine, and the severe labor which would be entailed upon the keepers by the use of powerful machinery worked by hand. But the author still entertained the opinion, which he formed sixteen years ago, that the vast dynamical power afforded by the rise and fall of the tide would yet be utilized and applied to the compression of air for the purposes of fog signals at such stations.

The Shape of Saw Teeth.

The adaptation of tools, in form and construction, to the nature of the work required of them, says *Leffel's Mechanical News*, is an important item in every branch of mechanical industry, and in none more vitally than in the sawing of lumber. The distinction to be made according to the direction in which the saw is to run, whether across the grain or with the grain, is sufficiently plain, and is familiar to every workman in a saw mill. As the fiber of the wood to be severed in cross cutting presents a firm, almost unyielding resistance to the saw, the teeth are of an acute or lancet-like shape, cutting the wood rapidly asunder, as if with a succession of knives, and producing a fine granular sawdust; while the teeth of the rip saw, cutting with or rather separating the grain, are made comparatively large and coarse, encountering less resistance from the wood, which they tear into small chips or shavings. The experience of workmen in soft and especially in gummy or resinous woods, such as pitch pine, larch, etc., gives still more striking proof of the necessity of adapting the saw to the nature of the material in which it is to operate. To prevent the choking of the saw, and a resulting demand for additional power to maintain the motion, the points of the teeth require to be made acute and to have considerable pitch, in order to overcome the obstruction of damp sawdust accumulating in their path; and in gummy wood, an application of grease is often necessary, as a remedy for the heating and friction caused by the tendency of the resin to adhere to the saw.

It may be stated, in general terms, that for soft or yielding woods, of the class of which the willow and pine are common examples, the pitch should be greater, and the teeth large and acutely pointed. For mahogany, rosewood, and other woods of tough and dense fiber, teeth of less size and of perpendicular pitch are appropriate. The principle which should govern the shape of saw teeth is indeed an extremely simple one, and would seem to require no formal statement, more especially as it is certain to make itself manifest, if disregarded, upon a brief experiment. In practice, however, it often fails to receive due attention, and no small amount of inconvenience and actual loss is occasioned by neglect of this material point.

COCHINEAL INSECTS AND THEIR ALLIES.

BY PROFESSOR E. C. H. DAY.

Plant lice and bark lice are among the naturalists' most puzzling conundrums. Insignificant as they are, aphides have been a perturbing element in biology, and have helped to cause a revolution in scientific thought; and they illustrate, in a wonderful manner, the variety of Nature's ways and her unfailing resources. We know that plants, their life being devoted, in even the highest instances, to nothing more than growth and reproduction, possess these powers in many, and sometimes all, parts of their structure. It is not necessary that they should produce flowers and fruit, and that there should be a development of male and female elements, whose subsequent union should give rise to seed containing the germ of a new individual. The plant may renew its own existence by every bud, and may continue to propagate itself, at least for a time, without any manifestation of sexual character. But in the animal kingdom, in the members of which the mere vegetative conditions of life become altogether subservient to sensation and intelligence, reproduction by means of buds appears as an exceptional phenomenon, except among the lowest forms, in which a plant-like absence of sensation is frequently accompanied by a plant-like want of the power of free locomotion. It was therefore deemed an astonishing discovery when it was found that, in a colony of plant lice, the multiplication of the species was carried on, from generation to generation, for many successive generations without the appearance of any males. The reproducing forms were at first regarded as true females, but subsequently it was suggested, that the young of the original females are of the nature of buds, and that this system of reproduction, therefore, consists rather in the development of a series of such buds, than in the production of entirely new individuals. According to this light, the series of such offspring, be they even reckoned by millions, are rather successional and oft-multiplied parts of one, than so many generations of different, individuals; and a new generation only appears when males, at the end of the season, again come into existence and give rise to a family according to the ordinary law of animal reproduction.

It seems almost useless to speculate on any special purpose in this extraordinary method of multiplying animal life. Why should a cuttlefish bud out an arm which eventually becomes its male representative? Why should a lizard occasionally bud forth an extra tail, or a human being an extra thumb? Still more useless is it to seek in these anomalous acts of Nature for purposes special to man; in fact, the entire order of the hemiptera, or bugs, is a commentary upon the futility of the questions so frequently asked, and already alluded to in a former paper. Of what use are many of the productions of Nature to man? Is it for the purposes of man at all, that they have been called into being? We should not be surprised to hear some one deeply interested in establishing man's "divine rights" to all the ends of Nature, reply that plant lice were created as a check upon the pride of science, as a part of the punishment of Adam's original sin, and that certain bark lice were similarly designed to gratify at once female vanity and men who have an eye to color. Unfortunately for such an argument, the naturalist must believe that bark lice wasted carmine before there was a human being to extract the dye, that aphides checked the growth of plants before gardeners ever thought of forcing them, and perpetuated their race in the most irregular manner before a Greek had even invented the words combined in "Parthenogenesis." At first sight, we may even be inclined to think that, as far as any, even indirect, bearing on the human welfare is concerned, the whole group of bugs might have been advantageously omitted from the scheme of the universe. We could well afford to sacrifice cochineal to have our favorite plants and trees free from aphides; and to have been untortured by bedbugs, we should have contentedly remained in eternal ignorance of their enemy, the Reduvius, a kindred bug, that has the bad taste to feed upon them. But such a view is narrow. Had the bugs been omitted in the insect department of the Universal Scheme, that scheme would not have been complete and perfect; why, or wherefore, we cannot exactly see. The whole reason is as far beyond our ken as the entire design is beyond our comprehension, but we may be convinced that it must be so, or all the lessons of the Universe have no meaning.

As man himself is part of the great scheme, he shares in the general results of its perfection; and he may always console himself, that if a particular natural object seems of no use to his very important self, yet that it undoubtedly has its significance in the designs of his Creator. One effect of this peculiar budding process among the aphides is, that they multiply with a rapidity almost inconceivable. Fitch says: "It is reported of the insects of this family, that there are from sixteen to twenty generations in the course of the season—from twenty to forty young being produced from each parent. Thus, from one egg, as stated by Mr. Curtis, in seven generations, seven hundred and twenty millions of lice will be bred." "Such is their fecundity, that if no check were given them, it is evident that from the cedars of Lebanon to the hyssop upon the wall, every leaf and spear of vegetation springing from the bosom of mother earth, would be thronged and blighted by the countless myriads which would be produced in the space of a few months." He adds: "We accordingly find that the aphides have enemies more numerous, active, and inveterate, than any other group in this department of the works of nature. Whole families of other insects, some of them numerous in species, appear to have been called into existence chiefly for the purpose of feeding upon and destroying these vermin. And an acquaintance with the several kinds of insects, which, in our country, occur in company with these pests of vegetation, is quite important, that we may know which to destroy or pass by in indifference, and which to cherish and protect, and call to our aid, in instances where Nature herself does not furnish them in sufficient numbers."

On the other hand, these same aphides present us with the extraordinary spectacle of insects of another kind carefully protecting them, caring for them with the most assiduous instinct, and receiving in return a coveted secretion, the honey dew, which the aphides discharge. It was no fabulous tale that originated the name for these diminutive beings of "the ants' milch cows." As your milkmaid draws milk from the sweet-breathed kine, so does an ant, gently titillating with its antennæ an aphis, induce the latter to discharge its secretion; and as your herdsman keeps off the bear and the wolf, and conducts your cows from pasture to pasture, so do the ants drive away the enemies of the helpless aphis, and even carry it tenderly from an exhausted to a fresh and juicy leaf.

But the wonders of the life history of the aphis have nearly made us forget the subject of our present engraving, which represents a group of the female cochineal insects upon a leaf of the nopal, upon which they are "cultivated" and protected by human beings, with a care almost rivaling that just recorded of the ants. We must, however, reserve our description of the cochineal insect for our next contribution.

FEMALE COCHINEAL INSECTS.

The Supposed Fungoid Origin of Cholera.

In the year 1866, Hallier discovered, in cholera discharges, yellowish colored cysts, of spherical or oval form, inclosing yellowish shining spores, varying in size; also, groups of swollen spores, surrounded by minute molecular matter (so called *micrococcus*), proceeding apparently from the rupture or breaking up of spores.

These minute molecules were seen to adhere to various objects in the fluid, on which they appeared to feed; they exhibi ed signs of germination, grouping, filamentary arrangements, and, finally, branching filaments with *macroconidia* and *cysts*, the relations of which to each other were considered as established by cultivation experiments. The resulting fungus, a *polocystus*, was considered by Hallier to resemble the rye fungus in Europe, and probably to be present in diseased rice in India; and he held that this fungus, introduced into the intestinal canal and there passing through the various stages of its existence, caused the phenomena of cholera, by its action on the intestinal epithelium.

Here Dr. Lewis's work begins, and every step in it is illustrated by microscopic slides. He shows that minutely divided matter is not more prevalent in choleraic than in other discharges, indeed, less so; but that attempts to produce "*micrococcus*" by cultivation had entirely failed, possibly on account of the many sources of fallacy in such experiments He gives the results of a number of observations made with infusions and decoctions of animal matter, including cultivations with cholera discharge, and shows that in spite of every care in the manipulations, very different forms of life will make their appearance in substances derived from the same source, and under apparently identical conditions. His general conclusions on this first stage of the inquiry are:

1. That no cysts exists in choleraic discharges which are not found under other conditions. 2. That cysts, or "sporangia" of fungi are very rarely found, under any circumstances, in alvine discharges. 3. That no special fungus has been developed in cholera discharges, the fungus described by Hallier being certainly not confined to such. 4. That there are no animalcular developments, either as to nature or proportionate amount peculiar to cholera, and that the same organisms may be developed in nitrogenous material, even outside the body. Lastly, that the *débris* of intestinal epithelium is not of this origin, but appears to result from effused blood plasma.

Unless these conclusions are materially modified on subsequent inquiry, they must be considered as disposing of Hallier's theory of cholera. Should, however, Dr. Lewis's further investigation prove that Hallier's fungus is present in choleraic discharges, and in diseased rice, as a *constant*, we should require scientific proof that cholera was caused by the action of this fungus, and by nothing else.

Pettenkoffer's theory of cholera connects the prevalence of the disease with certain conditions of damp subsoil, and subsoil water, and with the presence of a "germ," favorable meteorological conditions, and personal predisposition. Little has been done, as yet, in this portion of the cholera inquiry. What has been done is very interesting, although it does not support the theory. The subsoil water experiments do not appear to sustain Pettenkoffer's views, but the examination of soils has yielded several important scientific facts of general interest The amount of air, in specimens of soil taken at different stations, varies from 33 to 66 per cent by measure. The amount of organic matter in soils, when compared with the amount, weight for weight, in the water at the same stations, is from ten to twenty times greater; one instance is given in which it was forty times greater. But the most interesting scientific facts are those connected with the development of lower forms of life in infusions of soils in water. Besides a few *algæ*, the prevailing forms are *Monas lens*, *Paramecium*, *Monera* assuming the most fantastic outlines, *Vibriones*, *Amœba*, *Englenæ*, etc.

We look forward with great interest to further instalments of this important inquiry, which we trust may add largely to our knowledge, and by this means enable human life to be saved.—*Nature*.

A New Wonder.

Yesterday morning April 9th, Mr. J. B. Knight, agent of the Watertown Steam Engine Company, sunk a drove well in rear of his office, with a view to getting a supply of water; and when at the depth of forty-six feet, a sudden and very powerful draft of gas was observed to flow from the mouth of the pipe. He immediately clo ed the pipe, thinking to utilize this gas for illuminating purposes, but found the pressure too great; when the idea struck him to direct it into the boiler of one of his engines and experiment with it in making steam. But no sooner had the connection been made than the engine began to run entirely by the pressure of the gas acting upon the piston, at a pressure of twelve pounds to the square inch; and so it continued all day yesterday, giving no sign of exhaustion.

Here is a discovery. A motive power which costs absolutely nothing, sufficient to be made available in running many kinds of light machinery, perfectly controllable and seemingly inexhaustible. What shall we find next under our city? —*New Orleans Republican, April 9th.*

Says the *New Orleans Times* of the same date:

A great curiosity is to be seen at J. B. Knight's machinery establishment on Carondelet street, near Poydras. No less than a stationary steam engine, running without steam. Mr. Knight, having had occasion last week to bore for water at the depth of forty-seven feet, encountered a flow of natural gas, with such a pressure that on attaching it to the engine with a flexible pipe, it drove it with ease. When we witnessed it in operation, the gage marked a pressure of twelve pounds to the square inch, and the gas from the discharge pipe was burning brilliantly. An engine, apparently furnishing its own power, and a brilliant light to see it by, comes nearer to the realization of a perpetual motion machine than any yet reached.

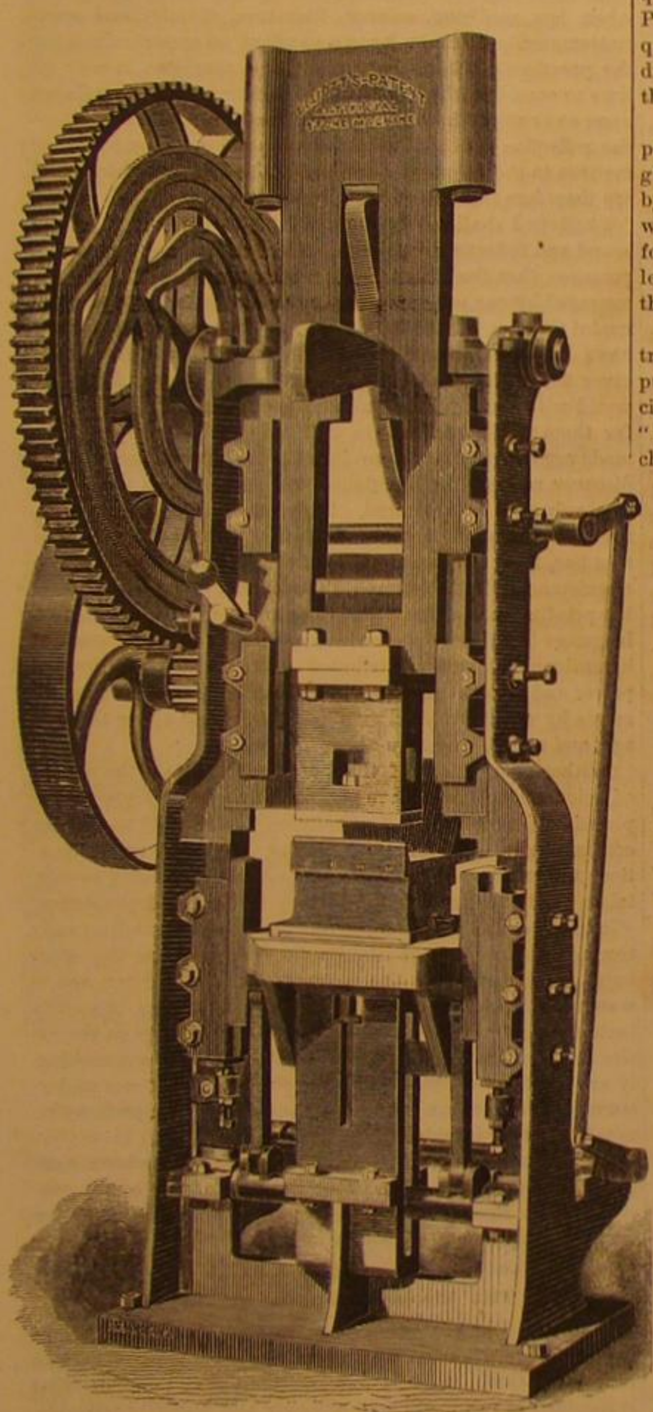
Railroads in Iowa.—The unprecedented rapidity with which our railroad system is being extended is well shown in some statistics which we have received from Iowa. In the last eight years, no less than two thousand miles have been constructed in that State, of which more than one thousand have been made in the years 1869 and 1870. The railroads of Iowa are 2,683 miles long, and the gross earnings for the the past nine years about $50,000,000.

MOLDING AND MIXING MACHINES, USED BY THE UNION STONE COMPANY--THE SOREL PROCESS OF MANUFACTURING ARTIFICIAL STONE.

The main features of the Sorel process of manufacturing artificial stone were laid before our readers in an article published on page 263, Vol. XXIII. The patent for the process is owned by the Union Stone Co., of Boston, and the stones made by it are, as noticed in our previous article, of great variety. We are told that the demand for them is constantly increasing.

The base of the "Union Stone," as it is now called in this country, is the cement invented by M. Sorel, of France, depending upon the property possessed by magnesia, of forming with the chloride of the same base, an insoluble compound.

These substances, when mixed together in proper proportions, the chloride being in solution, soon become solid, or set so as to retain the form of the mold or vessel in which they are mixed; and, the process of solidification continuing, they become eventually as hard as the hardest marble.



The resulting substance is the whitest and hardest of all cements. By combination with mineral colors, it may be made to assume any desired tint, may be molded like plaster, and be employed in the manufacture or imitation of innumerable objects of art or ornament.

In practice, the cement is never used in a pure form, but in combination with other materials; which, being incorporated with it while in the moist condition, are in the subsequent setting chemically bound together into a solid mass.

For this purpose, the magnesia, in fine powder, is mixed with mineral substances, such as sand gravel, dust or chips from marble or other stones, or with emery, quartz, or other grits of various kinds, in varying proportions, according to the result desired. This mixture is then moistened with a solution of the chloride of magnesium, or with the bittern from salt works.

In some cases it is made sufficiently wet to form a mortar, and in others only to produce a condition of dampness like that of molding sand. The mixture may be effected in troughs, by hand labor, the materials being worked over with shovels or hoes; or, more expeditiously, in mixing machines designed expressly for the purpose, and worked by horse or steam power.

Those in use by the Union Stone Co. were invented by Mr. J. S. Elliott, and are capable of mixing thoroughly about two tuns per hour. The mixer consists principally of a vertical cylinder of iron, divided horizontally by a slotted diaphragm, in the axis of which an iron shaft revolves, carrying horizontal arms. The arms are movable, up and down, on the shaft to allow relief when coarse pieces get in, but are ordinarily held in place by a strong spiral spring. The slotted diaphragm sustains the mass of materials, so that they may not pack heavily by their own weight; and it assists in cutting in pieces and grinding any lumps, and gives double effect to the machine.

The materials, roughly compounded, are thrown into the upper part of the cylinder; and, in their descent, become thoroughly mixed and ground together by the revolving arms; and, after passing through the slotted diaphragm, emerge at the bottom. The material, as it comes from the mixing machine, may either be placed in molds of iron or wood of the proper shape, or spread out in slabs or sheets, when it soon sets and forms a hard stone.

When designed to be formed in molds, it should be brought to the consistency only of molder's sand, and then consolidated into the mold by means of tampers; percussive force being better than steady pressure. The mold may then be immediately withdrawn, when the mass will retain its form, and may be left to harden.

The machines in use by the Company, for taking off large quantities of blocks of a given shape, are known as "Elliott's Patent Artificial Stone Machines," described below; and are quite extensively in use for making building blocks of hydraulic cement, lime, and sand. A few modifications to meet the requirements of the Union Stone Co. have been made.

The materials of which this cementing substance is composed, are abundantly distributed over the surface of the globe. Magnesia sufficiently pure for the purpose is obtained by simply calcining mineral magnesite, large deposits of which are known to exist in Prussia, Greece, Canada, California, Pennsylvania, and Maryland. Deposits will doubtless be found in other places when the demand is made for the material.

The chloride of magnesium is readily obtained by concentrating sea water, the bittern of salt works being sufficiently pure for the purpose. Sea water concentrated to 30° B. precipitates nearly the whole of its chloride of sodium. In the "Sorel" process, it is concentrated to 33° B., when all the chloride of sodium is practically crystallized and precipitated, the mother liquor retaining, besides the chloride of magnesium, some chloride of potassium, and some sulphate of magnesia, which seem to add strength to the cement, as the water in this state makes a stronger stone than the pure chloride of magnesium.

We herewith give an illustration of the molding machine. The hopper, partially shown in the rear of the machine, having been filled with the prepared materials, the machine is set in motion, and a feeder, capable of containing enough of the materials to form the proposed article, is carried first under the hopper to receive its charge, and then under a ram. The bottom of the feeder is then withdrawn, and the ram strikes a blow down upon the materials, forcing them into a mold, and partially condensing them. The blow is repeated, and the ram is raised for a third blow; and, at the same time, the feeder is carried back under the hopper for another charge. A third blow is then struck by the ram, which then rises, and is held still and firm while the core is withdrawn downward, and the mold is pressed upward against the face of the ram, pushing out the molded article upon a table advanced to receive it, which table then carries the article to the front of the machine. The whole process is automatic, and repeated indefinitely, the motions being derived from a series of cams, shown at the left in the engraving.

The machine will, it is claimed, make 3,000 building blocks per day with single ram, or nearly double that amount with double ram. Each of the blocks is three times the size of a brick, and hence a day's work of a single ram machine is equivalent to 9,000 bricks.

The molds are interchangeable for any shaped block within the capacity of the machine.

Various sizes are made, some being small enough to work by hand. A machine of the latter kind will, we are informed, turn out 1,200 blocks per day with the labor of a single boy, who also does the mixing and feeding.

The patent for the machine is now owned by the Union Stone Co., 32 Pemberton Square, Boston, Mass., who will fill orders for them. Address as above for further information.

Copper Balloons.

In a recent newspaper article, John Wise, of Pennsylvania, the aeronaut, recalls his suggestions for the use of balloons for the capture of the fortress at Vera Cruz, during the war with Mexico, in 1846. He proposed to elevate balloons above and near the fortress, to a hight of from one to five miles, with cable attached, and then to hurl down explosive shells in such numbers as to render the fortification untenable.

Our military men of that day could not conceive of the practicability of the project. Congress refused an appropriation, and the balloons never rose to view. Mr. Wise thinks it needed a man like Gambetta, the French Minister of War, to boss the job, and render it effective.

In the same article Mr. Wise describes a copper balloon of his own invention:

One of two hundred feet in diameter could be constructed of copper weighing one pound to the square foot, which, deducted from its ascensive power when inflated with hydrogen, would leave sixty-eight tuns of lifting power. Such a machine, constructed inside a framework from which to solder it together, could be easily inflated, by the expansion of a cloth balloon inside of it filled with atmospheric air, and then the hydrogen gas introduced between the inside copper surface and the bag of atmosphere, so that, as it filled with gas, the atmosphere and its envelope would be expelled from its lower orifice. To meet the necessity of the expansion and contraction of gas in the copper war ship, it would have to be supplied with an india-rubber diaphragm in its lowermost section, which would rise and fall agreeably to the necessity as it occurred.

MORTAR LIGHT.

The "Light Ball" shown in the engraving, fig. 1, consists of two tin hemispheres, the lower one of which is filled with an inflammatory composition, and the upper one with a folded calico parachute, which is attached to the lower one by a small chain and cords, the whole being enclosed in a galvanised iron shell made in two parts; the edge of the lower half overlaps the upper half for a short distance, and the two are soldered together, a small space being left in the upper half, to contain the bursting charge and the socket into which the fuse fits. The action is as follows:—On the mortar being fired, the flash from the charge ignites the fuse (previously bored to its required length), which burns until the fire flashes through the prepared hole into the powder channel and ignites the bursting charge in the ball. The soldered junction then gives way, and the outside hemispheres are blown in different directions. The top one, being attached to the inside hemisphere, containing the calico parachute, by a small chain, jerks it off. The parachute is very slightly attached to the top of its hemisphere, and on the bursting of the ball this slight attachment also gives way; but at the same time this connection assists in the expansion of the parachute by drawing out its top. The composition in the lower inside hemisphere is ignited by a quick match, laid in grooves from the bursting charge to the priming at its bottom. The parachute being now released expands like a large umbrella, as seen in fig. 2, the burning composition assisting to keep it up on the same principle as a fire balloon. This composition gives an extraordinarily brilliant light, illuminating the ground from 300 to 400 yards round the point over which it is suspended. The shell ought to burst just after it has attained the highest point of its flight. The light is useful to discover the enemy's working parties in time of war, or to ascertain what he is about at night. With a few of these light balls fired together, objects can be discovered at a considerable distance on a dark night nearly as well as by daylight. Before using them, note of course must be taken of the wind, as, should it not be blowing towards the enemy, he will in all probability reap the advantage you have endeavored to obtain for yourselves. The great advantage this parachute light has over all other light balls is that, on account of its elevated position, it is impossible for an enemy to extinguish it until it descends.—*Mechanics' Magazine.*

FIG. 1.

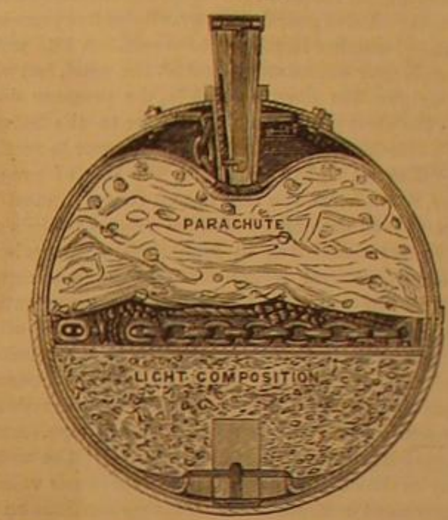
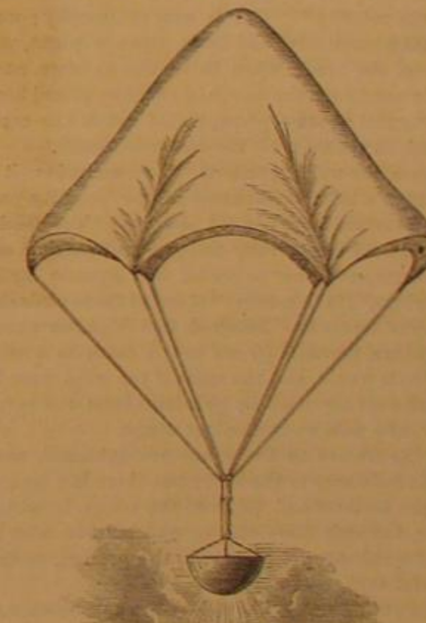


FIG. 2



IRON AS A DEODORIZER.—The porous, spongy cast iron, which sometimes is observed in imperfectly smelted pigs, is stated by Dr. Voelcker to be a most valuable deodorizer, and to surpass charcoal in this character. Sewage can be most efficiently purified by its use. Such iron can be made by pulverizing ore and charcoal together, and smelting in a close furnace.

Correspondence.

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

Flight of Birds.

Messrs. Editors:—A constant reader of your journal is unwilling that the article of March 25, on "The Flight of Birds," should pass unanswered. You say you are not responsible for views entertained by your correspondents; it is well for your reputation, that it is so, in this instance. The writer takes, as an example of swift flight, a five pound wild duck, which he elevates to a point whence "the flight proper commences." He then says: "In this situation, it is evident that the animal must constantly gravitate diagonally towards a point on the earth at a considerable distance ahead;" this is not true. The duck, and every other five pound object on or near the earth, gravitates vertically towards the center of the earth; gravitation does not stop to see which way the duck is "heading," but draws downwards no more in the direction of its head than of its tail. He says: "The swift motion of the animal reduces the weight for the time being;" this is not true. A five pound duck gravitates five pounds on the same plane, whether in motion or at rest. A kite weighing five pounds may be sustained against the wind, but when so held, it weighs five pounds; that is, the pressure downwards upon the air is as great as if it were in the balance. Again: "The stroke of the wing in flight proper is vertical, and must be made at right angles with the line of progression." True, "and hence the bird cannot propel himself by such a movement of the organs of aerial motion. Birds and bats do not propel themselves in flight;" false, for when a bird is making a vertical motion with its wings, the quills and feathers of the wings are in a diagonal position extending backward and upward from the bone frame work of the wings, giving, by the vertical motion of the wings, propulsion forward and upward. Again, he says: "Birds of passage proceed with a uniform motion of one hundred miles an hour;" they often attain this motion, but not always. Again, "Their progression upon the wing is incidental; the weight of their body is the chief means of their flight; their velocity cannot be increased or diminished while they continue on the same plane of elevation;" all of which is false.

I wish to ask the writer: if the motion cannot be decreased upon the plane, by what means is it decreased upon a down grade? Wild geese often alight in Lakes Michigan and Superior, but never with a motion of one hundred miles an hour, or one hundred and fifty feet per second. He says that "in rectilineal motion, the weight is in all cases more or less merged in the velocity." This is new philosophy; we had supposed that a locomotive and train, upon a plane, was as weighty, upon the track, when in motion as when at rest; that a ball dropped from the mouth of a cannon placed horizontally, say twenty feet above a plane, would reach the earth in the same time as if shot from the cannon's mouth.

Furthermore, the writer remarks: "In conclusion, it only remains to give a brief explanation of the peculiar process of motion of certain large winged species of the feathered tribes, as exhibited in the lofty and graceful soaring, of the sociable vulture and other terrestial and aquatic birds, on motionless wings." He then says: "If one of these birds should leave the top of a pole one hundred feet high, on extended motionless wings, it would gyrate to the earth in a still atmosphere;" so it would, and the same if the wind were blowing. No bird ever ascended by gyrations from the earth, or from the top of a pole on motionless wings.

It is true the frames of the wings are extended, and are motionless in reference to the bird; but there is a tremulous motion of the feathers and quills of the wings, imparted by the muscles, through the tendons and skin in which the feathers and quills are set, similar to the sculling motion of the tails of fishes.

The writer of this article has stood upon an eminence, when there was not a breath of air in motion to move an aspen leaf, when an eagle in his upward gyrations soared so near that we could distinctly see the tremulous motions referred to, accompanied by a shrill humming sound, which sound is not heard when the eagle moves its wings vertically in ascending or when descending rapidly. A current of air does not facilitat the ascent of a soaring bird after it has left water or land. After leaving the earth, the conditions of ascent are the same, if the air has a motion of five miles an hour, as when the gyrations of the bird in a still atmosphere have a progressive motion of five miles an hour. To propel a balloon, against the wind blowing at the rate of five miles an hour, so that the balloon will remain over the same spot on the earth, is equivalent to propelling the balloon in a still atmosphere five miles an hour. But to return to the bird on the diagram, as it leaves the earth, why does it make a diagonal ascent at all, unless it has the power of propulsion as well as of elevation? Gravitation certainly does not propel the bird in its ascent. Why does not gravitation horizontally propel a fish suspended in water by its bladder? Our western eagles, gulls, and fishhawks will not be governed by the laws of the new philosophy, until the writer of "The Flight of Birds" can, by taking hold of the straps of his boots, lift himself up into the ethereal regions.

Traverse City, Mich. A. S. Wadsworth.

Flight of Birds.

Messrs. Editors:—I have been a constant reader of your paper for the past four years, and during that time have gathered much valuable information from its pages. I have read therein many artic es containing facts which were entirely new to me, but never before have I met with anything so astonishing, and so entirely at variance with my preconceived ideas concerning the physical laws, as the assertions contained in an article entitled "the Flight of Birds," which appeared in the number issued March 25th.

I have often watched birds in their flight, and wondered how they did it. I knew that I was ignorant on that point, but, since reading the article referred to, the conviction of ignorance on many other points has been forced upon me.

The inference drawn from the assertions of all the writers on physics, whose works I have read, is, that "to hold five pounds weight suspended in the air, a power of five pounds is absolutely necessary;" but Mr. Davidson's duck, exerting a power of one pound, holds a weight of five pounds suspended in the air, and moreover propels it, or makes it get along somehow through the air, at the rate of 100 miles per hour. Marvelous duck! The invention of a perpetual motor would be a trifle to a fowl of thy abilities.

Hold! I forget: "The duck's weight is, for the time being, reduced four fifths," because of the fact that he advances through the air at the rate of 100 miles per hour. How thankful that bird should be that he does not move at the rate of 150 miles per hour, for in that case he would weigh one fifth less than nothing, and consequently would tumble up through eternal space, *ad infinitum*.

There is another astonishing feature of this fowl's performance. He does not propel himself, but, by vertical strokes of the wing, holds himself at the desired elevation, and is *tumbled* through the air, on a horizontal line, by the force of gravity. When I went to school, they taught me that if a body were acted upon by two forces, from opposite directions, it would move in the direction of the greater force; yet this marvelous bird flies straight up, and is attracted straight down, and goes ahead at the rate aforementioned. What careth a duck for the laws of the resolution of forces?

Scarcely less wonderful is the performance of the majestic eagle. Well may he be called the bird of liberty. When he wants to soar heavenward, he flaps his wings a few times (merely to get clear of local obstructions) and then spreads them, and "goes it" like an ant climbing a corkscrew. He meets two forces, the "wind" and "gravity;" the one acts horizontally, the other perpendicularly downwards; yet that ingenious bird makes that horizontal force "boost" him up against the other to an indefinite hight, without the least exertion, beyond a mere turn of the head. How in the world does he do it? If some man of science and common sense would watch him and study his motions, he would, without doubt, give a reasonable analysis of them, which, if published, would be read with interest by many, besides the subscriber, H. H.

La Salle, Ill.

Chemistry of Honey.

Messrs. Editors:—On page 99, present vol. Scientific American, J. H. M. makes inquiries about the chemical properties of honey. The chemical formula for honey is, carbon, 12, hydrogen, 14, oxygen, 14: for beeswax, C, 24, H, 34, O, 2.

Glucose, or grape sugar, is obtained from honey by treating it with alcohol. This sugar is employed in Europe for ordinary sweetening purposes, for confectionery, etc. But the abundance of cane sugar in this country makes its manufacture unprofitable. It has been proposed, and at present prices of strained honey (market quotation in New York ten cents per pound), I should think it might be profitable, to manufacture honey into confectionery in this country. I believe it is used largely for this purpose in Germany.

As I am ignorant of the processes of manufacturing confectionery, except molasses candy, some of your readers may enlighten me upon this branch of industry.

Chemists have given us the foregoing formula for honey, but, when first gathered, honey partakes more or less of the essential properties of the plant from which it is gathered. This essence soon evaporates, if the honey be obtained from certain plants; while from others—buckwheat, for instance—the odor and taste is retained for a great length of time.

A. M. B., on page 108, truly says that the crystallization of honey is an evidence of its purity; but he must know that many persons are more fastidious than wise about the food they eat. Honey in the comb is generally preferred, because of its beautiful appearance, and the impossibility of its being adulterated. Still, wax is very indigestible, and pure extracted honey is not only cheaper, but far more healthful and convenient to handle.

There is a process for converting honey into wax, but, owing to the large amount of honey required to produce a small quantity of wax, the manufacture is unprofitable. There is much interest in the production and uses of honey, and it will soon find its proper place and price, for use upon the table and in the arts. Apiarian.

Whitehall, N. Y.

Traction Engines.

Messrs. Editors:—Having recently witnessed the performance of the *G. H. Craft*, a road steamer invented in New Albany, Ind., I think the position taken by you, in your article on rubber tires, is not entirely correct. You say: Loss of power in going over rough roads would not result, could the power, developed in falling, be wholly applied to useful work in the direction of the advance of the machine. The fact is, however, that, in any method of propulsion at present known to engineering science, it cannot be so applied. The construction of the road steamer alluded to is such that when a stone or brick is mounted, it does not fall after passing over the obstruction, but lunges forward and gives back, so to speak, the force expended on its ascent. With this machine there is no concussion on rough roads, and, while mounting an ascent of one in four, a brick was placed for it to run over. Even on this steep grade, the machine did not fall after passing over the brick, but forced itself farther up the incline to correspond with the angle at which the pushing legs were adjusted. I belive this machine has a grand future before it. John G. Wilson.

Louisville, Ky.

What Inventors Have Done.

I know that there are many persons in whose minds an invention is but the subject of a sneer. Such men are unbelievers in the wisdom of encouraging the useful arts by the granting of patents at all, and therefore probably regard extraordinary taxation as not only expedient, but also as eminently just.

I believe such opinions are founded in error. They usually rest, not so much upon the merits and principles involved, as upon those abuses which are sometimes unavoidable. Fraud and imposition certainly sometimes find admittance through this channel; but when any profession or walk in life can be pointed out, against which a like objection does not exist: when law, medicine, science, literature, divinity, and even statesmanship, shall be known to afford no opportunities for the practices of the impostor and the charlatan, it will be time to consider whether it is not unsafe to form an opinion upon any subject from its unavoidable abuses, and to suggest the reflection that the more valuable coins present greater motives to the counterfeiter than do the more worthless, and are therefore the more probable subjects of fraud.

I believe I shall not be charged with extravagance, by any sound and reflecting mind, when I assert, as I now do, in this presence, that the class of men who were intended to be encouraged by our patent system, are the most meritorious and useful that are ever to be found in any age or country. They have been the creators of all the wealth of which the law gives them the limited enjoyment. They have filled the world with the comforts and conveniences of life, which but for them would never have had an existence. They have made aggressive incursions into the realms of ignorance, to discover and utilize the richest treasures, which were hitherto valueless or neglected. They have, with wizard touch, revealed the great secrets of Nature, whereby the human race has, from time to time, been elevated to a higher plane of existence. The telegraph, the railroad, the steam engine, the printing press, the plow, the alphabet, and even spoken language itself, are only leading specimens of the myriads of inventions that have contributed to the extension of human power and human happiness, and have been the chief instruments by which civilized man has been raised above the savage, and even the savage above the brute.

Without inventions of the more modern type, the realms of science would still have remained in a great degree unexplored, and even the voice of religion itself would have been comparatively weak and inexpressive. Through such inventions the wonders of the universe have been revealed to mortal ken with the most extraordinary fullness and perfection. We have been enabled on the one hand to soar intellectually through the regions of illimitable space, and on the other hand, to almost count the ultimate atoms of matter, and to watch the habits of as many separate existences in a cubic inch of stagnant water as there are human beings on the entire surface of the great globe we inhabit. How astonishingly are we thus enabled to enlarge the scope of our understanding of the Great Omnipresence, in all its comprehensiveness, and in all its minuteness of detail!

Are not men of this class, by whom such results have been produced, entitled to at least an equality of the public consideration? Special favor is not sought, but simple justice may certainly be reasonably expected.—*Judge Mason.*

The Twenty-Fourth of May.

Twenty-seven years ago, May 24th, Miss Ellsworth sent that message over the first wires erected on the American continent, which, in its laconic grandeur, gave token of what it signified to the world, and properly and devoutly recognized the source of the latest and best gift of science to mankind. It was the first message which woke the slumbering spirit of the silent wire to a knowledge of its powers and to its new and grander uses. We have occasion to know that although in the moment of its passage, the inventor of the machinery by which the electric current first made an intelligent record to the human eye, with a joy which he would have been less than man not to feel, greeted gladly the first words of the child his brain had born, yet that then as now he claims to have been only the instrument of the Almighty in the delivery of the great gift of the century to his race. So the message may be read to-day in the light of these wondrous intervening years, with a devouter recognition of where gratitude is due; and while the mechanism may bear the name of Morse, the mind of thoughtful men, looking beyond the inventor's mediate work, exclaims with deepening recognition: "What hath God wrought!"

Those who have seen the plaster cast of the statue of Prof. Morse, now in the National Art Foundry in process of casting, know that it represents the Professor presenting this identical message and uttering, as his own, the exclamation it bears. It is urged that the date of the receipt of that message is the proper date of the inauguration of the statue. We acknowledge it fully. Additional men, therefore, have been put to work on the molds, so as to have the statue ready before that time. The intelligent head of the foundry will do all he can to secure its completion. On the 1st of May it will be definitely announced whether the ceremonies of inauguration can then be performed. We hope to announce at that date that all is ready, and that on May 24th the statue of Prof. Morse will be unveiled.—*Journal of the Telegraph.*

Iron in Architecture.

The following able remarks upon the use of iron in architecture are extracted from the *American Builder*:

The questions involved in the use of iron relate to its value as a lasting and strong material, and the conditions under which it may be employed without violating the known and universally recognized laws of appropriateness in construction. As regards the superiority of iron over any other material for performing a certain part in architecture, there can exist no doubt. Only the necessities of construction have made its use so general, especially in America. Cast iron is so notably adapted to resist crushing weight, that slim columns perform the work where, of another material, a heavy wall would be required.

Rolled iron possesses the same qualities when used for beams. Hence the demands of trade, where space is required for display, necessitate the use of the material which will support a given weight, and occupy the least room. Especially is this the case with store fronts, where only slim columns furnish a support, and obstruct but little the view obtainable, through broad glass windows, of the goods beyond. This object could not be secured were any material employed for the columns which did not unite strength with lightness. It is evident, then, that iron must always occupy a place in architecture which cannot be held by any other material.

The faults committed by those who use iron in construction generally arise from the fact that they do not fully consider its capabilities and requirements when artistically treated. Iron is strong, and conveys to the mind an idea of strength, but massiveness of appearance should not be the desired end when it is used in building. Here is a common error. From the nature of the metal it must, to insure durability, be protected from contact with the atmosphere; painting becomes necessary.

The character of this painting is an important thing to be considered. The ignorant designer causes the iron to be painted white, in imitation of marble; or brown, to make it resemble sandstone; or gray, to secure the appearance of granite. No greater blunder could be committed. With almost equal propriety might a chimney be painted in imitation of wood.

Iron cannot be made to resemble stone for any great length of time, looking at its surface alone, and even could this be done, a glance at the slender columns supporting immense weight would cause their proportions to appear unsafe and ridiculous.

But iron can be made to appear light and graceful, and, suited as it is for such an effect, it should be the aim of an architect to produce with it the style of building to which it is so well adapted. Consistency in architecture is desirable; more, it is absolutely necessary, and when iron is treated, not as stone or wood, but as metal, there will be no violation of any recognized law.

Iron may be painted, and it may be made beautiful in itself. It may properly exhibit bright colors, and be picked out with gold and silver until its surface sparkles. It is for such showy, graceful effects that the metal should be used; it is a material perfectly adapted for store fronts or buildings of any class where the essentials are lightness, strength, and showiness, rather than grave and ponderous effects.

Facts about the Sun.

The following results have been deduced from a great number of observations made upon the border of the sun's disk, in the region of the spots, by Prof. Respighi:

In the neighborhood of the spots, the chromosphere (*strato rosato*) is rather low, quite regular, and intensely bright.

Upon the exact locality of a spot, or rather over its nucleus, the chromosphere is generally very low, and sometimes totally wanting.

At the nucleus, either there are no eruptions, or they are confined to jets of great subtilty and little duration.

The nuclei of the spots are either totally obscure or possess very feeble luminosity.

Along the borders of the spots, jets are thrown up of extraordinary intensity and violence, and of very definite configuration.

The jets adjoining the spots consist not solely of hydrogen, but also of other substances, as is shown by their respective bright lines in the spectrum.

Now and then the eruptions in the vicinity of the spots assume gigantic proportions, and are probably the cause of the rapid changes of form and position which are observed in the spots themselves.

There are often seen, in the neighborhood of the spots, jets curved backward upon the solar disk, in forms which are sensibly parabolic.

The immense jets and erupted masses near the spots expand and vanish away more rapidly than in any other region.

On the area of the spots, neither the photosphere nor the edge of the sun's disk shows any perceptible irregularity; that is, neither any perceptible prominence nor depression.

From these results, obtained by spectroscopic observations of the border of the sun and of the protuberances, Prof. Respighi is led to conclude that the photosphere is an incandescent liquid mass or stratum, of suitable specific gravity, by the weight of which various gases, and especially hydrogen, are confined and compressed in the interior of the sun, at an elevated temperature, under an enormous tension, and with a density differing but little from that of the superincumbent liquid stratum.

These gaseous masses in the interior of the sun, not yet having been brought to a condition of stable equilibrium, might in some portions be less condensed, and hence from hydrostatic pressure would rise toward the surface with great velocity, until, overcoming by their enormous expansive force the resistance of the liquid stratum, they wou'd burst through it with a velocity greater or less, according to the depth from which they emerged, and the degree of tension in which they originally were, and would thus develop those jets or eruptions which constitute the protuberances.

The masses thus erupted, then, would not be determined in their movement solely by their initial velocity and the action of gravitation, but would generally be subjected to the operation of other forces, which would concur in their elevation, their diffusion, and their ramification into those extraordinary forms which the protuberances present. According to this hypothesis, the hydrogen issuing from the body of the sun would serve as aliment to the chromosphere, repairing thus the rapid losses of the latter by its not improbable combination with the substances of the photosphere; and it does not appear to Prof. Respighi absurd to suppose that this immense stratum of incandescent hydrogen, that is, the chromosphere, may be the principal source of the heat radiated from the sun.

In regard to the spots, spectroscopic observations appear to show that they are neither cavities nor clouds, but are merely superficial modifications; that is, partial obscurations of the photosphere, produced, probably, by scoria or scum floating upon it. On the contrary, regard being had to the well defined forms of the jets neighboring the spots, to their extraordinary subtilty, and to their enormous energy, the supposition does not appear to the author irrational, that the nuclei of the spots consist of portions, slightly projecting from the photosphere, of solid masses or islands floating upon the liquid stratum which envelops the body of the sun. The immense chains of jets and protuberances, which rise ordinarily in the region of the spots, might be the cause of those great transformations which are observed in the latter, and determine, by their resistance in the superficial strata, currents in a direction opposite to that of the solar rotation, from which would result the proper motion of the spots themselves.

The translator of the paper in the *American Journal of Science*, from which we have gathered these statements, says the above conclusion is entirely at variance with those of other observers, unless the author designedly omits the consideration of the penumbra, or makes no distinction between it and the umbra. The observations of Prof. Wilson, in the last century, and of many others since, have shown that the nucleus or umbra is very often, if not generally, lower than the penumbra and the surrounding luminous masses. Some years since, Mr. De la Rue made a photograph of a solar spot, and another of the same spot after an interval of a day or two. When these were placed in a stereoscope, the spot appeared funnel-shaped, the central portion being clearly lowest. Also Zöllner and Lockyer have found, in the displacement of the lines in the spectroscope, that there is sometimes decided evidence of a downward motion in the dark portion of a spot.

Tunnels---Railway and Canal--in England.

The London and Northwestern Railway, from Liverpool and Manchester to Huddersfield and the North, passes through a range of hills separating Marsden, on the Yorkshire side, and Diggle on the Lancashire side, the range bearing the name of Stand Edge, and it has now three tunnels running through it—one a canal tunnel, and the other two for the purposes of the railway.

The first named was commenced in 1794, and completed in 1811; length, 5,451 yards, or 3 miles and 171 yards: cost, £123,803; and the loss of life during its progress was serious.

The first of the two railway tunnels was made by Mr. T. Nicholson, contractor for the Woodhead tunnel, which is shorter than the Stand Edge one by about 40 yards, Stand Edge being 3 miles and 60 yards long. It was commenced in 1845, and completed in November, 1848; the cost was £171,003, 12*s*. 3¼*d*., of the approaches, £30,605, making a total of £201,608, and the largest number of men employed on the undertaking was 1,953. Nine fatal accidents occurred in its construction.

Messrs. Thomas Nelson & Sons, of Carlisle, were the contractors for the new tunnel; the work was commenced in the middle of April, 1868, and was completed in the middle of October, 1870, or six months earlier than the time specified. Its exact length is 5,435 yards, 1 yard less than its twin tunnel: but the actual length constructed by the Messrs. Nelson is 5,297¾ yards, the difference arising from a short piece at each end having been made when the first railway tunnel was executed. The whole length is lined with red bricks, faced with blue Staffordshire bricks. The hight of the tunnel inside the brickwork is 20 feet, and the width, 15 feet. The total quantity of brickwork built is 52,156 cubic yards, the total number of bricks used being 16,831,149, the weight of which amounts to 68,000 tuns; 6,271 tuns of coal, 472 tuns of coke, and 2,421 tuns of lime, 140 tuns of cement were consumed; and of powder, 1,744 casks, equal to 174,400 pounds; fusee, 35,853 coils, each 25 feet, equal to 170 miles; candles, 8,745 dozen pounds, equal to 104,940 pounds; oil, 6,416 gallons; and vast quantities of timber were used. The rubbish was conveyed away by means of tramways, which ran through passages under the railway, and was tipped into the boats on the canal before mentioned. It was conveyed through "break-ups" or cross headings, of which Messrs. Nelson constructed 21; but only 16 were used at one time.

For the conveyance of the material used in the construction of the tunnels, 25 boats and 4 steamboats were constantly plying, and an immense expense had to be incurred in erecting huts, providing business offices, and putting down costly plant for economising labor. Only one life has been lost during the construction, but there have, of course, been plenty of accidents of a less serious nature. The work has been pronounced satisfactory in all respects, and the line is reported as being one of the smoothest portions of railway traveling in Great Britain. The line was opened about the middle of February for regular traffic.

Coating Iron and Steel with Molten Iron.

Rufus B. Fowler and Daniel F. Brandon, of Chicago, Ill., have recently patented the following process:

The iron to be applied is melted in a crucible or other suitable receptacle, and thoroughly mixed with borax or other material used for making a flux.

The plate or other article of wrought iron or steel shou'd be covered, upon the surface to be coated, with a very thin layer of finely pulverized borax which has previously been burned, and then placed in a close furnace or oven, and heated to a white or welding heat. It is then placed upon a large anvil or block of iron, the upper surface of which is perfectly level. The article to be covered with the molten iron should then be surrounded by an iron frame or form, in such a manner that the molten iron may be prevented from flowing off the surface to be coated.

The molten iron which has been mixed with borax, as hereinbefore described, is then poured upon the surface of the heated plate or other article of wrought iron or steel. When a sufficient quantity of molten iron has been poured on as described, a plate of steel or hard smooth iron, of sufficient size to nearly cover the whole of the molten iron, is brought down upon its upper surface, and a pressure immediately applied sufficient to reduce the molten iron to the desired thickness, and also to expel all the air or gases that may be contained in the molten iron, and which would otherwise render the coating porous and of no practical value.

The amount of pressure required will depend upon the degree of heat to which the molten iron is brought, and the quickness with which the operation is performed. The pressure should be applied, however, while the iron coating is in a molten state, and it may be applied by means of a lever, a hydraulic press, or any of the known mechanisms or devices by which a powerful pressure may be instantly applied; or, in lieu of the smooth plate or die mentioned above, a roller with a smooth surface may be made to pass over the upper surface of the molten iron, with a pressure sufficient to produce the desired results.

The mechanism used for pressing should be near the oven or furnace in which the plate or other article of wrought iron or steel is heated, in order that the heat of the plate or other article may not fall much, if any, below the welding point when the molten iron is applied; and the surface of the plate or other article of wrought iron or steel to be coated, should be free from dirt, scale, or such other substance as would ordinarily prevent two pieces of wrought iron from forming a perfect weld or union.

The above described process of applying the molten iron to the surfaces of plates or other articles of wrought iron or steel, expels the air or gas from between the molten iron and the surface of the wrought iron or steel, causing a more perfect union between the two, and renders the coating of molten iron much more compact and gives it a smoother surface.

We do not claim any mechanism or device used for applying the pressure; nor do we claim the employment of molten iron for the purpose of coating articles of wrought iron or steel.

We claim as our invention: The process of coating the surfaces of plates or other articles of wrought iron by the use or application of pressure, substantially as described.

Success in Life.

The great secret of success in life consists in bending all your efforts to whatever you happen to engage in. Don't let your fickleness lead you to slight your present occupation, and to think lightly of it, hoping something better will turn up by and by. The way to get along in the world is to make every step one that is ahead, and each to follow its predecessor. For full fifty per cent of the effort of the world is absolutely wasted in indirect, diffuse, indefinite labors. Young men start out in life without purpose or point, casting a thought neither on their fitness nor unfitness for a particular calling; now doing this thing, then that; and after that nothing; one day going on, another on the right (which is wrong) or left, the next backward, and then not going on at all, which is perhaps as bad as the whole combined. The right line in life is the one which leads straight ahead. This almost always secures success. If you are creeping, do it energetically until you can get on your feet to walk; but never do both at once. And when once on your feet, never get on your hands and knees again; but strain all your efforts to your new life.

House Plants.

To succeed in growing plants in dwellings, it is necessary to keep the air around the plants at a moderate temperature, say from fifty to sixty degrees, and as moist as possible, by having the plants stand on damp moss, sand, or other material that will all the time be giving off moisture amongst the leaves.

Any plant having leaves large enough—as the beautiful waxy camelia, the India rubber plant, century, and others, are greatly benefited by occasionally sponging the leaves with water, by which means the dust that accumulates on them is removed—a fruitful source of trouble to house plants. Where sponging is not applicable, as with small leaved sorts, or those of a wooly or rough surface, a syringing, or, what is better, an hour or two in a warm rain, will have the same effect, and be vastly beneficial to the health of the plants.

Improved Dumping Cart.

We herewith present to the consideration of our readers a simple yet important improvement in dumping carts, which will, we think, commend itself to all extensively using such carts on railway works or canals, in brickyards, excavating for building, mines, coal yards, etc.

The object of the device is to so facilitate the dumping of such carts that even boys may perform the driving and dumping, and do the latter almost instantly.

The tail-board, instead of being slid in between cleats fastened to the side of the cart body, or hinged to the same, is fixed to two supporting arms, extending backward from the shafts, to which latter the arms are attached at a point a little in front of the axletree, which causes the tail-board to move backwards, when it lifts, so that there is no strain upon it whatever.

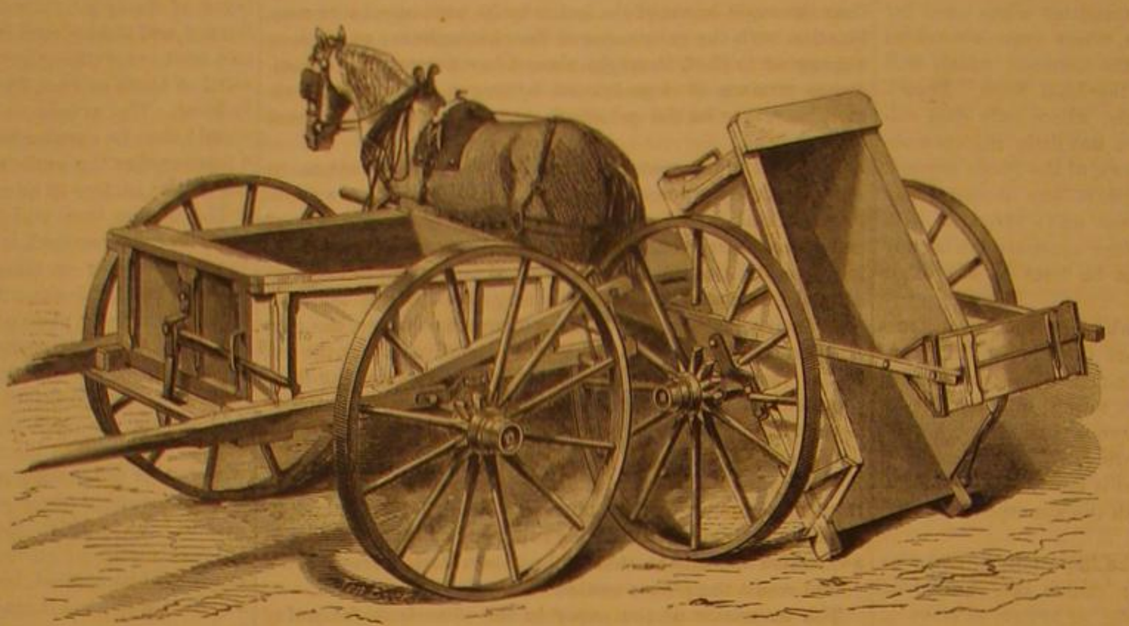
The shafts, instead of being attached directly to the axletree, are pivoted strongly to the side of the body, and a little in front of the axletree, and the cart body is fastened firmly to the axletree, so that the latter forms the pivot upon which the body turns in dumping.

A lever and catch is attached to the front of the body, so that when, after dumping, the latter assumes the position shown at the left of the engraving, it is firmly held in position until the catch is unlocked by the hand lever projecting sidewise from the front of the body, and convenient to the hand of the driver, whether standing on the ground or upon a foot board fastened to the under side of the shafts just in front of the body of the cart. It is impossible for the body to play from side to side (as is the case with other carts) on account of the shafts being attached to the outside of the body, near to the wheels, which gives the horse great control over the cart.

The cart is shown dumped at the right of the engraving. It will be seen that starting up the horse will at once bring the body into the position shown at the left of the figure, and lock it there.

This arrangement obviates all the difficulty of removing or raising the tail-board when the cart is loaded, caused by pressure of the contents. A very slight exertion releases the catch in front of the cart, which instantly dumps, and the moment the horse is started, again closes.

Patented, through the Scientific American Patent Agency, April 4, 1871. For further particulars address William and Henry Hand, Plainfield, N. J.



HAND'S IMPROVED DUMPING CART.

Fossil Forest in California.

Prof. O. C. Marsh, of Yale College, communicates to the *American Journal of Science* an article on the above subject, from which we condense the following facts:

During the visit of the Yale College scientific party to the Pacific Coast, in October last, several members of the expedition, including the writer, while on their way from San Francisco to the "Geysers," took occasion to examine a locality, a few miles from the route, where a number of fossil trunks of trees had recently been discovered.

The locality is situated on a high rocky ridge, in Napa county, California, about five miles southwest of Calistoga Hot Springs, and perhaps ten miles south of the summit of Mount St. Helena. The existence in this place of several petrified trunks of trees was first made public by Charles H. Denison, Esq., of San Francisco, who visited the spot in July last, and soon after gave a short account of the discovery in the San Francisco *Bulletin*.

A careful examination of the locality where the first prostrate trunks had been discovered, soon made it evident that those now on the surface had all been weathered out of the volcanic tufa and sandstones, which form the summit of this part of the mountain ridge. Several large silicified trees were, indeed, subsequently found in the vicinity, projecting from the side of a steep bluff, which had partially escaped denudation. Portions of nearly one hundred distinct trees, scattered over a tract three or four miles in extent, were found by our party; and the information we received from hunters and others, familiar with the surrounding country, renders it more than probable that the same beds, containing similar masses of silicified wood, extend over a much greater area.

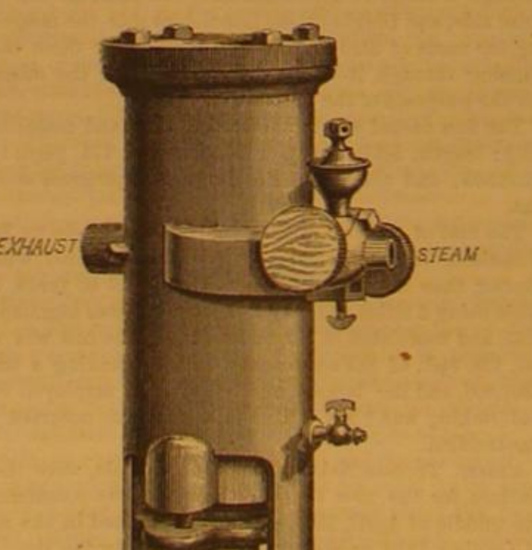
The fossil trees washing out of this volcanic tufa were mostly of great size, and appeared to be closely related to some of the modern forest trees of the Pacific coast, especially the gigantic Conifers. One of the prostrate trunks examined during our explorations was only partially exposed above the surface, dipping with the strata about 10° to the northward. Its accessible portion, evidently but a small part of the original tree, measured sixty-three feet in length, and, although denuded of its bark and very much weathered, was over seven feet in diameter near its smaller end. On a high summit, about a quarter of a mile west of this point, two other large trunks were found, one about five feet in diameter, lying east and west, with thirty feet of its length above the surface. The other rested directly on this, dipping with the strata to the north. The exposed fragments of this trunk indicated that the tree when standing could not have been less than twelve feet in diameter. These two trees had apparently fallen not far from where they were imbedded, as the bark was well preserved, both on the main trunks and on the small branches, numerous fragments of which were lying near. Many other trees were found, nearly or quite equal to these in size; and all those examined indicated a very large general growth for the original forest.

All the trees discovered were prostrate, and most of them, after their petrifaction, had been broken transversely into several sections, apparently by the disturbance of the enclosing strata. A majority of the trunks had a general north and south direction, probably due to the course of the current that covered them with volcanic material, or perhaps indicating, in some cases, the position in which they had fallen. Several of the trunks had portions of their roots still attached, and some were evidently much decayed internally, and worm eaten before their entombment. All the fossil wood observed was silicified, probably by means of hot alkaline waters containing silica in solution, a natural result of volcanic action, especially when occurring in connection with water, as was evidently the case in the present instance.

The trees, closely examined, appear to be all conifers, and in their external characters, especially in the bark, mode of branching, and general habit of growth, most nearly resemble the modern redwoods, still flourishing in the same region.

COPE & MAXWELL'S UPRIGHT BOILER FEEDER.

It is entirely unnecessary to dwell upon the fact, now universally admitted, that it is the best practice to feed boilers uniformly and automatically, by apparatus working independently, whenever it is possible so to do. When boilers are employed to furnish steam for other purposes than motive power, it becomes absolutely necessary to use an independent boiler feeder. The demand for this class of apparatus is already very large, yet it is still increasing. Numerous claimants for public favor are in the market. Many of them are excellent, others not so good; yet most find ready sale.



Patents for new devices of this class are multiplying, and still the field seems unexhausted. We this week illustrate a very substantial and compact steam pump, designed for feeding boilers, having but two moving parts in the engine, and but two valves in the pump.

It is a single acting plunger pump, operated by a steam engine, the cylinder of which is cast in connection with the pump chamber, the two being in one piece and forming the body of the machine. The upper portion of the body, or that part above the open space, contains the steam cylinder, and the portion below the space contains the pump or water cylinder. The vertical shaft seen in the open space is the pump ram, which is cast in connection with the steam piston, the two forming but one piece. The valve chamber, containing the pump valves, and having the receiving and discharging water openings, is bolted to the body of the machine at the bottom of the water cylinder, with which it has direct open communication.

The chamber, bolted to the upper part of the body of the machine, or near the middle of the steam cylinder, contains the oil cup through which the cylinder is oiled, and the two regulating valves, which are operated by the round wooden knobs or handles. The steam is admitted to each end of the steam cylinder through two regulating valves, the lower handle operating the valve that admits the steam for the down stroke, and the upper one for the up stroke.

The down stroke, having the most work to perform, requires a larger volume of steam, which is obtained by opening the lower valve the most.

The steam piston is about twice the diameter of the pump ram, which is cast in connection with it; and is hollow, having a cylindrical chamber inside, which is bored out true, and has a small piston accurately fitted to it. This cylindrical chamber forms the steam chest of the steam engine, and the small piston working in it operates as the slide or steam valve, opening and closing the ports so as to admit the steam supplied through the two regulating valves, alternately to the two ends of the steam cylinder.

Though of recent invention, we are informed the pump has been largely introduced in this country, and has given much satisfaction. It has been patented both in this country and abroad, and a large manufactory has been established in London for its construction.

Messrs. Cope & Co., of 118, 120, and 122 East Second street, Cincinnati, Ohio, are the sole manufacturers in the United States, and they may be addressed for illustrated descriptive catalogues, or for further information.

The Walter Printing Press.

At the printing end, it looks like a collection of small cylinders, or rollers. The paper, mounted on a huge reel as it comes from the paper mill, goes in at one end in an endless web, 3,300 yards in length, seems to fly through among the cylinders, and issues forth at the other in two descending torrents of sheets, accurately cut into lengths, and printed on both sides. The rapidity with which it works may be inferred from the fact that the printing cylinders (round which the stereotyped plates are fixed), while making their impressions on the paper, travel at the surprising speed of two hundred revolutions a minute. As the sheet passes inwards, it is first damped on one side, by being carried rapidly over a cylinder which revolves in a trough of cold water; it then passes on to the first pair of printing and impression cylinders, where it is printed on one side; it is next reversed and sent through the second pair, where it is printed on the other side; then it passes on to the cutting cylinders, which divide the web of now printed paper into the proper lengths. The sheets are rapidly conducted by tapes into a swing frame, which, as it vibrates, delivers them alternately on either side, in two apparently continuous streams of sheets, which are rapidly-thrown forward from the frame by a rocker, and deposited on tables, at which the lads sit to receive them.

The machine is almost entirely self-acting, from the pumping up of the ink, into the ink box, out of the cistern below stairs, to the registering of the numbers, as they are printed, in the manager's room above. Newspapers of moderate circulation, and jobbing work generally, are now worked on machines the design of which was originally that of Kœnig, as improved by Applegath and Cowper, about the year 1818. Innumerable improvements have been made subsequently, and the manufacture of printing machines has become a large and important business.—*Printers' Circular.*

SALT IN SAN DOMINGO.—A recent letter reports that a mountain of salt, of a purity unequalled by any other natural source of supply, has been discovered in the island of San Domingo. The writer states that the hill is nine miles long, and one and a quarter miles wide, and that shafts have been sunk to a depth of 800 feet through the salt, without reaching the underlying strata. It should be stated that the salt is only one side of the hill, the crown or ridge dividing it from a series of limestone and sandstone layers. The ridge is of alabaster, of great purity and whiteness. The salt is stated to contain 98 per cent of pure saline matter, and is of crystal clearness.

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Contents:

(Illustrated articles are marked with an asterisk.)

PROPOSED CHANGES IN THE BRITISH PATENT LAWS.

A bill has lately been presented in Parliament, which, if passed, will add some novel features to the British patent laws.

The new bill provides that the Lord Chancellor and the Master of Rolls, who at present do nothing except draw large salaries, are to be relieved, and their places in the Patent Office filled by three persons called "Special Commissioners of Patents," one of whom is to be a lawyer, the others, persons of distinguished or well ascertained ability and experience in chemical and mechanical knowledge.

All proceedings for patents are to be conducted at such places and in such manner as the Commissioners shall direct, and they shall have power to make rules and regulations, summon witnesses to give evidence in any case, and also to require models to be deposited. In fact, the grant of applications for patents is to be more or less discretionary with the Commissioners.

The official fees to obtain a patent are fixed at about $62, with an annual payment of $25. This is a great reduction over the present rates.

After a patent has been issued three years, during which it has been exclusively and publicly enjoyed by the patentee or his assign, or at any time after the validity of the patent shall have been established in a court of law, such patentee or assign may apply to have the patent registered as an "indefeasible patent."

If no objection to such registration be made, or, if made, be disallowed, the Commissioners shall cause such patent to be registered as an *indefeasible patent*, and thenceforth the validity of such patent shall not be questioned in any court or in any manner whatsoever.

At any time after the expiration of a term, say of the first five years after the issue of a patent, the Commissioners may direct the holder of the patent to grant licences to any person who shall apply for the same, upon such terms and conditions as the Commissioners shall designate; and if the patentee refuses to obey the order of the Commissioners, the patent shall become null and void.

The provisions relative to the registration of indefeasible patents, and the compulsory issue of licenses, are novel, and we should be glad to see them put to a practical test. So long as patents are granted, it would seem to be only right and proper to establish, by law, some period during which the patentee may enjoy the fruits of his discovery, unvexed by the cares and expenses of law suits. At present there is no such limit, and in this country, as well as in England, the patentee is always liable to attacks upon his patent, by anybody who takes a fancy in that direction.

The provision giving the Commissioners power to order the patentee to issue licenses, seems to have for its object to discourage the formation of great patent monopolies, and also to secure to the public the right to use inventions upon fair and reasonable terms. These are good and plausible objects; but if the terms and conditions of use are left wholly to the discretion of the Commissioners, the provision would probably be of little value. Few officials are sufficiently virtuous to stand up against the pecuniary temptations which great monopolists command.

In this connection, it is proper to refer to a very interesting discussion upon the Patent Laws, at a recent meeting of the Society of Arts, in London. The subject was opened by the reading of a very able and comprehensive paper by Mr. A. V. Newton, who is one of the most experienced and prominent patent solicitors in Great Britain. He went over the whole ground upon which patents rest, pointed out the defects of the English, the American, and other systems, and suggested such reforms as appeared to him most needed. He showed conclusively that most of the defects attributed to the present British laws were really due to the ignorance and narrowmindedness of the Lords who administer them. Mr. Newton suggested, as a remedy for useless litigations, that before any action should be brought into court, the several contestants should be compelled to appear before an open tribunal, ruled by a competent examiner, and submit their several allegations; the examiner to investigate their merits and determine what points, if any, should be placed before the court for adjudication. Such examination, he contended, would do away with the greater proportion of the present needless and expensive law suits. Mr. Newton also favored the compulsory grant of licenses to use patents.

In the course of the discussion which followed, while the views and suggestions of Mr. Newton were, in the main, approved, it was held by most of the speakers that the English laws ought also to be modified so as to provide for a primary examination of all applications for patents, analogous to that in vogue at the American Patent Office.

The principal objection raised against this examination was the great number of clerks and other officers required, many of whom would be necessarily incompetent; it having been shown that sixty-two examiners and three hundred employees were engaged at Washington, chiefly for the above purpose. One of the members suggested that no such force would be required in England, as the total issue of patents is only 2,400 per annum, or eight per diem.

He might have added that there is not much probability of any rapid increase in the issues of British patents, while the present high fees are continued. In this country the official fees for a patent are only $35; while the number of applications filed and examined, in 1870, was 19,171.

CANAL NAVIGATION.

The bill introduced in the New York Legislature, offering a prize of $50,000 for a practical means of propelling canal boats, to be driven by steam, hot air, or electricity, has, at least, opened the eyes of inventors to the fact that the time is ripe for the introduction of a successful system, which shall be able to supersede horse towing.

We are not inclined to ridicule in the least the attempts that have been made, and are now making, to supersede steam, as a motive power, by hot air, or electro-magnetism. It is only when inventors in this field seek to delude the public by claiming results they have not attained, that they may properly be made to feel the lash of satire. Yet, in the present state of affairs relative to hot air engines and electro-motors, it was almost superfluous to include them in the offer. Neither of them can at present be practically used for towing or propelling boats, and there is small prospect that either will soon be available for any such purposes.

It seems to us that the question of motive power is a side issue, of little account as affecting the main problem. How to propel canal boats without towing by horses, in such a way as not to destroy the banks of the canal, so that boats may run in either direction without obstruction, pass into and out of locks with the same facility as at present, and make as good or better speed than is made under the present system, with economy of whatever motive power is employed, seems to be a fair statement of the problem.

The system of laying wire cables in the bottoms of canals and rivers, and winding them off and on revolving drums, has been extensively employed in Germany, Holland, and we believe to some extent in Belgium, with considerable success. There would be, however, many difficulties in applying such a system on American canals. Our ideal of a propeller for this purpose is one that makes each boat independent of every other boat, and which answers all the conditions above enumerated. Next to this ranks a propeller capable of towing a number of boats simultaneously.

Traction engines, running on tow-paths, if they can be made so as to mount and cross bridges, might at once be made to answer the last named purpose, provided that they would not injure the banks or bridges by their weight; and even if the latter were the case, of course bridges and banks can be made to be strong enough. So many kinds of propellers to be directly attached to boats have been invented, that we cannot attempt a minute review of them here. There have been side wheels, stern wheels, stern screws, and bow screws, and even paddle wheels placed at the bow. There have been endless chains, designed to propel boats by friction against the bottoms of canals. There have been machines for "poling" boats along, as is now done by hand on occasion. Endless ropes, to which boats could be hooked, the ropes to be kept in motion by water wheels, have also been proposed. Boats have been propelled by jets of water, or air, forced out of the stern, and by air propeller screws, driven at high speed. Wheels rolling upon the bottoms of canals have also been tried.

Of all these methods, three only have, we think, promise of success, namely: the traction engine, the bow paddle wheel, and the bow screw propeller.

If the use of rubber tires, such as are used on the Thompson road steamer, proves to be what its promoters claim for it, and what those interested in other traction engines dispute, engines provided with such tires can undoubtedly be used for towing boats, with great success. They can cross bridges, and will not injure tow-paths as much as the feet of the horses now employed. The expense of towing by such engines would be far less than towing by horses. A year or two will settle the question of the economy and durability of rubber tires; and if they perform all that is desired of them, their use on traction engines for canal towing may become one of their most important applications.

Of the two other methods thought practical, we are inclined to favor that of the screw propeller in the bow, rather than the paddle wheel, though both accomplish the same results. The water is in both cases forced directly backward under the bottom of the boat, and quietly delivered in the rear, without side swells, which injure the banks. But the paddle wheel is more cumbrous than the screw, and has to be made adjustable vertically, to accommodate itself to the varying draft of boats, while the screw needs no such adjustment, and occupies very little space comparatively. The latter system, known as "Main's system," has, as our readers are aware, been tried with satisfactory results on the Erie canal in New York. Of all methods yet employed, it seems most likely to become popular, and to supply the long sought-for means of propulsion.

From this brief review of the subject, our inventors may learn something of what has been done, and judge of the possibility of striking out original paths for themselves. It is not probable that all mechanical resources have been exhausted, and it would not surprise us to see something yet devised, quite in advance of any method yet proposed.

ROOFS AND ROOFING.

It would be difficult to point out a more important subject, or one more beset with practical difficulties, than the one chosen for the title of the present article. So far as cities are concerned, the old fashioned shingle roofs are things of the past. There have been as many inventions for roofs and roofing as for street pavements, yet there is a want of cheap, permanent, and tight roofs, and there is no betterfield than this for inventors to exert their skill in. In this assertion we do not mean to cast any odium upon many valuable inventions that have done and are still doing good service, in bridging the gap between the roof that was and the roof that we trust is yet to be. We do not see how the world would have got along, or could now get along without them. That they possess imperfections does not affect their sale and employment, so long as they are the most perfect of anything yet available. Inventors may rest assured, however, that the problem of roofs combining maximum durability and tightness, with minimum cost, is not yet solved. We need not dwell upon the fact that he who shall succeed in solving it satisfactorily, will be likely to reap a large reward for his invention. The field is so enormous, and the demand so great, that the roof which answers to all the conditions required would be one of the most valuable inventions of the age.

We have been led to these remarks by a conversation with Elder Evans, of the Shaker Settlement at New Lebanon, in which he has given us the experience of that community in the matter of roofing. The buildings of the society are extensive and numerous, and present a very large roof area. It has given these people very much trouble to select and apply roofing materials, such as would give a fireproof, tight, and durable covering to their buildings. They have tried nearly everything in market, with that thoroughness characteristic of all their work, and have finally settled upon slate with a felt lining as the only material that combines all the qualities essential to a good fireproof and durable roof. Their method of laying this sort of roof is, first, to cover the rafters with edged boards, putting the latter close together. They then felt, taking care to lap and cement well, as upon this depends the ultimate tightness of the roof, against drifting snows in high winds. The slates are then put on the roof in the best manner possible, which can be done as slowly as may be necessary, the felt making a tight roof, which only needs protection, from external influences, by the slate.

It is the opinion of Mr. Evans that gravel roofs may be made so as to do good service, but that they are not *likely to be so laid*. The variations in temperature, damp weather, etc., which ought to interfere with the laying of such roofs, are not often allowed to interrupt the progress of a job in hand, and imperfect work is the result. The society alluded to has such a roof, laid in the most thorough manner possible, that has been in use since 1859, and has as yet given no trouble.

Their experience with tin roofs has been decidedly unfavorable. Plastic slate has also failed utterly, though they have done their best to make it a success, trying it in numerous ways.

It seems that the contraction and expansion of continuous metal roofs will generally cause leaks to succeed each other, so as to require a constant succession of repairs; and the larger the roof, the greater is the annoyance from this cause. Such roofs, to be good, ought to be made of small pieces, which, while they act together in shedding rain and keeping out wind, act individually when expanded by heat or contracted by cold.

The use of slates or shingles for roofing necessitates greater pitch to roofs than is given to those of ordinary city buildings; and when slates are employed, their weight requires increased strength in the supporting parts. These are drawbacks which are seriously felt in cities, where room is so valuable as to make flat roofs very desirable.

Such, in brief, is the present condition of the roofing question in this country. How long it will remain so depends wholly upon the fertility of inventive genius.

MINING SCHOOLS IN THE UNITED STATES.

A paper bearing the above title, written by John A. Church, E.M., and originally published in the *North American Review*, was deemed of such value by the trustees of Columbia College that they requested permission to republish it, in order to secure for it a wider circulation. Permission was accorded, and the paper, reprinted in pamphlet form, is now before us.

We are not surprised at the desire of the trustees of Columbia College to circulate this paper more widely, as it is perhaps as thorough an exposition of the state of mining schools, and the needs of the country in this respect, as has ever been written.

We shall only attempt, in the present article, a very brief review of this interesting and valuable paper; and though we must, for want of space, give a very inadequate idea of its contents, we shall be able, at least, to do an act of justice to the first established, as well as the most complete, mining school in the United States, namely, that of Columbia College.

The author, upon the authority of Commissioner Ross Browne, states that experienced investers, in Western mining property, are unwilling to pay for a mine more than two and one half times its yearly profit. Such property is not considered a safe investment unless its annual profit, on cost of purchase, is forty per cent. The reason ascribed for this state of things is, that the mines are so unskillfully and unscientifically managed, that if, to use the precise words of Mr. Church, "an investigation could be had of the exact proportion of precious metal saved to the quantity in the ore, the story would be astonishing even to scientific men. Without careful proof, it is impossible to make men believe the reports of the few competent observers who have been there, so apparently incredible are the results of recklessness and want of knowledge. It was difficult to introduce even the thinnest entering wedge of common sense into this hard prejudice against skill and study. For a long time the miners refused all help from schools or scholars; but the experience of continual trouble with their ores, and the gradually developed fact that they often lost more than they gained, have worked a complete revolution."

The more difficult ores are found in Nevada, Montana, and Colorado. But Mr. Church states that the early losses, in even the more easily worked ores of California, have been estimated as being at least two thirds of the gold really attainable, and no one has estimated them as less than one half.

In Europe, mining schools have been long established, and indeed form part of the system of government. The knowledge acquired in these schools enables ores of low grade to be worked in European mines, many of which would otherwise have to be abandoned.

Three grades of schools, for this purpose, are maintained. The right to attend the lectures, even in the primary schools (*Bergschüle*), is not easily attained. Mr. Church tells us that, "Entering a metallurgical work, a young man first spends two or three years in wheeling slag to the waste heap; then as much more time at each of the following steps: wheeling ore to the mixing bed, shoveling ore into the weighing bucket, weighing ore, working at the roasting heaps, throwing ore into the furnace. Here his progress is slower, and he may remain at the last employment five or ten years. Finally he becomes smelter or tapper of the furnace. The uneducated man can rise no higher. The educated man spends much less time at each of these grades, but go through them he must. He is usually occupied two or three years in all at practical work, and then performs clerical duties in the office. Rising higher and higher, he may in time become director of a smelting establishment or a mining district. The director of the world famous mines around Clausthal, Andreasberg, and Altenau, in the upper Harz Mountains, is an instance of a man who has passed through the commonest grades of service to a high position; he was a picker of ore in his boyhood. Plattner, a thorough chemist, founder of the analysis with the blowpipe, and an elegant as well as scientific writer on metallurgical chemistry, began in the same way."

The higher grades of schools (*Bergakademien*) are scattered throughout Europe; the four considered to be of first rank being at Paris, Freiberg in Saxony, Berlin, and St. Petersburg. The French school is distinguished for its breadth of instruction, the Freiberg school for its facilities for practice in mines and smelting works.

We are sorry to say that there is undoubtedly too much truth in what Mr. Church affirms of the mining schools in the United States.

"At present there is but one fairly established school of this class in the country—that in New York. Institutions which bear the name of schools of mines are also to be found in New Haven, Boston, Troy, Philadelphia, Ann Arbor, and many other places. But those where the instruction is general and complete, as at Cambridge or New Haven, lack the students necessary to form a living school, while the others have no claim to the title they have taken, except by virtue of a course of lectures on metallurgy or mining, tacked on to their regular studies. The latter are no more schools of mines than is the Military Academy at West Point, where a course on metallurgy has been given for years. They lack not only the purpose, the singleness of aim, the undivided attention to one absorbing subject, without which a school of this kind has no life, but also the support necessary to carry on so expensive an institution."

The New York school was founded in 1864. The number of students on its opening day was twenty, and before the year closed there were fifty. It has since had an average of fifty new pupils each year. Mr. Church characterizes it as one of the best schools of its kind in the world. "More scientific than Freiberg, more practical than Paris," are the terms of high praise he accords to it, and he adds; "Remarkable as it may seem, no school in Europe, unless that in St. Petersburg be excepted, can compare with it in the appointments, either of its chemical or its assay laboratories."

We will close this review by quoting a foot note appended to the last page of the pamphlet, which contains statistical information of importance.

"The cost of this school (New York School of Mines) for the last five years of its existence has been $248,049, and its receipts from students, $82,134. The first year, which was exceptional, cost only about $28,000, but the average payments are very nearly $50,000, and the average receipts, $16,000. These figures may be studied with advantage by those who would be glad to see the country filled with schools of this kind."

USES OF INFUSORIAL SILICA.

Infusorial silica is now employed as a substitute for heavy spar, in the manufacture of certain kinds of rubber goods. As india-rubber will float on water, it is desirable to have something to add to it that is lighter than heavy spar, and the silica seems admirably adapted to take the place of the heavy earth. By mixing three to six parts of infusorial silica to one part of freshly burnt lime, and stamping the whole, after slightly moistening it, into a suitable mold, artificial stone of any desired form can be made. Such stones become extremely hard, are impervious to water, are finer grained than cements or *béton*, can be used for gas or water pipes, and will take any color. As there are large deposits of diatomaceous earth in various parts of our country, this application for artificial stone and cement is well worthy of consideration.

By combining infusorial earth with native magnesite and chloride of magnesium, a cement is produced which is known in Germany under the name of albolith cement. The chloride of magnesium, obtained as an incidental product in salt manufacture, is very cheap in some parts of Germany, and the occurrence of large deposits of magnesite renders this variety of cement available in Europe for many purposes. A fine glaze for earthenware is obtained by fusing infusorial earth with crude borate of lime, or boronatrocalcite. A variety of porcelain can be made by fusing infusorial silica with the borate of magnesia of the Stassfurt mines. This kind of porcelain can be cast, pressed, and, if sufficiently thin, can be blown as easily as glass. It is capable of extensive use in the arts.

Infusorial silica is the best material for absorbing nitroglycerin, in the manufacture of dynamite, and is used for that purpose. Ordinary sand is not sufficiently porous. The ready solubility of this form of silica in soda, suggests its application in the manufacture of liquid quartz. It is not a little singular that an earth which has long afforded test objects for microscopists, and has been employed as a polishing powder, should become an article of so much importance in the arts.

CARBOLIC ACID.

So much is said about carbolic acid, and it is now so largely used in medicine and the arts, that more information ought to be popularly disseminated in reference to it. It is not a new thing, but most of its applications are of recent date; and as nearly every person who has taken out a patent has given it a new name, we are often perplexed to recognize the precise article that is meant. It may be well to look into this labyrinth of names before proceeding to a description of the article itself.

Carbolic acid was discovered by Runge in wood tar in 1834, and was so called by him. It is a pity that other chemists have not adhered to the original name, as we should thus have been saved much confusion. Six years after Runge's original discovery, a French chemist named Laurent made some of the pure acid, and proposed to call it Phenylhydrate, from a Greek word meaning to illuminate, because it was supposed to be a constituent of illuminating gas; and still later, such names as phenylic acid, phenol, phenyl alcohol, coal tar creosote, coal oil acid, phenylous acid, and sundry others, were proposed. All of them ought to be dropped, and the original name of carbolic acid retained. It is really and truly an acid, capable of combining with bases to form salts, but is not strong enough to drive out many other acids from their compounds.

Carbolic acid has been found ready formed in the bile and urine of various animals, and is the product of the dry distillation of vegetable matter; and can be made by conducting the vapor of acetic acid or alcohol through a red hot tube. For technical purposes, it is almost exclusively made from coal tar, and as its boiling point is between 360° and 365° Fah., it is from the dead oil that the greater portion is obtained.

The details of the manufacture of carbolic acid may be consulted in works on chemistry, but its properties and uses may well occupy our attention for a few paragraphs. When pure, it consist of long needles of a peculiar, smoky odor and caustic burning taste; its specific gravity is 1·066, and it fuses at about 98° Fah. It absorbs moisture from the air, and runs to water, and it requires twenty times its weight of water to dissolve it. Alcohol and ether dissolve it in all proportions, and acetic acid is a better solvent than water. Concentrated solutions act powerfully on the skin, turning it white and afterwards red brown, and the spots afterwards peel off. Gelatin and albumen are precipitated by it, and this property has suggested its use in tanning. It is a dangerous poison; a few drops will kill a dog, and plants are at once destroyed by a weak aqueous solution.

Runge recommended carbolic acid for embalming bodies, and as a disinfectant, and tried many experiments to show its value for this purpose; but little attention was bestowed upon his assertions, and it is only recently that the substance has obtained proper recognition from medical and other authorities.

Extensive use is now made of carbolic acid to destroy the odor of stables; a carbolate of lime is prepared and sold for this purpose. As an insect exterminator, few agents can be compared with carbolic acid, and it is naturally applied by physicians for such cutaneous diseases as are caused by insect life. Several cases of death have been reported in consequence of an incautious use for this purpose. Three women, who bathed themselves with a sponge with carbolic acid, to cure the itch, were immediately attacked by dizziness, and soon became unconscious. Two of them subsequently died, and the life of the other was saved with difficulty. When used as a wash for men and the lower animals, it must be taken very weak, and in small quantities at a time. Dogs have been sadly tortured by it, in the vain hope of killing fleas.

The odor of carbolic acid is sometimes disguised by mixing it with camphor, when it is required to keep moths out of furs and clothing. No doubt, the preservative property of coal tar is largely due to the presence of this powerful agent.

All manner of soaps, ointments, and even troches, are made with carbolic acid, which must be used with caution, as the poisonous character of the acid suggests at once that it ought not to be tampered with. A new application of carbolic acid is proposed nearly every week, and it has become one of the most important of our chemical products.

SCIENTIFIC INTELLIGENCE.

DANGEROUS WELL WATER.

It frequently happens that wells, which at one time were supplied with pure and fresh water, in the progress of building and change in population become contaminated with organic matter, having its source in cesspools, outhouses, and the like. A convenient way of testing whether the well is subject to external influences, is to employ a salt of lithium. For example, pour into the cesspool a small quantity of a soluble salt of lithia, and after a few hours, test the well water to see if any of the lithia has percolated through the soil. The least trace of lithia can be shown through the spectroscope, and a subterranean connection, with the well, at once determined.

There is nothing more dangerous than organic matter in drinking water. To such impurities have been traced many cases of typhoid fever, cholera, and other epidemics; and too much caution cannot therefore be observed in the location of wells. On the upper part of the island of New York are numerous wells, that, from the nature of things, must be simple reservoirs for the open drains of those wards. They are fever receptacles, and must be the occasion of much of the sickness that is known to prevail there. On the corner of Eighty-second street and Eleventh avenue is a well that has been used for forty years by the pupils of a large public school. It was formerly in the country, but now is surrounded by houses, privies, and open sewers, and must be a perfect mine of disease. If the chemists of the Board of Health were to try the lithia experiment, and thus trace a connection with the open privy of the school, they would be able to see if it were safe to permit the children to use such water; and they could also pronounce the privy a nuisance to the vicinity. In London, all such wells have been suppressed by the government; but not until the lives of many persons were sacrificed to the apathy and ignorance of the authorities.

The insidious character of water cannot always be determined by a direct chemical analysis, and the taste of soft water becomes more palatable than that of hard, so that it is better, if possible, to prove a connection with drains or pools, in order to frighten persons from using from unwholesome wells. As lithia is not a poison, its use for this test can be safely tried.

SILVERING GLASS.

An easy method is as follows: Nine hundred cubic centimeters of distilled water is mixed with 90 cubic centimeters of a solution of Rochelle salts (1·50) in a flask and boiled; 20 cubic centimeters of a solution of nitrate of silver (1·18) are carefully dropped in, and the whole again boiled. In this way, a reducing solution is obtained containing oxytartrate of silver. This standard solution can be kept any length of time; in fact, it improves by age. A second stock bottle is prepared by adding ammonia to a solution of nitrate of silver, until the precipitate is entirely dissolved, filtering and diluting with water, until there is one gramme of the silver salt in 100 cubic centimeters of the liquid. For use, take equal quantities of the two stock solutions, pour them into a suitable dish, and immerse the well cleaned glass until it is sufficiently coated.

The layer of silver must be polished by good lac varnish. The excess of silver can be reclaimed from the bath in the usual way. As Rochelle salts are now a cheap article of commerce, and the actual amount of silver employed is very small, this method is one of the most economical of any thus far proposed, and it is also perfectly easy of execution.

STATISTICS OF ANILINE COLORS.

It is estimated that 10,000 pounds of aniline oil are manufactured every day in Europe. Of this, Germany consumes 2,000,000 pounds annually, and the remainder is distributed over France, Holland, Switzerland, and England. There are no aniline factories in Russia, and the amount made in the United States is scarcely worth mentioning. Although England is the chief producer of benzole, it is said to import most of its aniline oil from France. The total annual value of the aniline production is put down at nearly $5,000,000. This is doing pretty well for an industry that had no existence fifteen years ago.

DEATH OF WILHELM VON HAIDINGER.

The death of Wilhelm von Haidinger, of Vienna, one of the most celebrated mineralogists of Europe, is announced in our foreign exchanges. He was born February 5, 1795, and was consequently in his 77th year at the time of his death. His father before him was Professor of Mining and Engineering, and Director of the Natural History Cabinets in Vienna, so that the son came naturally by a love for science. Haidinger studied at Freiberg, afterwards resided several years as private tutor, in the family of the banker Allan in Edinburgh, and traveled extensively before returning to his native city of Vienna. He has been a prodigious worker and contributor to scientific journals. The number of titles to papers written by him exceeds one hundred, and they are all of a valuable character. They chiefly relate to mineralogy and geology. Haidinger was a gentleman of the old school, a thorough courtier, gentle in manners, refined, of a kindly disposition, and ready to aid the young student by word and deed. No one who ever met him can ever forget the pleasant impression produced by his appearance and bearing. He was the intimate personal friend of such men as Woehler, Liebig, Mitscherlich, Rose, and Humboldt, and was a great favorite with them all. His death is a great loss to science, and a personal affliction to all who knew him.

Reduction of Silver Ore.

Eugene N. Riotte, of San Francisco, Cal., has recently patented an improved process for chloridizing silver ores, of which the following is the specification:

I take any silver ore and mix it with from four to eight per cent of its weight of common salt, more or less, according to the richness of the ore, after which I pulverize the mixture to the degree of fineness commonly required to prepare ore for amalgamation.

In order to accomplish an intimate mixture of the ore and salt, I prefer to crush them together in a dry crushing battery. I then introduce this mixture into the top of a furnace, the shaft of which is vertical or nearly vertical, and which is heated by fireplaces at or near the top, so that a current of heated air, gases, and other products of combustion is continually descending through the shaft.

Care must be taken to introduce the mixture so that it shall fall in separate and finely divided particles, and not in lumps.

As the pulverized mixture falls with the current, the ore and salt are both instantly decomposed, the action of the heat separating the silver from the sulphur, antimony, or other substances combined or mixed with it, and the salt being also, at the same time, decomposed by the gases which are formed by the decomposition of the ore.

The chlorine of the salt then instantly unites with the silver, so that the chlorination of the silver is completed in less than two seconds.

I do not confine myself to the exact proportions of ore and salt specified above, as they are not essential to my process; but I state those proportions which I have found to be most advantageous in practice.

What I claim as new is, the process of chloridizing silver ore by dropping a mixture of pulverized ore and salt, through a vertical or nearly vertical shaft, with the product of combustion.

The Decree of Cannopus.

Mr. Samuel Sharpe, an English gentleman whose profound knowledge of the literature of the Egyptians is without parallel in our day, has translated the inscription in hieroglyphics entitled "The Decree of Cannopus." This work will be appreciated by all students of history and philologists. Mr. Sharpe is another instance of the high culture of the intellect to which commercial men sometimes attain. Like Sir John Lubbock the ethnologist, Mr. Geo. Grote the historian of Greece, and the late Samuel Rogers the poet, Mr. Sharpe, who is the nephew of Rogers, was, for nearly all his life, a London banker, but retired from business some years ago.

Cannopus, sometimes improperly spelt Canopus and Canobus, was a water god in the Egyptian mythology, and his effigy decorates many of the urns and vases that illustrate the fine arts of the ancient people. The deity was worshipped up to the time of the first Ptolemy, when Serapis became the supreme power in Egyptian religion. Cannopus gave the name to a city in Lower Egypt, near the most westerly mouth of the Nile.

WE read of a discovery of fossil ivory, in prodigious quantities, in Alaska.

Tunnel between Hecla and Etna.

A native of Iceland recently delivered a lecture in London, descriptive of that remarkable island. He began by a edscription of the country, its position and extent, its most remarkable geographical features, its vast ice-covered mountains and numerous volcanoes, on account of which Mr. Carlyle termed it "the battle field of frost and fire." The largest of these ice mountains, Vatnajokull, covers an area of about 3,500 square miles, and the highest of its peaks, Prafajokull, rises 6,300 feet above the level of the sea. Mr. Hjaltalin drew a vivid picture of the grand and beautiful effect of these icy mountains seen under the different aspects afforded by the changes from a brilliant sunshine to a dark and clouded atmosphere.

That the island owed its existence entirely to submarine volcanic agency, having, at some very early period of geological history, been thrown from the depths of the sea, is proved by every hill and mountain. From the formation of these mountains, it is apparent that many convulsions, at long intervals, took place, ere the volcanic island was brought to its present shape. In confirmation of this statement, Mr. Hjaltalin described the upheaval, which took place towards the latter end of the last century, of an island not far from the part of the coast where Keykjavik is situated. It was preceded by shocks like those of an earthquake, felt by passing navigators, who, at the same time, observed the water to be discolored and agitated. Columns of steam arose, then flames; the sea was covered with pumice and cinders, and then a cone with a crater in the center appeared, and scoriæ, pumice, and ashes accumulated, until it became an island. The volcanic power which had brought it to the surface subsided before it was firmly fixed in its position, and it afterwards sank again beneath the sea.

Mr. Hjaltalin then noticed the opinion, very generally received among scientific men of all countries, that there is an underground connection between the volcanoes of Hecla, in Iceland, and Etna, in Sicily—a tunnel, of which the two mountains form the mouths. A peculiarity of the Icelandic volcanoes is their sending forth streams of boiling water with the lava currents. The volcanic ice mountains throw off their icy covers at the beginning of an eruption, which are floated down to the lowlands or the sea by the water cast forth from the volcano.

He then described the hot springs which are found all over Iceland. The principal of these is the far-famed Geyser, from which we have incorrectly called all the hot springs "geysers"—a mistake, he observed, as ridiculous to an Icelander as it would be to us if he were to speak of all the rivers of England as "Thameses." Next in importance to the Geyser (*raging*) is the *Strak Kur* ("a churn"), which is, in one respect, more remarkable, as, when quiescent, it can be made to perform by throwing in sods and stones in considerable quantities. The hot springs often increase and decrease in activity, disappearing sometimes in one place and reappearing in another.

Improvement in the Manufacture of Salt.

Samuel D. Gilson, of Syracuse, has recently patented the following improvements:

A tank or bath is provided, made of wood or metal, but so constructed as to resist the chemical action of the brine when placed therein. At the upper part of the tank, steam heated cylinders are arranged, the lower portions of which dip into the brine.

In using the apparatus, steam, water, or hot air, is let into the cylinders, and motion being applied to them, as the surface of the cylinders successively revolves within the brine, a film of salt will be deposited thereon, which is dried in part by the cylinders.

As the salt accumulates upon the cylinders, it gradually falls off by its own gravity, and descends to the bottom of the tank, but the salt thus produced is of a coarse quality.

When it is desired to make a fine quality of salt, a steam heated chest, which is provided with a knife, is moved toward the cylinder or cylinders, and so adjusted as to scrape the salt off in the required degree of fineness; and as the salt falls off on to the chest, it is quickly dried and ready for use.

The impurities which gather upon the revolving cylinders, such as lime, iron, etc., before the salt water is reduced to brine, are removed by the knife, as before described.

It is stated that salt of the best quality can be manufactured very economically by this apparatus.

Electroplated Signs.

John J. Pratt, of New York city, has lately patented the following improvement in electroplating signs, etc.

Upon the surface of sheets of polished brass, copper, tin, steel, or iron, of the requisite dimensions, the letters, numbers, and the like are laid off and covered with asphaltum, black varnish, or any paint or material that will resist the acids or chemicals used in electroplating. The sheets thus prepared are covered with a coat of nickel or silver plating, leaving the letters intact, and not plated; then the signs are burnished, which removes the paint, leaving the letters depressed below the plating. They can be painted to suit the taste, or, if upon brass or copper, can be left without coloring. He claims:

1. The improved process for forming letters, figures, and the like on metal plates, herein shown and described.

2. The new manufacture herein described, using metal plates suitable for signs, door plates, or labels, with letters or figures formed by electroplating as set forth.

IT is the most beautiful and humane thing in the world, so to mingle gravity and pleasure that the one may not sink into melancholy, nor the other rise up into wantonness.—PLINY.

EDITORIAL SUMMARY.

POWER FOR LESS THAN NOTHING.—The Philadelphia *Trade Journal* announces a discovery, by which petroleum can be used for fuel, and the waste product be sold at a lighter price than the crude oil costs. The theory is that the lighter and more volatile constituents of the mineral oil will be consumed, leaving the heavy lubricating fluid in the furnace. The residue is the more valuable part of the petroleum, and is separated in the combustion of the other components. The description includes, among many novel features, a four-horse engine, which was run for ten hours, at an expense of fifty-five cents.

ACTION IS MAN'S SALVATION.—Men who have half a dozen irons in the fire are not the ones to go crazy. It is the man of voluntary or compelled leisure, who mopes and pines and thinks himself into the mad house or the grave. Motion is all nature's law. Action is man's salvation, physical and mental; and yet nine or ten are wistfully looking forward to the coveted hour when they shall have leisure to do nothing—the very siren that has lured to death many a "successful" man. He only is truly wise who lays himself out to work till life's latest hour, and that is the man who will live the longest, and will live to most purpose.

IN Edinburgh a new musical instrument is now being exhibited. It is described in the *English Mechanic* as a keyed instrument of six octaves, resembling an harmonium in general form, but very different in mechanism. The sounds are produced by the friction of wooden hammers against a revolving cylinder of wood, set in motion by the feet. The tones produced are said to be very sweet and wonderfully varied. "One can sometimes hardly believe they are not those of a wind instrument."

CHAPPED HANDS.—It is said that honey is an unfailing preventive for chapped hands. When washing the hands, or rather having washed them, while they are still wet, rub on them a little honey, and then dry them, taking care to leave the honey on, and not rinse it off before drying the hands. If the hands are sore and chapped, on the first and second application the honey will cause pain for about five minutes, but if used every time the hands are washed, the hands never chap. It is also a cure for irritation on the face caused by wind and cold weather.

THE ELECTRIC LIGHT IN WARFARE.—An experiment has been made at St. Petersburg, with the view of ascertaining whether the electric light is capable of being turned to account in night warfare. The trial proved completely successful. With an ordinary piece of field artillery, the experimenters succeeded in lodging every ball in a target, at a distance of 1,660 yards. Not merely the target, but also surrounding objects, to a considerable distance, were rendered perfectly distinct, in spite of the darkness of the night.

A MAN at Peabody, Mass., who has been treated for more than a year for paralysis of the throat, and who was for some time able to take only liquid nourishment, recently coughed up an upper set of false teeth, which he had swallowed in his sleep fifteen months before, and which, lodging in the lower part of the throat, had been the cause of all his troubles. The teeth were missed at the time, hunted for, but never found, and nobody had suspected the place of their concealment.

IT is a curious fact that our hat and cap manufacturers in different localities, use different sizes of hats and caps as standards. Boston and the eastern states use the smallest sizes, New York and the middle states use the medium to largest sizes, and Chicago and the western states require the largest sizes. Goods manufactured for one market cannot be sold for the other, only in exceptional cases. The South use a shape peculiar to themselves and of a large size.

A CROWBAR WITH JOINTS.—Among the implements found in the possession of two burglars, when arrested in Norristown, Pa., was a crowbar, jointed so as to admit of being folded up and carried in an ordinary sized satchel. When extended to its full length, it was nearly six feet long, and when the joints were covered with stout rings, the implement was a powerful lever.

IN the museum at Cassel, Germany, is a library made from 500 European trees. The back of each volume is formed of the bark of a tree, the sides, of the perfect wood, the top, of young wood, and the bottom, of old. When opened, the book is found to be a box, containing the flower, seed, fruit, and leaves of the tree, either dried or imitated in wax.

UNDERDRAINING.—Surface water that flows off the land instead of passing through the soil, carries with it whatever fertilizing matter it may contain, and abstracts some from the earth. If it pass down through the soil to drain, this waste is arrested.

A NEW KIND OF LEATHER.—Fifty skins of the anaconda snake have, it is said, been tanned by Schayer Brothers, at the Boston Highlands, for boot leather. The largest of the skins was forty feet in length. The tanning process was similar to that observed in the manufacture of alligator leather.

A WISE SAYING.—It is related of an English farmer that he condensed his practical experience into this rule, "Feed your land before it is hungry, rest it before it is weary, and weed it before it is foul."

AN honest employment is the best inheritance that can fall to any one.

Business and Personal.

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

Lubricators.—For swift-running or heavy machinery, bolt and screw cutting, looms, and sewing machines, Chard & Howe, 134 Maiden Lane, N.Y., have the cheapest and best. Send for sample and price list.

"507 Mechanical Movements."—This valuable work, now in its 6th Edition, is a complete illustrated table of Mechanical Movements. Mechanics, Inventors, and others, will find it indispensable for reference and study. Price $1. By mail, $1.12. Theo. Tusch, 37 Park Row, New York.

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

Contractors get early information of contracts to be let in the Railroad Gazette.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

Send your address to Howard & Co., No. 865 Broadway, New York, and by return mail you will receive their Descriptive Price List of Waltham Watches. All prices reduced since February 1st.

Wanted.—A second-hand Otis Brothers' 6 to 8 inch cylinder Hoisting Engine, with patent automaton stop mechanism, that has been used but a short time. Address, stating price, size, and full particulars, P.O. Box 1478, New York.

Balloons made to order, with instructions, by John Wise, Lancaster, Pa.

Wanted.—25 to 30 feet second-hand Steam Launch, or boiler and machinery for one. Parties wishing to sell cheap may address E. J. H., P.O. Box 138, Addison, N. Y., giving description, weight, condition, and price, and stating where it can be seen.

I have a cheap water motor for Sewing Machines, or any H.P.'s, thoroughly successful, for sale, whole or in part. R. H. Atwell, Baltimore, Md.

Wanted.—A Partner, with capital, to manufacture a valuable Agricultural Implement. Address Louis de Mortemer, Chaptico, Md.

Ashcroft's Low Water Detector, $15; thousands in use; can be applied for less than $1. Names of corporations having thirty in use can be given. Send for circular. E. H. Ashcroft, Boston, Mass.

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Gage Lathes for Broom and other handles, Chair Rounds, etc. Price $30. With attachment for Nail work, price $30. Also, Wood-turning Lathes. A. L. Henderer & Co., Binghamton, N.Y.

E. P. Peacock, Manufacturer of Cutting Dies, Press Work. Patent Articles in Metals, etc. 55 Franklin st., Chicago.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Wanted.—A practical Mechanic, who thoroughly understands manufacturing Chairs, Bedsteads, and other Furniture, as manager. Must be able to take an interest in the business, now in operation. For particulars address "Mason," P.O. Box 2899, New York.

To Cotton Pressers, Storage Men, and Freighters.—35-horse Engine and Boiler, with two Hydraulic Cotton Presses, capable of pressing 75 bales an hour. Machinery first class. Price extremely low. Wm. D. Andrews & Bro., 414 Water st. New York.

Twelve-horse Engine and Boiler, Paint Grinding Machinery, Feed Pumps, two Martin Boilers, suitable for Fish Factory. Wm. D. Andrews & Bro., 414 Water st., New York.

Wanted.—An Automatic Power to run a small Fan, 6 in. vanes, at 200 revolutions per minute. Address Lock Box 128, Pittsburgh, Pa.

Use Rawhide Sash Cord for heavy weights. It makes the best round belting. Darrow Manufacturing Co., Bristol, Conn.

For the best 15-in. Swing Engine Lathe, at the lowest price, address Star Tool Co., Providence, R. I.

American Boiler Powder Co., P. O. Box 315, Pittsburgh, Pa.

Winans' Boiler Powder.—15 years' practical use proves this a cheap, efficient, safe prevention of Incrustations. 11 Wall st., New York.

Mechanical Draftsman wanted.—One experienced and expert in getting up machinery will find permanent employment, with liberal weekly pay. Address E. H. Stearns, Erie, Pa.

See advertisement of L. & J. W. Feuchtwanger, Chemists, N.Y.

Carpenters wanted—$10 per day—to sell the Burglar Proof Sash Lock. Address G. S. Lacey, 27 Park Row, New York.

Manufacturers' and Patentees' Agencies, for the sale of manufactured goods on the Pacific coast, wanted by Nathan Joseph & Co., 619 Washington street, San Francisco, who are already acting for several firms in the United States and Europe, to whom they can give references.

All parties wanting a water wheel will learn something of interest by addressing P. H. Wait, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N.Y.

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

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D. Andrews & Bro, 414 Water st., N.Y.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

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

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., 25 Whitney ave., New Haven, Conn.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

English and American Cotton Machinery and Yarns, Beam Warps and Machine Tools. Thos. Pray, Jr., 57 Weybosset st. Providence, R.I.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

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

"Of Late Years Advertising

Has assumed a very important phase—in fact, has become a science in business; and no one has done more, or as much, to make it so, as Geo. P. Rowell & Co., of New York. Their prompt and systematic mode of transacting their business has gained the confidence of all large advertisers, and has raised them in a few years from one of the smallest to the leading advertising house in the world."—*Maple Leaves.*

Answers to Correspondents.

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

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

Imitation of Ebony.—E. E. B. can make imitation ebony by using a dye of logwood, galls, and sulphate or acetate of iron; but it will always look dull and unnatural unless he knows how to polish it, when it will come out a most brilliant, shiny black. It is done in this way: Put the dyed or finished article in the lathe, turn at great speed, and while in revolution, firmly and evenly press the siliceous rind of bamboo or a hard wood burnisher against the article, and continue the operation till all the grain is reduced into a smooth glossy surface. The bamboo is best, it is so unyielding and hard in texture. Smooth flat work, not adapted to a lathe, must be rubbed till a polish is obtained.

Cement for Marble.—Let C. H. P. sift plaster of Paris through muslin, and mix it with shellac dissolved in alcohol, or naphtha. As soon as mixed, apply quickly, and squeeze out as much of the composition as possible, wiping off that which squeezes out before it sets. The cement will hold better, if the parts to be joined be roughened by a pointed tool before cementing. This can be done without breaking off the edges of the fractured parts. Plaster of Paris used with white of egg also makes a good cement, but it must be used with expedition.

Telescope.—W. B. can make a telescope of sufficient power to see the rings and satellites of Saturn. Object glass, 3 inches in diameter, 20 in focus. Achromatic, 3 double convex lenses, 1 inch in diameter, set 1½ inches apart, constituting the eye piece. He can set these lenses in brass or paper tubing, if he be sufficiently skillful.—A. W. G., of Mich.

A. W. G., of Mich.—It is getting more and more difficult to obtain situations as apprentices in machine shops, owing to depression in business, and glut of applications. The only way for you to do is to keep trying.

Cement for Leaks in Gas Holders.—In answer to F. C. I would say that I repaired an extremely leaky gas holder by putting red lead over the leaks, and then painting the whole with the "Ritchie Mineral Paint." That was two years ago. The gas holder has received one coat of paint since, but it has never leaked.—I. H. F., of Md.

Cement for Gas Holders.—If F. C. does not find a cement for his gas holder, insoluble in both oil and water, let him caulk the leaky spots in the seams with tin foil; heavy tobacco foil is the best. I had a 1,000 feet holder, for gas made from the lighter products of petroleum, which leaked very badly, and none of the usual cements, paints, varnishes, or tar, would stop the leaks; an afternoon in a dentist's chair, having teeth filled, suggested a similar process for my disabled gas holder, and it was a success.—J. T. W., of Mass.

W. C. A., of Mass.—The article entitled "A Wonder in Weaving," was taken from another paper, for whose enthusiastic opinions we do not hold ourselves responsible. Indeed, a careful perusal of our own introductory clause will show you that we had doubts whether the statements made were supported by facts.

E. B., of Iowa.—To answer the question, what attempts have been made to make a device that would make a crank pass its dead centers without a fly wheel? would take too much space. We can say, however, that none have ever been found a good substitute for the fly wheel, for heavy work. Some devices have been made that will do for very light work, such as gas-meter registers and the like.

H. A. C., of Ca.—You cannot set fire to wood by steam escaping into the air from a pipe, no matter what may be the temperature in the boiler or pipe. The steam in escaping expands so as to reduce its temperature almost instantly to 212°.

S. S., of Va.—Your suggestions in regard to forcing air through moist porous materials, for removing dust in the ventilation of cars, funnels being employed to collect the air, have already been acted upon, and are now in use on some roads. Your suggestions in regard to heating cars have also been used.

L. B. S., of Tenn.—To keep polished iron work from rusting in salt air, coat it with mercurial ointment, or what answers nearly as well, with a mixture of mutton tallow (free from salt) and white lead, applied in a melted state. When the machinery is to be used, the coating can be removed by slightly warming the metal.

Composition for Matches.—B. H. will find recipes for this in Dr. Chase's "Recipe Book," also in Dussauce's "Treatise on the Manufacture of Matches," published by H. Carey Baird, Philadelphia, Pa.—A. W. G., of Mich.

Furniture Varnish.—Best alcohol, 1 gallon, gum shellac, 2½ pounds. Place the vessel containing these ingredients in a warm place, till the gum is dissolved.—H. W. G., of Mich.

A. D. F., of D. C.—The washing of banks by canal boats is due altogether to swells, caused by the propellers, unless they are propelled at such speed as to make a bow swell. Such speed is not allowable.

S. S., of Va.—We advise you to admit air to your furnace, when burning the "ross" of oak bark, at or near the first bridge wall, through openings made in the masonry, and provided with dampers to regulate the admission. We are sure this will obviate all the smoke nuisance and add to the economical working of your furnace.

J. B., of N. Y.—There is no such thing as an electroplating machine. The apparatus employed, is a galvanic battery, and is described in almost every chemical or natural philosophy book.

N. T. W., of Me.—The mineral you send appears to be a sulphuret of antimony, containing some lead and probably silver. It may be of value. Briefly, the way to reduce this ore is by means of a close crucible with borax and charcoal.

J. S. H.—Select a refrigerator from any good maker, and you cannot go astray.

NEW BOOKS AND PUBLICATIONS.

The *American Journal of Microscopy* is the title of a new monthly publication, published at Chicago, Ill., by G. Mead & Co. $2·00 a year. E. M. Hale, M.D., Editor. The contents of the first number are quite interesting. We are glad to welcome this new candidate for public favor, and trust it may find liberal and prompt support.

Queries.

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

1.—Waterproof Paper.—I am in want of a paper which shall be waterproof, and yet have the same appearance as common paper. Can any of your correspondents give me the desired article, or the process for making the same?—Z. M. J.

2.—Paint.—Will some practical painter tell me why mixed paints become "fat?"—J. B.

3.—Singular Occurrence.—I used a brass bell wire to connect my room with my office (for bell), being about fifty feet long, running very near east and west, and upwards at about an angle of 40°. After being up about twelve months, the wire was found to be cracked, perhaps in a thousand or more places, leaving only a small particle to keep it together. What is the explanation?—J. H.

4.—Wooden Railway.—Which is the best kind and size of wood for a wooden railroad, for four wheel cars, weighing ten tuns loaded?—E. R. C.

5.—Preserving Flowers.—Will some one give me the recipe for a process of preserving flowers, that will also preserve the colors? Also for a good cement for aquaria, white preferred?—T. E. L.

6.—Ink Stains in Marble.—What will take ink stains out of marble?—J. L.

7.—Rancid Butter.—Is there any chemical process for restoring rancid butter, that is, removing its bad taste and smell?—R.

8.—Cheap Hydrogen.—I want a safe and cheap method of making hydrogen.—J. H. F.

9.—Stencil Ink.—I desire a good ink for stenciling on on cases. I have been using chrome ink, and am not satisfied with it. I want something that will not coat the stencils over, but leave them clean, as I have experienced a great deal of inconvenience in using inks that collect on the stencils and leave them foul.—C. T. D.

10.—Impervious Material.—What is the best material entirely impervious to all the vegetable, animal, and mineral oils (particularly the latter), having a great degree of flexibility, durable, but not necessarily elastic?

11.—Lens for Magic Lantern.—How large a lens must I use to make a magic lantern, that will show a circle six feet in diameter at a reasonable distance from the instrument? What should be the focal distance, and how near the inside lens ought the light to be placed?

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

826.—Mode of Supplying Paper to Printing Presses.—Olof Nilson, Red Wing, Minn. March 28, 1871.

833.—Machinery for Washing and Separating Ores.—John Collom, Houghton, Mich. March 28, 1871.

838.—Steam Pumping Engines and Valves, Valve Gear, etc.—Adam S. Cameron, New York city. March 29, 1871.

842.—Revolving Oven.— . Curtis, Mishawaka, and C. B. Graham, South Bend, Ind. March 29, 1871.

849.—Mold Draining, and Drying Sugar.—A. F. W. Partz, San Francisco, Cal. March 30, '71.

857.—Manufacture of Illuminating Gas—Darius Davidson, New York city. March 30, 1871.

866.—Iron and Steel.—Charles M. Nes, York, Pa. March 31, 1871.

867.—Washing Machine.—Albert Assmann, Rahway, N. J. March 31, 1871.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address Munn & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Recent American and Foreign Patents.

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

Broiler.—William Thompson Howard, Baltimore, Md.—This invention has for its object to prevent the liquid fat, which exudes from meat during the process of broiling, from falling into the fire, and thence sending up smoke and flame, which scorch and fumigate the meat, and also to save the fat and gravy by means of a receptacle below the broiler, and also to prevent the meat from coming into contact with, and being fried in, the fat in the broiler.

Horse Collars.—John W. Schwaner, Egg Harbor City, N. J.—This invention has for its object to improve the construction of horse collars, so that they may fit more closely to the horse's neck, be more easy upon the horse, retain their form better, be stronger, more durable, and be more easily made, and more readily put on and taken off the horse, than collars constructed in the ordinary manner.

Dies for Forming Horse Collar Shells.—John W. Schwaner, Egg Harbor City, N. J.—This invention has for its object to furnish improved dies for forming the shells or foundation plates for horse collars.

Corn Planter.—Rev. G. J. Vaught, Hanby, Ky.—This invention has for its object to furnish an improved corn planter which shall be simple in construction, and convenient, accurate, and reliable in operation, and which shall be so constructed as to furrow the ground, drop, and cover the seed, and remove any clods that may be left upon the hills, leaving the seed uniformly covered to any desired depth.

Barrel Rolling Apparatus.—Lewis L. Ryatt, New York city, and Adolph G. Hüpfel, Morrisania, N. Y.—This invention has for its object to furnish an improved apparatus for rolling barrels, which have been coated with pitch or other similar substance, to keep the said substance spread over the surface of the barrel, until cooled, and which shall be simple in construction, easily operated, and effective in operation.

Plumbago Oil Cans.—Donald D. Mackay, Whitestone, and Cyrus Butler, New York city.—This invention relates to improvements in oil cans, and it consists in a combination, with an oil can, of a stirring apparatus, arranged in a simple manner, to be actuated by the same hand by which the can is taken for use, to stir the oil rapidly before using, to thoroughly mix the plumbago or other substance, which is not soluble in the oil, with the latter.

Spittoon Lifter.—James Walker and H. F. Lilly, Philadelphia, Pa.—This invention relates to a new and useful improvement in an implement for lifting spittoons and other hollow vessels, and for other purposes, as solid or spherical bodies, cannon balls, etc.

Sectional Ceiling and Walls for Buildings.—Charles N. Poole, Sandwich, Ill.—This invention relates to a new and useful improvement in mode of finishing the inside of dwelling houses and other buildings, and consists in putting on the finish of the walls and ceiling in sections so that the ordinary mode of finishing by plastering is dispensed with.

RAILROAD CAR COUPLING.—Lycurgus Jedson Bosworth, Monmouth, Ill.—This invention has for its object to produce a car coupling which will be readily opened or closed by convenient means, and become automatically uncoupled whenever the cars run off the track. The invention consists in a novel combination of a sliding ring on the handbar with an adjusting lever, pivoted jaw, and beaded coupling link, all arranged in conjunction with each other, to operate in the stated manner.

WATERPROOF FLOORS.—Tobias New, New York city.—This invention relates to a new and useful improvement in constructing waterproof floors for packing houses and stables, and for all purposes for which such floors are desired.

COTTON SEED AND GUANO DRILL.—Leonidas M. Rhodes and Christian N. Rhodes, Warrenton, Ga.—This invention relates to a new and useful improvement in drills for planting cotton and other seeds with guano or other fertilizer.

PLANING TOOL.—Nathaniel Russell, Plymouth, Mass.—This invention relates to a new and useful improvement in tools for planing wood and metals, and consists in a series of steel plates confined in a hollow block or case by means of screws or keys.

OPERATING WATER WHEEL.—John S. Warren, Fishkill on the Hudson N. Y.—This invention relates to a new and useful improvement in mode of operating the chutes of water wheels.

PISTON PACKING.—John C. Merriam, Olneyville, R. I.—This invention has for its object to furnish an improved packing for steam engines, pumps, etc., which shall be so formed that the argillaceous clay or other powdered mineral cannot be blown off by the steam.

[Mr. Merriam was formerly editor of the *American Engineer*, and the clay he uses comes from a mountain in Vermont. The deposit was discovered by a Californian, and it is claimed to possess lubricating qualities not inferior to plumbago. A company under the name of "Clay Packing Company" has been formed, and further information may be had by addressing P.O. box 524, Providence, R. I.]

TRACTION ENGINE.—J. W. Hazen, West Hartford, Vt.—This invention has for its object to furnish an improved traction engine for drawing plows, and for other uses, and which shall be simple in construction and effective in operation.

COMBINED CIDER MILL AND PRESS.—Daniel H. Krauser, Pottsville, Pa.—This invention relates to new and useful improvements in mills for grinding and pressing fruit in the manufacture of cider or wine, and for similar purposes.

TILE DITCHER.—Isaac T. Baker, Gratiot, Ohio.—This invention relates to a new and useful improvement in machines for cutting ditches for drain tiles, and it consists in a hollow curved bed plate, or trough, provided with a share, or cutting edge, and with an adjustable beam.

EXTENSION PULLEY.—William Onions and Isaac Bagnall, St. Louis, Mo.—This invention relates to a new and useful improvement in pulleys for driving machinery, and consists in making the pulley in sections, and constructing and arranging the sections in such a manner that the diameter of the pulley may be increased or diminished, so as to vary the speed of the machinery without moving or changing the belt, or stopping the motion.

COKE FURNACE FOR HEATING SOLDERING IRONS.—Conrad Seimel, Greenpoint, N. Y.—This invention has for its object to furnish a substitute for the portable charcoal stoves now in use, by plumbers, roofers, and others, for heating soldering irons, and similar purposes, so that in place of the expensive charcoal the cheaper coke can be employed, with equal effect. The invention consists in the arrangement of a furnace having a grate and a peculiar draft apparatus, adapted to the peculiarities of coke.

ATTACHMENT TO OIL WELL TUBING.—William H. Dewey, Tideoute, Pa.—This invention has for its object to provide means for gathering the oil from well tubes when they are being withdrawn from the well.

DISINFECTING COMPOUND.—Guillaume Vigué, ainé, Bordeaux, France.—The object of this invention is to produce an inexpensive but effective compound for counteracting the offensive and injurious effects of mephitic exhalations, and foul odors of every kind.

APPARATUS FOR COVERING CORDS, ETC.—Reuben Lewis, New York city.—This invention relates to certain improvements in the arrangement of bobbins and apparatus for winding woolen or other yarn around cords or wires, to produce picture cords, stems for artificial flowers, or similar covered goods.

FENDER AND SIFTING ATTACHMENT TO FIRE GRATE.—Wm. H. Garrett, Canonsburgh, Pa.—This invention relates to an attachment to fire grates, for catching the droppings from the grate, sifting the ashes therefrom; and also for preventing fire from falling over the top of the grate; and it consists in a metal pan, or screen of any kind, suspended under the grate, by resting at the rear on studs projecting from the back wall, and at the front by chains from the top bars of the grate, or on studs in the wall thereabout, so that it may be swung back and forth for sifting the cinders, and then be brought forward and its contents emptied on the fire.

BOAT DETACHING APPARATUS.—D. L. Cohen, Pensacola, Fla.—This invention has for its object the detaching of boats from ships, and it consists in so arranging a rod or bar in the bottom of the boat, to connect with the devices by which it is suspended, and providing the same with a tooth, which is engaged by a suitable catch, that, when a locking lever is operated (as may be done by a single movement), the boat will be instantly detached from the davits.

FERRULE.—D. G. Smith, Columbus, Ohio.—This invention relates to improvements in ferrules for spades, forks, and other implements, but more especially such ferrules as have notches in the ends for receiving the shoulders of a fork or spade, or other article having shoulders. The invention consists in the application to the said ferrule of a reinforcing ring of oval, flat, or other form, fitted on to the top end, and driven on tight, and secured by soldering or brazing, or it may be retained by the friction, and by the shoulders of the tool driven into the wood handle, and confined by the ring and ferrule, the said ring being driven on at the same time the shank of the tool is driven into the handle.

DUMPING CAR.—W. A. Sharp, Tama City, Iowa.—This invention relates to improvements in dumping cars, and it consists in an arrangement of the bottom to slide over one or both sides of the car, or, being divided at the center, to slide over each side and tilt; and in connection therewith an arrangement of rigging to effect the movements of the bottom, for dumping and returning by the power of the locomotive, which, being uncoupled from the car, is hitched to such rigging.

COMBINED PLOW AND SCRAPER.—John C. Cameron, Madison Station, Miss. This invention relates to a new and useful improvement in an agricultural implement for cultivating growing crops, more especially designed for cotton, but applicable to other crops, and consists in a detachable scraper, which forms a continuation of the mold board on the opposite side of the bar of the plow, projecting over the land side, but attached to the plow in the place of the plow point.

TENONING MACHINE.—M. S. Bourland, Buena Vista, Texas.—This invention relates to a new tenoning machine which is provided with a circular saw for cutting the sides of the tenons and the shoulders formed by the same, and which may also be used for cutting the ends of boards, rails, etc., tapering or at any suitable angle.

SHINGLE MACHINERY.—James Decker, Doctortown, Ga.—This invention relates to improvements in shingle machines, and consists in the application to a reciprocating frame moving over the saw which works horizontally, of a set of holding dogs at each end, provided with novel apparatus for automatically feeding the bolts, and shifting them as required, for changing the bolt relatively to the saw at each cut, for cutting heads and points alternately.

WHIP RACK.—R. J. Anderson, New York city.—This invention relates to improvements in whip racks for livery and other stables, and it consists in one or more tubes arranged vertically above a shelf, on the wall of the building, or any suitable device for attaching thereto, and either inclosed in a case or not, in which tubes the whips are inserted from below, one in each, and the butt ends rested on the shelf below, in a way to keep the whips straight, while remaining therein.

POUND NET.—P. E. Tiernan, Waukegan, Ill.—This invention relates to a new pound net, to be used in rivers or lakes for continually arresting and retaining fish of proper growth and size, and absolutely preventing their escape, when once within the pound. The main object of the invention is to provide a secondary pound or fish receptacle, which will be in action while the main pound is being drawn up to be emptied, and thereby prevent the escape of fish from the heart of the net.

ADDING REGISTER.—C. W. Pyle, Wilmington, Del.—This invention relates to a new apparatus for registering the number of strokes or movements of a reciprocating bar, and is more particularly intended as an attachment for the "Ellis slat machine," although applicable to all other kinds of machinery. The invention consists in a new arrangement of concentric counting rings, and of the case containing the same; also in a new combination of parts for preventing said rings from being turned, one by another, and for imparting the requisite motion thereto.

CUT-OFF FOR BLAST FURNACE.—Henry Davis, Newport, Ky.—This invention relates to a new mechanism for cutting off the blast, for the purpose of letting down the stock in blast furnaces, and consists in a new arrangement of valves, and in an entirely original combination of machinery for regulating the motion of said valves.

RAILWAY SIGNAL APPARATUS.—John Fogarty, Brooklyn, N. Y.—This invention has for its object to furnish an improved signaling apparatus for use upon railways and other places, which shall be simple in construction, easily operated, and may be used for giving signals by day and by night.

MOP.—M. H. Kirkwood and S. H. Riley, Iowa City, Iowa.—This invention relates to improvements in scrubbing mops, and it consists in an improved arrangement of a clamp for holding the rag wiper, and a mode of detachably connecting brushes to it for using either the rag wiper or the brush, and it also consists in the application to the handle of a secondary clamp for holding rag wipers to be used for drying the floor after scrubbing.

APPARATUS FOR DRYING BONE BLACK.—Peter Farley, New York city.—This invention relates to a new apparatus for drying the bone black used in sugar refineries, and for other purposes, and consists in the arrangement of inclined shelves to the outer side of a heating structure, so that said shelves may retain the matter to be dried, and allow it to feed down slowly.

GRAIN HULLING MACHINE.—Michael Hoffman, Munich, Germany.—This invention relates to a new machine for so hulling grain that only the skins which contain the wooden fiber and useless matter will be removed from the grain, the nutritious body of the same being entirely preserved. The invention consists chiefly in the arrangement of a hulling cylinder having alternate circular grooves and ribs within the surrounding shell, which has also alternate circular ribs and grooves, in such manner that the ribs of the cylinder enter the grooves of the shell, and *vice versa*. The grain is, while it passes down between the cylinder and shell, properly peeled or hulled, the matter removed being ejected through sieves in the sides of the shell, while the full grain reaches the bottom of the shell. Finally, the invention consists in providing a sheet metal case around the shell and sieves for preventing the machine from dusting.

APPLICATIONS FOR EXTENSION OF PATENTS.

CENTERING MACHINE.—Edward F. Whiton, Stafford Springs, Conn., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

LOCK.—Lyman F. Munger, Rochester, N.Y., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

RAILROAD CAR SEATS.—B. J. La Mothe, New York city, has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

HARVESTER.—John P. Manny, Rockford, Ill., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

HARVESTER.—John P. Manny, Rockford, Ill., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

COTTON GIN.—Daniel Pratt, Prattville, Ala., has petitioned for an extension of the above patent. Day of hearing, June 28, 1871.

MEANS FOR RENDERING JOINTS STEAM-TIGHT.—Mary J. Kelsey, Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing, July 5, 1871.

RETORT COVERS.—James R. Floyd, New York city, has petitioned for the extension of the above patent. Day of hearing, July 5, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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113,719.—WHIP RACK.—Robert J. Anderson, New York city.
113,720.—SMOOTHING AND RUFFLE IRON.—A. R. Armstrong and C. S. Dudley, Nashua, N. H.
113,721.—PAPER FILE, ETC.—Albert Baker, Appleton, Wis.
113,722.—TILE DITCHER.—Isaac T. Baker, Gratiot, Ohio.
113,723.—EXPANDING PULLEY.—George S. Barton (assignor to Rice Barton & Fales' Machine and Iron Company) Worcester, Mass.
113,724.—SEWING MACHINE.—William G. Beckwith, Newark, N. J.
113,725.—STEAM PUMP.—William Baxter, Jr., Newark, N. J.
113,726.—RULER ATTACHMENT FOR DRAWING-BOARDS.—Theodore Bergner (assignor to James W. Queen & Co.,) Philadelphia, Pa.
113,727.—WASHING MACHINE.—Charles H. Berry, Natick, Mass.
113,728.—SHAFT COUPLING.—James H. Blessing (assignor to himself and Townsend & Jackson), Albany, N. Y.
113,729.—DOOR LATCH.—Eli S. Bitner, Lock Haven, Pa.
113,730.—CAR COUPLING.—Lycurgus J. Bosworth, Monmouth, Ill.
113,731.—TENONING MACHINE.—Melton S. Bourland, Buena Vista, Texas.
113,732.—CIDER MILL.—Jesse Bowen and Aaron T. Foster, Clarksburg, Ohio.
113,733.—PLOW.—Walter Britton, Truro, assignor to himself and Elmwood Mining and Manufacturing Company, Elmwood, Ill.
113,734.—SHAWL STRAP.—Damon W. Brockway, Dover, Me.
113,735.—APPARATUS FOR COMPRESSING, STRAINING, AND MOLDING PLASTIC PYROXYLINE.—Josephus Brockway, Albany, N. Y. assignor to himself and Urial K. Mayo, Boston, Mass.
113,736.—MANUFACTURE OF DENTAL PLATE FROM PYROXYLINE.—Josephus Brockway, Albany, N. Y., assignor to himself and Urial K. Mayo, Boston, Mass.
113,737.—MACHINE FOR PUNCHING CORSET SPRINGS.—Peter Brooks, assignor to Carrington Manufacturing Company, Waterbury, Conn.
113,738.—MODE OF ATTACHING TOPMASTS AND TOP-GALLANT MASTS.—Leverett Brown, New York city.
113,739.—SELF-CENTERING BOX OR BEARING.—Milan C. Bullock, Pottsville, assignor to himself and S. E. Griscom, Mahanoy Plain, Pa.
113,740.—MACHINE FOR CUTTING SCREWS.—James M. Carpenter, Pawtucket, R. I.
113,741.—TABLE FOR SEWING AND KNITTING MACHINES.—Edwin Chesterman, Tremont, N. Y.
113,742.—COOKING STOVE.—Franklin Clement (assignor to C. H. Buck and W. S. Wright), St. Louis, Mo.
113,743.—MODE OF FORMING THE HEADS OF WRENCH BARS.—Aury G. Coes, Worcester, Mass.
113,744.—HANGER FOR REVOLVING SHAFTING.—A. B. Couch, Worcester, Mass.
113,745.—CUT-OFF FOR BLAST FURNACES.—Henry Davies, Newport, Ky.
113,746.—SHINGLE MACHINE.—James Decker (assignor to himself and F. McRae), Holmesville, Ga.
113,747.—CORN PLANTER.—J. Dyson Delap, Tyrone township, Pa.
113,748.—SCARF.—George R. Dexter, New York city.
113,749.—DIRT CHAMBER FOR GAS PIPES.—Martin N. Dial, Painesville, Ohio.
113,750.—HORSE POWER.—William W. Dingee, Racine, Wis.
113,751.—BOTTLE STOPPER.—Louis Dovell, Newark, N. J.
113,752.—DRAWING FRAME.—George Draper, Hopedale, Mass.
113,753.—FENCE.—James T. Drummond, Mount Pleasant, Iowa.
113,754.—DRYING BONE BLACK.—Peter Farley, New York city.
113,755.—COMPOSITION FOR PRINTING OR PAINTING ON SURFACES.—Alonzo Farrar, Brookline, Mass.
113,756.—SIGNAL FOR RAILROADS.—John Fogarty, Brooklyn, N. Y.
113,757.—FIREPLACE GRATE.—Wm. H. Garrett, Cannonsburg, Pa.
113,758.—ORNAMENTATION OF METAL, GLASS, ETC.—B. G. George, London, England.
113,759.—SCUTTLE FASTENING.—Thomas J. Gifford, Mass.
113,760.—REVOLVING MOLD BOARD FOR PLOWS.—Joseph S. Godfrey, Rochester, assignor to himself and Sears M. Loveridge, Pittsburgh, Pa.
113,761.—CHECK ROW ATTACHMENT FOR CORN PLANTERS.—Wm. C. Grimes, Decatur, Ill.
113,762.—WASHING MACHINE.—Julius W. Groat, Fremont Ohio.
113,763.—CHEESE PRESS.—Charles L. Haines, North New burg, Me. Antedated April 3, 1871.
113,764.—CALORIC ENGINE.—William T Halefas, New York city.
113,765.—CARPET LINING.—John R. Harrington, Brooklyn N. Y.
113,766.—PARLOR AIR PISTOL.—Benjamin Haviland, Hudson and George P. Gunn, Ilion, N. Y.
113,767.—TRACTION ENGINE.—John W. Hazen, West Hartford, Vt.
113,768.—CAR SPRING.—Albert Hebbard, Cambridge, Mass assignor to himself and John P. Onderdonk.
113,769.—PRINTING PRESS.—Richard M. Hoe, New York city
113,770.—GRAIN HULLING MACHINE.—Michael Hoffmann, Munich, Bavaria, assignor to Ludwig Kölbl, St. Louis, Mo.
113,771.—BARREL ROLLING APPARATUS.—Lewis L. Hyatt, New York, and Adolph G. Hüpfel, Morrisania, N. Y.
113,772.—APPLICATION OF BRONZE AND GILDING TO PLATE GLASS.—Elias Ingraham, Bristol, Conn.
113,773.—INNER SOLE FOR BOOTS AND SHOES.—Charles P. Johnson, Jamaica Plain, Mass.
113,774.—WASH BOILER.—O. L. Kenyon and E. B. Palmer, Rome, N. Y.
113,775.—SHIFTING TOP FOR BASKET PHAETONS.—Charles P. Kimball, Portland, Me.
113,776.—TREADLE.—George Byron Kirkham, New York city.
113,777.—MOP.—Milton W. Kirkwood and Solomon H. Riley, Iowa City, Iowa.
113,778.—COMBINED CIDER MILL AND PRESS.—Daniel H. Krauser (assignor to himself and Joseph C. Bright), Pottsville, Pa.
113,779.—MACHINE FOR MAKING WIRE CYLINDERS.—Cyrus H. Latham, Lowell, Mass.
113,780.—NECKTIE RETAINER.—Christopher P. Lawton (assignor to himself and Eben A. Day), Webster, Mass.
113,781.—CLOCK MOVEMENT.—B. B. Lewis (assignor to S. C. Spring), Bristol, Conn.
113,782.—PURIFICATION OF OILS AND FATS BY ACIDS.—R. G. Loftus, Chelsea, Mass.
113,783.—PLUMBAGO OIL CAN.—D. B. Mackay, Whitestone, and Cyrus Butler, New York city.
113,784.—SELF-ACTING JACK FOR SPINNING.—Peter McGovern, Lawrence, Mass., assignor to G. L. Davis, J. A. Wiley, Joseph M. Stone, G. G. Davis, J. H. Stone, and J. H. Davis.
113,785.—PIANO FORTE ACTION.—Frazee B. McGregor (assignor to himself and George A. Hoyt), Pontiac, Mich.
113,786.—LIQUID RECEPTACLE AND FUNNEL.—William H. Mumler, Boston, Mass.
113,787.—WATERPROOF FLOOR.—Tobias New, New York city.
113,788.—HINGE FOR GATES.—Edwin D. Norton, Cuba, N. Y.
113,789.—EXTENSION PULLEY.—William Onions and Isaac Bagnall, St. Louis, Mo.
113,790.—COOKING STOVE.—Daniel E. Paris, Troy, N. Y.
113,791.—AMALGAMATING PAN FOR GOLD AND SILVER ORES. Ira S. Parke, Virginia City, Nev.
113,792.—GRAIN BINDER.—Previze A. Perry, Perth Amboy, N. J.
113,793.—CEILING AND WALL FOR BUILDINGS.—Charles N. Poole, Sandwich, Ill.
113,794.—COUNTING REGISTER.—Charles W. Pile, Wilmington, Del.
113,795.—MACHINE FOR TURNING BARREL HEADS.—John Jackson Ralya, Cleveland, Ohio.
113,796.—CANT HOOK.—Albert B. Reeves, Knightstown, Ind.
113,797.—GUANO AND SEED DRILL.—Leonidas M. Rhodes, Warrenton, Ga.
113,798.—LATHE.—John F. C. Rider, South New Market, N.H., and Emerson P. Brownell, Providence, R.I. Antedated April 10, 1871.
113,799.—BRICK LIFTER.—K. Julius Rugg, Cincinnati, Ohio.
113,800.—PLANING TOOL.—Nathaniel Russell, Plymouth Mass.
113,801.—APPARATUS FOR CONVERTING ROTARY INTO RECIPROCATING MOTION BY MEANS OF FRICTION.—Richard Sammer, Vineland, N. J.
113,802.—HORSE COLLAR.—John W. Schwaner, Egg Harbor City, N. J.
113,803.—SOLDERING FURNACE.—Conrad Seimel, Green Point assignor to himself and J. Hubert Richardson, Brooklyn, N. Y.
113,804.—DUMPING CAR.—William A. Sharp, Tama City, Iowa.
113,805.—FERRULE.—Dolphin G. Smith, Columbus, Ohio.
113,806.—MILKING STOOL.—George Smith, Rochester, N. Y.
113,807.—COOKING STOVE.—Samuel Smith (assignor to himself and Charles Noble & Co.), Philadelphia, Pa.
113,808.—HOOK FOR BIRD CAGES.—John M. Spring (assignor to P. & F. Corbin), New Britain, Conn.
113,809.—CHEESE HOOP.—William Sternberg, Bridgeport N. Y.

113,810.—Steam Engine Valve.—Nathan Page Stevens, Hopkinton, N. H.
113,811.—Petroleum Still.—John L. Stewart and John P. Logan, Philadelphia, Pa.
113,812.—Chair and Cradle Combined.—Edmund Stoney, Walkerton, Canada.
113,813.—Horse Hay Rake.—Ole O. Storle, North Cape, Wis. Antedated April 1, 1871.
113,814.—Self-acting Mule for Spinning.—James Sutherland, East Hampton, Mass.
113,815.—Drilling Machine.—George C. Taft, Worcester, Mass.
113,816.—Machine for making Pottery Ware.—Samuel R. Thompson, Portsmouth, N. H.
113,817.—Pound Net for Fishing.—Patrick E. Tiernan, Waukegan, Ill.
113,818.—Steam Engine.—Samuel D. Tillman, New York city.
113,819.—Corn Planter.—Granville J. Vaught, Hanly, Ky.
113,820.—Disinfecting Compound.—Guillaume Vigné, ainé, Bordeaux, France.
113,821.—Wardrobe and Book Case.—Ferdinand F. Voight, New Orleans, La.
113,822.—Lifter for Spittoon, etc.—James Walker and Henry F. Lilly, Philadelphia, Pa.
113,823.—Water Wheel.—John S. Warren, Fishkill-on-the-Hudson, N. Y.
113,824.—Shaping Machine.—William H. Warren (assignor to Aurin Wood and Joseph F. Light), Worcester, Mass.
113,825.—Comb for Combing Machines.—Charles Weiller (assignor to Martin Landenberger & Co.), Landenberger, Pa.
113,826.—Self-releasing Clutch for Water Wheels.—George W. Wesley, Meadville, Pa.
113,827.—Case for Ribbons, Laces, etc.—Samuel Whitaker, Macon, assignor to himself and Aaron Rath, Decatur, Ill.
113,828.—Time Indicator for Offices.—Edwin A. Wood, Utica, N. Y.
113,829.—Automatic Relief Valve.—Albert F. Allen, Providence, R. I.
113,830.—Portable Roller for Moving Heavy Bodies.—John R. Anderson, New York city.
113,831.—Machine for Balling Oakum.—Samuel George Archibald, Edinburgh, North Britain.
113,832.—Apparatus and Process for treating Coffee.—John Ashcroft (assignor to Sarah Jane Ashcroft), Brooklyn, N. Y.
113,833.—Lamp Burner.—Lewis J. Atwood (assignor to The Plume & Atwood Manufacturing Company), Waterbury, Conn.
113,834.—Clasp Fastener for Bags, etc.—Alfred Holme Balch and Wolfred David Emelius Nelson, Montreal, Canada.
113,835.—Tongue and Groove Joint.—Richard Barton, New York city.
113,836.—Hoisting Machine.—James Bates, Baltimore, Md.
113,837.—Hay Elevator.—Thomas Vandolah Bayly, Jones' Station, Ind.
113,838.—Wooden Pavement.—George A. Beidler, Philadelphia, Pa.
113,839.—Rotary Engine.—Henry Leonard Bennison, Greenwich, England.
113,840.—Grain Dryer.—William Blakey, Brooklyn, N. Y.
113,841.—Friction Clutch for Belt Pulleys.—James H. Blessing (assignor to himself and Townsend & Jackson), Albany, N. Y.
113,842.—Cooking Stove.—Mary Ann Boughton, Bridgeport, Conn.
113,843.—Low Water Indicator.—William A. Bradford, Cincinnati, Ohio.
113,844.—Apparatus for making Extracts from Vegetable and Animal Matter.—Louis Brauer, Philadelphia, Pa.
113,845.—Broom.—Thomas E. C. Brinley, Louisville, Ky., assignor to Tyler, Brown & Co.
113,846.—Cooking Stove.—Dominicus Brix, Geneseo, Ill.
113,847.—Machine for making Bricks and Tiles.—Isaac C. Bryant, Washington D.C. Antedated April 8, 1871.
113,848.—Hay Tedder.—Hiram M. Burdick, Ilion, N. Y.
113,849.—Hay Tedder.—Hiram M. Burdick, Ilion, N. Y.
112,850.—Machinery for Drilling Rocks.—Charles Burleigh (assignor to "The Burleigh Rock-Drill Company"), Fitchburg, Mass.
113,851.—Carriage Wheel.—Garrett G. W. Burnham, Baltimore, Md., assignor to himself and James N. Burnham.
112,852.—Curtain Fixture.—William Campbell, New York city.
113,853.—Water Wheel and Chute.—Elisha P. H. Capron, Hudson, N. Y.
113,854.—Hoop Skirt.—Albert Carter (assignor to Charles C. Carpenter), New York city.
113,855.—Curculio Catcher.—Frank J. Claxton and Charles D. Stevens, St. Louis, Mo.
113,856.—Thimble Skein and Boxing.—Moris Collins, Decatur, Ill.
113,857.—Sectional Steam Boiler.—William H. Cornell, Easton, Pa.
113,858.—Spool Exhibiter.—John D. Cutter, Brooklyn, N.Y.
113,859.—Preparing Flour for Use in Conectionery, etc.—W. G. Dean, Brooklyn, N. Y.
113,860.—Lubricator for Journals.—P. S. Devlan, Jersey City, N. J.
113,861.—Corpse Preserver.—H. M. Diggins, Cincinnati, Ohio.
113,862.—Dish Rack.—W. H. Duffett, Rochester, N. Y.
113,863.—Machine for Piercing Leather.—Asa Eggleston, Fall River, Mass.
113,864.—Construction of Thermo-electric Pairs.—M.G. Farmer, Salem, Mass.
113,865.—Saw Mill.—W. M. Ferry, Grand Haven, Mich.
113,866.—Saw Mill.—W. M. Ferry, Grand Haven, Mich.
113,867.—Bearing Step and Vertical Shaft.—Francis A. Gardner, Danbury, Conn.
113,868.—Device for Adjusting Mirrors.—O. L. Gardner and William Gardner, Glen Gardner, N. J.
113,869.—Lightning Rod.—A. A. Gaylord, East Cleveland, Ohio.
113,870.—Beehive.—Daniel Gebhart, Sallimonia, assignor to himself and Peter Weimer, Saratoga, Ind.
113,871.—Slide for Drawers.—J. S. Gibbons, Philadelphia, Pa.
113,872.—Fence Post.—Andrew J. Gill, Denver, Colorado Territory.
113,873.—Tenon Machine.—Wm. Gilmore (assignor to himself and H. Rogers), Hudson, N. J.
113,874.—Carpet Fastener.—Antoine Givaudan, Washington, D. C.
113,875.—Water Closet Valve.—Wm. Gordon (assignor to himself and Andrew McCambridge), Philadelphia, Pa.
113,876.—Lamp Burner.—W. H. Gray, St. Louis, Mo.
113,877.—Burglar-proof Safe.—Edward K. Hall, Louisville, Ky.
113,878.—Railway Car Truck.—Francis S. Harrington, Boston, Mass.
113,879.—Spring Roller Shade.—Stewart Hartshorn, New York city.
113,880.—Cigar Machine.—Issachar A. Heald, Lowell, Mass.
113,881.—Arched Structure.—Constantine Henderson, London, Eng., assignor to E. R. Hall, Philadelphia, Pa.
113,882.—Metal-clad Shingle.—T. N. Hickcox, Brooklyn, N. Y.
113,883.—Excavator.—Marcus M. Hodgman, Weymouth, Mass.
113,884.—Carriage Coupling.—Jacob Hollinger, Millersburg, Ohio.
113,885.—Machine for Reducing or Pointing Wire.—A. G. Hotchkiss, Wolcottville, Conn.
113,886.—Broiler.—W. T. Howard, Baltimore, Md.
113,887.—Hand Seed Sower.—Thomas Howell, Morgantown, W. Va.
113,888.—Water Wheel.—C. F. H. Huff, New York city.
113,889.—Peanut Huller.—Josee Johnson, New York city.
113,890.—Apparatus for Cleaning Coffee, etc.—Josee Johnson, New York city.
113,891.—Pipe for Water, Gas, etc.—A. K. Johnston, Brooklyn, N. Y.
113,892.—Beehive.—Campbell Jones and Albert Jones, Santa Anna, Ill.
113,893.—Dinner Pail.—H. Joyce and Anthony Ernest, Troy' N. Y.
113,894.—Steam Bath.—Charles Kaestner, Chicago, Ill.
113,895.—Double Tree.—David W. Kauffman, Sterling, Ill.
113,896.—Wagon Axle.—August Kessberger, Springfield, Ill.
113,897.—Steam Pump.—Lucien J. Knowles, Worcester, Mass.
113,898.—Machine for Molding Chair Backs.—John Lemman, Cincinnati, Ohio.
113,899.—Horse Hay Rake.—W. H. Locke, Canton, Ill.
113,900.—Cotton and Hay Press.—C. K. Marshall, New Orleans, La.
113,901.—Cotton Press and Tramper.—C. K. Marshall, New Orleans, La. Antedated April 10, 1870.
113,902.—Buckle.—John H. Martin, Columbus, Ohio.
113,903.—Hemming and Tucking Attachment for Sewing Machines.—W. N. Martin, Boston, Mass.
113,904.—Shade Cord Retainer.—William McConnell, Philadelphia, Pa.
113,905.—Combining Carbonaceous Matter for the Manufacture of Gas.—George McKenzie, Glasgow, Scotland.
113,906.—Revolving Gas Burner.—Frederick McLewee, New York city.
113,907.—Scroll Saw.—Louis Miller, Baltimore, Md.
113,908.—Fire Grate.—G. R. Moore, Philadelphia, Pa.
113,909.—Reversible Knob Latch.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.
113,910.—Door Lock.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.
113,911.—Apparatus for Vapor Bath.—G. F. Munro, Sr., Albany Mo.
113,912.—Type-setting and Distributing Machine.—F. M. Neff and John E. Scruggs, Monroe, Iowa.
113,913.—Sheave or Pulley Block.—Henry Nick, Paris, France. Antedated April 8, 1871.
113,914.—Machine for Dressing Millstones.—John Norman, Glasgow, Scotland, assignor to W. H. Howland.
113,915.—Brace for Carriage Springs.—D. W. Norris, Paxton, assignor to Michael Neill, Chatsworth, Ill.
113,916.—Gate for Draw Bridges.—Ferdinand Pairan (assignor to himself and Henry Myer), Dayton, Ohio.
113,917.—Machine for Dressing Worsted Cord.—Isaac E. Palmer, Hackensack, N. J.
113,918.—Product for Madder.—Alfred Paraf (assignor to E. S. Renwick, trustee), New York city.
113,919.—Composition of Madder for Printing Cloths, etc.—Alfred Paraf (assignor to E. A. Renwick, trustee), New York city.
113,920.—Wash Boiler.—H. W. Pell, Rome, N. Y.
113,921.—Earth Mattress.—T. Wm. Phinney, Newport, R. I.
113,922.—Forging Machine.—James Pipes, Ripley, W. Va.
113,923.—Fountain Brush.—Zephire Poitras (assignor to C. H. Merrill, F. G. Tanner, and A. W. Merrill), Chicago, Ill.
113,924.—Sleigh-runner Attachment to Wheel Vehicles.—Z. I. Pratt, Chicago, Ill.
113,925.—Bedstead Fastening.—Rezin M. Price, Leesville, Ohio.
113,926.—Sawing Machine.—Paul Pryibil, New York city.
113,927.—Machine for Cutting Cloth, etc.—W. Raeuchle, Philadelphia, Pa., assignor to himself, George Rex, and Abraham R. Bockins.
113,928.—Beehive.—D. R. Read, Lawrence, Kansas.
113,929.—Wood Pavement.—P. H. Reinhard and E. F. M. Faehtz, Washington, D. C.
113,930.—Sash Holder.—George W. Reisinger, Harrisburg, Pa.
113,931.—Car Door.—J. H. Robertson, New York city.
113,932.—Car Coupling.—W. B. Rogerson and Harvey Beyea, Paterson, N. J.
113,933.—Welding Powder for Iron, etc.—G. E. Rose, Philadelphia, Pa.
113,934.—Horse Hoe and Cultivator.—G. D. Rowell, Menomonee Falls, Wis.
113,935.—Shoemaker's Jack.—August Rust, Egg Harbor City, N. J.
113,936.—Corn Planter.—W. J. Sager, Milesburg, Pa.
113,937.—Percussion Match.—William Servant (assignor to himself and J. A. Whitman), Providence, R. I.
113,938.—Medical Compound or Bitters.—W. T. Sherwood, Ripon, Wis.
113,939.—Belt Shifter.—W. H. H. Sisum, Newark, N. J.
113,940.—Reverberating Reed Cell for Organs or Melodeons.—C. W. Small, Worcester, Mass.
113,941.—Hat Ventilator.—Alden Solmens, New York city.
113,942.—Gas Condenser.—I. N. Stanley, Brooklyn, N. Y.
113,943.—Sawing Machine.—William Steschult, Glandorf, Ohio.
113,944.—Seaming Machine.—O. F. Stow, Plantsville, Conn.
113,945.—Hame for Harness.—James Thornton and E. G. Latta (assignors to James Thornton and James Macken), Wellsville, N. Y.
113,946.—Seal for Hydraulic Mains of Gas Works.—Samuel Trumbore, Easton, Pa.
113,947.—Printers' Ink.—Marshall Turley, Council Bluffs, Iowa.
113,948.—Washing Machine.—Foster Utley, Chapel Hill, N. C.
113,949.—Laundry Stove.—John Van, Cincinnati, Ohio.
113,950.—Road Scraper.—H. B. Van Voorhis, Pittsburgh, Pa.
113,951.—Propelling Canal Boats.—W. W. Virdin, Baltimore, Md.
113,952.—Cooking Range.—G. W. Walker, Boston, Mass.
113,953.—Turntable.—George Walters (assignor to Phœnix Iron Co.), Phœnixville, Pa.
113,954.—Barrel Filler.—L. H. Watson, Pittsburgh, Pa.
113,955.—Steam Generator.—Elijah Weston, Buffalo, N. Y.
113,956.—Steam Engine Valve.—S. H. Whitmore, Decatur, Ill.
113,957.—Neck Tie.—J. R. Wilber and O. W. Peirce, Providence, R. I.
113,958.—Fire Escape Ladder.—Tobias Witmer, Buffalo, N. Y.
113,959.—Machine for Turning Crank Pins.—M. G. Wood, Boston, Mass.
113,960.—Plow.—C. A. Beard and E. E. Evans, Zanesville, Ohio.

REISSUES.

4,342.—Combined Vapor Burner and Lamp Post.—B. D. Evans, Columbus, Ohio, assignor to J. W. Baker.—Patent No. 90,830, dated June 1, 1869.
4,343.—Clothes-wringing Hook.—J. H. Pratt (assignor to himself and B. F. Larabee), Lynn, Mass.—Patent No. 112,074, dated February 21, 1871.
4,344.—Hose Coupling.—J. C. Cooke, Bridgeport, Conn., assignor to A. F. Allen, Providence, R. I.—Patent No. 22,166, dated Nov. 30, 1858.
4,345.—Division A.—Feed Water Pipe.—John Doyle, Baltimore, Md., assignor to himself and Anthony Reybold, Delaware City, Del.—Patent No. 110,753, dated Jan. 3, 1871.
4,346.—Division B.—Feed Water Pipe.—John Doyle, Baltimore, Md., assignor to himself and Anthony Reybold, Delaware City, Del.—Patent No. 110,753, dated Jan. 3, 1871.
4,347.—Mold.—William Hainsworth, Allegheny City, assignor of one half interest to S. M. Loveridge, Pittsburgh, Pa.—Patent No. 109,894, dated Dec. 6, 1870.
4,348.—Suspender.—J. B. Sharp, New York city, and William Seymour, administrator of R. M. Seymour, deceased, Sing Sing, N. Y.—Patent No. 59,465, dated Nov. 6, 1866.

DESIGNS.

4,810.—Cooking Stove.—John Abendroth, New York city.
4,811.—Claw Bar.—David Christie, Chillicothe, Ohio.
4,812.—Bottle Stand.—George Gill (assignor to Reed & Barton), Taunton, Mass.
4,813.—Tea-pot.—George Gill (assignor to Reed & Barton), Taunton, Mass.
4,814.—Match Safe.—G. R. Hubbard, New York city, assignor to Bradley & Hubbard, West Meriden, Conn.
4,815.—Cooking Stove.—J. L. Kuechler (assignor to Orr, Painter & Co.), Reading, Pa.
4,816.—Stove.—J. H. Keyser, New York city.
4,817.—Oven.—J. H. Keyser, New York city.
4,818.—Parlor Stove.—John Martino and John Currie, Philadelphia, assignors to Orr, Painter & Co., Reading, Pa.
4,819.—Plate for Cooking Stoves.—Charles Noble (assignor to Charles Noble & Co.), Philadelphia, Pa.
4,820.—Type.—W. H. Page (assignor to W. H. Page & Co.), Norwich, Conn.
4,821.—Stove.—La Forist Rollins, Bangor, Me.
4,822.—Drawer Pull.—E. J. Steele, New Britain, assignor to Turner, Seymour & Judds, Wolcottville, Conn.
4,823.—Cooking Stove.—Jacob Steffe, Philadelphia, assignor to Orr, Painter & Co., Reading, Pa.
4,824.—Show Case.—J D. Vredenburgh, Chicago, Ill.
4,825.—Cooking Stove.—George Wellhouse, Akron, Ohio.
4,826 and 4,827.—Stocking Fabric.—Thomas Dolan, Philadelphia, Pa. Two Patents.
4,828.—Talma or Cloak Garment.—Eberhard Flues, Fort Washington (Whitemarsh Post Office), Pa.
4,829 and 4,830.—Lamp Burner.—H. W. Hayden (assignor to Holmes, Booth & Haydens), Waterbury, Conn.
4,831.—Spoon or Fork Handle.—E. C. Moore, Yonkers, N. Y., assignor to Tiffany & Co., New York city.
4,832.—Pattern for Cutting Dress Waists.—E. P. Smith (assignor to herself and N. H. Sherburne), Chicago, Ill.
4,833.—Public Urinal and Water Closet.—F. J. Smith, Chicago, Ill.
4,834.—Steam Engine.—P. L. Weimer, Lebanon, Pa.
4,835.—Range.—C. J. Wood, Baltimore, Md.

TRADE-MARKS.

222.—Cassimeres.—Gallaghan & Brother, Philadelphia, Pa.
223.—Medicine.—Hostetter & Smith, Pittsburgh, Pa.
224.—Paint.—The Averill Chemical Paint Co., New York city, and Cleveland, Ohio.
225.—Cotton Goods.—The Harris Manufacturing Co., Coventry, R. I.
226.—Whiskey.—Vidvard & Shehan, Utica, N. Y.

EXTENSIONS.

Harrow.—S. S. Hogle, of Berea, Ohio.—Letters Patent No. 16,866, dated March 17, 1857; reissue No. 804, dated Aug. 30, 1859.
Automatic Lathe for Turning Irregular Forms.—W. D. Sloan, of New York city.—Letters Patent No. 16,936, dated March 31, 1857.
Machine for Composing and Distributing Type.—W. H. Houston, Peabody, Mass.—Letters Patent No. 16,947, dated March 31, 1857.
Rake to Grain Harvester.—Jearum Atkins, of Mokena, Ill.—Letters Patent No. 9,479, dated Dec. 21, 1852. [Extended by an act approved March 3, 1871, entitled "An act to amend an act for the relief of Jearum Atkins," approved July 15, 1870.]
Mill for Cleaning Castings.—H. R. Remsen, of Albany, N. Y.—Letters Patent No. 17,012, dated April 7, 1857.

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SCIENTIFIC AMERICAN

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

Vol. XXIV.--No. 19. [NEW SERIES.] NEW YORK, MAY 6, 1871. $3 per Annum. [IN ADVANCE.]

Improved Wheat Steamer and Dryer.

This is an application for steaming and drying wheat preparatory to grinding, so as to bring it to the exact hygrometrical condition to secure the best results in the manufacture of flour. It is constructed upon sound principles, and seems calculated to accomplish the end sought. It is simple in construction, and its operation will be readily understood by referring to the accompanying engraving, which is a vertical section through the apparatus.

A is the upper chamber of the apparatus, into which the wheat runs from a chute, the whole being fastened to the underside of a floor by bolts passing through the flange at the top of the steamer. The wheat falls down through the annular chamber, B, into the steam jacketed funnel-shaped chamber, C, whence it runs into the hopper of the mill, to be ground.

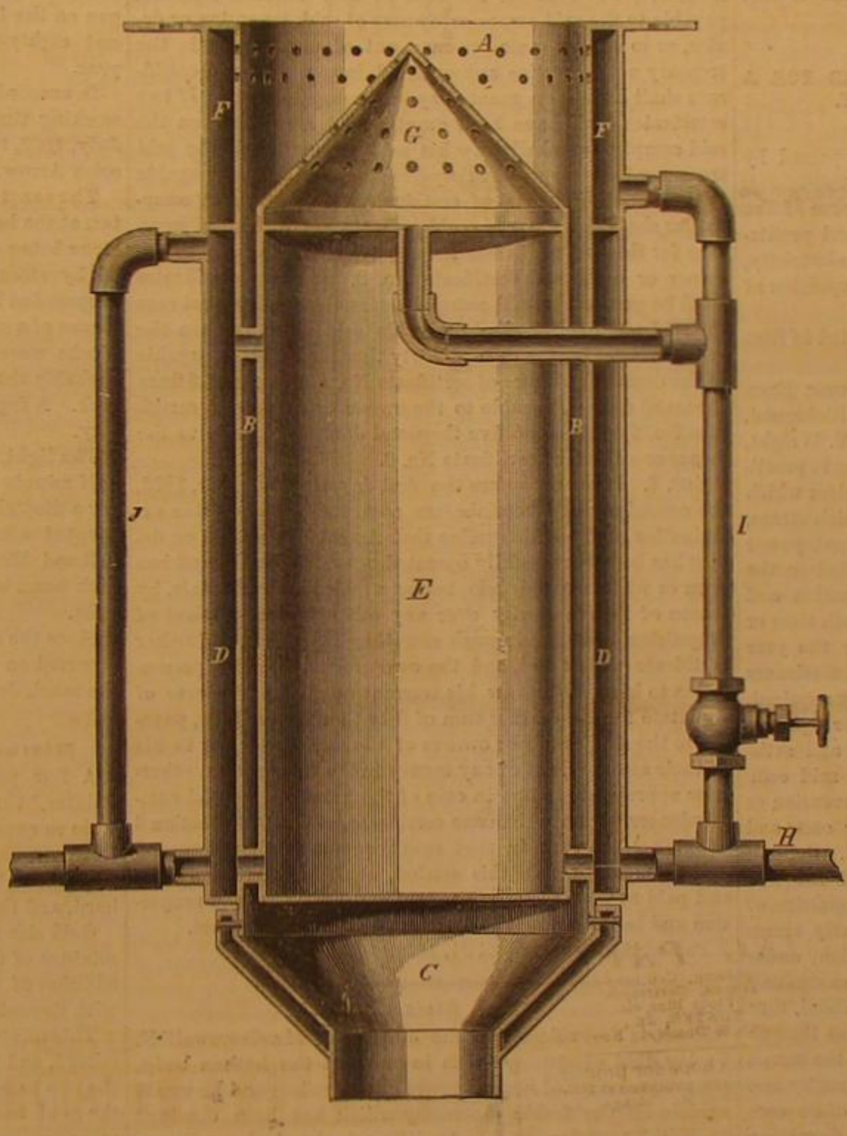
During its passage, it is either dried by means of steam heat, or steamed by the escape of steam into the interspaces of the grain, as may be required. This is accomplished by a series of pipes and chambers which we will now describe.

D is an annular steam chamber separated by an annular partition from the upper annular chamber, F. E is a central steam chamber. G is a conical steam chamber, with a perforated shell. The inner shell of the chamber, F, is also perforated. Steam from the boiler is admitted through the pipe, H; whence—if the wheat has only to be dried—it passes through short pipes into the inner chamber, E, filling both chambers, and finally exhausting through the pipe, J. The wheat is thus, in its passage through the annular chamber, B, subjected to radiated heat from both the chambers, D and E, which dries it to the extent desired.

If it be desired to steam the wheat, the pipe, I, is brought into action by opening its valve, and steam then entering the chambers, A and G, escapes through their perforated walls into the grain. By closing or opening the cock in the pipe, I, the required amount of steaming may be adjusted to a nicety, and the whole apparatus is under perfect control, so as to make the wheat grind as soft as is desired. The exhaust pipe, J, is also provided with a cock, which assists in the control of the heating power of the apparatus.

The following results are claimed as being obtained through the use of this apparatus, viz., that it enables the miller to adapt all kinds of wheat to his buhrs; that the flour produced can be bolted or dressed much cleaner; that the miller can grind higher and yet get all the flour, as the dryer expands the hull of the grain, effecting a partial separation between the starch and gluten; that the flour produced is more "grainy," while it yet retains the soft silky feeling so essential in flour for general baking purposes; that the bolting does not change so often, as the wheat is more uniformly ground, and, of course, bolts more uniformly; that in grinding soft wheat by the use of the drying part of the apparatus alone, as above described, the grinding may be higher and the offal cleaned; and, lastly, that the flour can be dressed as clean in cold weather as in warm.

We are informed that these claims have all been proved in practice, the apparatus having demonstrated its adaptability to the end sought by its use. It was patented, through the Scientific American Patent Agency, Sept. 27, 1870, by Cyrus T. Hanna, of Keokuk, Iowa, from whom further information may be had.



HANNA'S WHEAT STEAMER AND DRYER.

New Telegraphic Instrument.

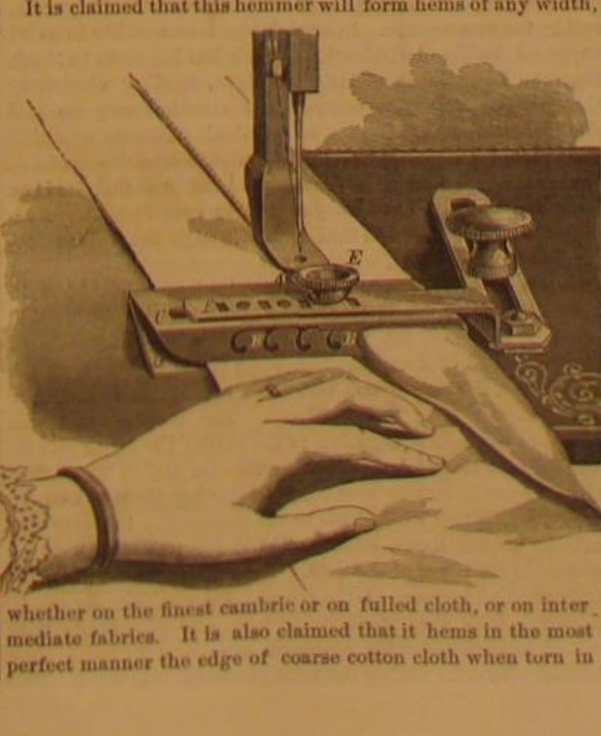
A new telegraphic instrument, a modified form of Morse's, has been patented in England by Mr. Richard Herring. Mr. Herring is the author of the articles on "Paper and Paper-hanging," in Ure's "Dictionary of Arts and Manufactures." His instrument is furnished with two keys, one to work a lever carrying a pin, to make a dot, and the other to work a ever carrying a small linear stile to make a dash.

The London *Times* says: "Greater accuracy seems likely to be secured; for it now takes a very long time to acquire the art of releasing or holding down the key with accuracy. It will be much easier to learn to use two keys, one for the dot and the other for the dash, and to use them with the same rapidity. Mr. Herring suggests that it would be practicable to emboss two slips at the same operation, and to give one to the sender, who would thus know with certainty what message had been dispatched. The changes introduced by Mr. Herring may be almost regarded as matters of mechanical detail; but they seem likely to be of practical value and importance. To save nearly half the time now consumed in telegraphing, to give a compressed and easily legible dispatch in place of one that is always lengthy and often obscure, to make one tun of paper do the work of four tuns, and to remove a fertile source of inaccuracy, are promises, any one of which would call for careful investigation by the authorities."

We cannot agree with the *Times* in its estimate of the value of the above improvement. To clumsy or inexperienced telegraphers it may possibly be of advantage. But in this country where the use of paper has been discarded and messages are received by sound, it cannot be better, if as good, as Morse's single key.

BARTLETT AND BOOMER'S EXTENSION HEMMER.

It is claimed that this hemmer will form hems of any width,



whether on the finest cambric or on fulled cloth, or on intermediate fabrics. It is also claimed that it hems in the most perfect manner the edge of coarse cotton cloth when torn in two; also that it hems nicely, elastic worsted goods cut bias. It is further claimed that inexperienced operators can work it satisfactorily. It is designed for attachment to any of the first class sewing machines in market.

It is attached to the sewing machine with the point of the hemmer scroll, A, in front of the needle, as represented in the accompanying engraving. Then the notch, B, that will give the width of hem required, is set even with the hemmer scroll, A. Next, the cloth is passed between the plates C and D, around the end of the notched plate back into the notch, B. This is easily done by drawing the cloth backwards and forwards, until it forms the hem. Then the width being obtained, the end of the cloth is turned on the edge, drawn backward under the needle, and the presser foot is lowered. The cloth is then guided by the hand, as represented. The edge of the cloth should never be held; but it should be guided by taking hold of it six or eight inches from the hemmer, and letting it slide easily between the forefinger and thumb, half an inch from the edge—if the hem be half an inch in width; and one inch from the edge—if the hem be one inch in width; and so on.

Should the widest hems be required, the set screw, E, is moved to the end of the top plate, F.

This improvement was patented April 19, 1870, by Almore W. Boomer and John P. Haskins. Address for further particulars Bartlett & Boomer, Westfield, N. Y.

Fresco Painting.

In a lecture, "On Colors and Pigments," Professor Barff said: Experiments in fresco painting have been made in England, and from the result of these experiments, I am very much afraid that many of us have formed wrong impressions about fresco painting.

The ground upon which fresco is painted is a lime ground; and, in order to have a permanent picture, we must have a firm and stable ground. First of all, the wall must be absolutely dry; there must be no leakage of moisture from behind. Lime which has been run (as it is, I believe, technically called by builders) for a year or a year and a half, is best to be employed, for in proportion as the lime has been carbonated (though it must not be so to too great an extent) by the action of the carbonic acid cf the air, it makes a better and a harder mortar. With this lime must be mixed river sand, of even grain; the sand should be mixed with water, and allowed to pass along down a small stream, so that in the centre of the stream you would have sand the grains of which would be pretty nearly equal in size. This is a point of considerable importance. The reason why new lime cannot and ought not to be used is because it blisters; small blisters appear on the surface, and that of course would be ruinous to a picture. A well plastered wall should not have a blister or a crack in it, and this is secured by having your lime run for some time, of good quality to start with, and mixed with good sand. There is no chemical process that I know of that takes place in fresco painting other than this, that silicates are formed by the action of the lime upon the the sand, and carbonates by the action of the carbonic acid of the air upon the lime.

In painting a fresco picture, inasmuch as there is no retouching the work when it is finished, the artist must make his drawing very carefully. The cartoon is made upon ordinary paper; then it is fixed against the wall, where the picture is to be painted. The part where the artist decides to begin his work is uncovered; that is to say, a portion of the paper is turned down and cut away, but in such a manner that it may be replaced. Then the plasterer puts fresh plaster, about an eight of an inch thick, upon the uncovered portion of the wall; and the plasterer's work is of the utmost importance in fresco painting. The workman ought to practice it well before he attempts to prepare the ground for a large picture, and I have found it of the greatest importance to allow the man to practice for several weeks before he was allowed to prepare any portion of the ground, even for decorative painting. In this way he becomes accustomed to the suction of the wall, and upon the suction of the wall depends the soundness of the ground and the success of fresco painting. When the plaster is first put on, of course it is very soft; the piece of the cartoon is replaced upon it, and the lines of the picture are gone over with a bone point so that an indentation is made, and then the artist begins his painting. At first he finds his colors work greasy; you cannot get the tint to lie on, it works streaky; but you must not mind that, you must paint on, but you must only paint on for a certain time, for if you go on painting too long, you will interfere with the satisfactory suction of the ground, which is so necessary to produce a good fresco painting. Of course, nothing but practice can tell any one the period at which he ought to stop. I cannot describe it, because I should be simply trying to describe a sensation, which I cannot do. After some practice, you know perfectly well by the feel when you ought to stop. If you feel your color flowing from your brush too readily, you ought to stop at this period. You must then leave your work for a time, and go back to it again. And then you will find, as the plaster sucks in the color which you have first laid on, that there will be,—it may be in the course of half an hour, it may be an hour; that depends upon the temperature of the atmosphere,—a pleasant suction from your brush, the color going from it agreeably, and you will find that it will cover better. Now is the time to paint rapidly, and complete the work you have in hand. When the color leaves your brush as though the wall were thirsty for moisture, you should cease painting; every touch that is applied after that will turn out gray when it dies, and the color will not be fast upon the wall.

ONE HUNDRED THOUSAND DOLLARS REWARD FOR A NEW PLAN FOR CANAL PROPULSION.

The following is the text of the law recently passed by the Legislature of New York:

An Act to foster and develop the internal commerce of the State, by inviting and rewarding the practicable and profitable introduction, upon the canals, of steam, caloric, electricity, or any motor other than animal power for the propulsion of boats.

The people of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. George B. McClellan, Horatio Seymour, Erastus S. Prosser, David Dows, George Geddes, Van R. Richmond, Willis S. Nelson, George W. Chapman, William W. Wright, and John D. Fay, are hereby appointed a commission to practically test and examine inventions or any and all devices which may be submitted to them for that purpose, by which steam, caloric, electricity, or any other motor than animal power may be practically and profitably used and applied in the propulsion of boats upon the canals; said examination and tests shall be had by the said commissioners at such time or times during the season of canal navigation, for the year 1871–72, as they may order and direct; said commissioners shall have the right, and they are hereby expressly required, to reject all such inventions or devices, if, in their opinion, none of the said inventions or devices shall fully and satisfactorily meet the requirements of this act; but said commissioners shall demand and require: First, the invention or devices to be tested and tried at their own proper costs and charges of the parties offering the same for trial. Second, that the boat shall, in addition to the weight of the machinery and fuel reasonably necessary for the propulsion of said boat, be enabled to transport, and shall actually transport, on the Erie Canal, on a test or trial exhibition, under the rules and regulations now governing the boats navigating the canals, at least two hundred tuns of cargo. Third, that the rate of speed made by said boat shall not be less than an average of three miles per hour without injury to the canals or their structures. Fourth, that the boat can be readily and easily stopped or backed by the use and power of its own machinery. Fifth, that the simplicity, economy, and durability of the invention or device must be elements of its worth and usefulness. Sixth, that the invention, device, or improvement can be readily adapted to the present canal boats; and lastly, that the commissioners shall be fully satisfied that the invention or device will lessen the cost of canal transportation, and increase the capacity of canals by any means of propulsion or towage, other than by a direct application of power upon the boat, which does not interfere in any manner with the present method of towage on the canals, and, complying in all other respects with the provisions of this act, may be entitled to the benefits thereof; but this shall not be construed to apply to the system known as the Belgian system, or to any mode of propulsion, by steam engines or otherwise, upon either bank of the canal.

Sec. 2. No such test shall be made, if the same shall in any manner retard, hinder, or delay the passage of boats navigating the canals under the present system.

Sec. 3. If the commissioners herein appointed shall, upon each examination and test, as is provided for in the first section of this act, conclude and determine, at any time, that one or more inventions or devices aforesaid (but not to exceed three in number) shall be, in all respects, a full and satisfactory practical and profitable adaptation to the wants of the canals, by reason of a new, useful and economical means of propulsion for boats within the meaning of this act, it shall then, and not otherwise, be their duty to grant unto the owner or owners of such inventions or devices, his or their attorney, their certificate or certificates, under their hands as such commissioners, that they have so determined and adjudged.

To the owner or owners of the invention or device which, in the judgment of the said commissioners, possesses in the greatest degree of perfection the requisites mentioned in the first section, they shall grant a certificate which shall be known as certificate No. 1, and to the owner or owners of the next best invention or device, they shall grant a certificate as aforesaid, which shall be known as certificate No. 2, and to the owner or owners of the third best invention or device they shall grant a certificate as aforesaid, which shall be known as certificate No. 3.

Sec. 4. Before entering upon the duties of his office, each of the commissioners herein named shall take and subscribe an official oath, which shall be filed at once in the office of the Secretary of State; any vacancy, arising from any cause, in said commission, may be filled, on the application of the remaining commissioners, by the Governor.

Sec. 5. The reasonable expenses of the said commission, not exceeding in all the sum of five thousand dollars, to be determined by the said board, shall be paid out of any sum which may be awarded to the person or persons receiving the certificates mentioned in the third section of this act, in proportion to the amount awarded to the holders of said certificates, providing such certificates shall be granted; and if no such certificate shall be granted, then the same shall be paid by the treasurer, on the warrant of the comptroller, out of any moneys in the treasury not otherwise appropriated.

Sec. 6. Upon the production, by the owner or owners, of his or their attorney, of such certificate or certificates as may be granted under the provisions of this act, to the comptroller, he shall draw his warrant upon the treasurer of the State of New York for the sum of fifty thousand dollars, payable to the said owner or owners of said invention or device, or to his or their attorney, out of any money in the treasury not otherwise appropriated, in case but one certificate shall have been granted by said commissioners. If two certificates shall have been granted and no more, then the said comptroller shall draw his said warrant upon the said treasurer for the sum of thirty-five thousand dollars, payable to the owner or owners of certificate No. 1; and said comptroller shall also draw his said warrant upon the said treasurer for the sum of fifteen thousand dollars, payable to the owner or owners of certificate No. 2. If three certificates shall be granted by said commissioners, then and in that case the said comptroller shall draw his said warrant upon the said treasurer for the sum of thirty thousand dollars, payable to the owner or owners of certificate No. 1, and one of fifteen thousand dollars, payable to the owner or owners of certificate No. 2, and one of five thousand dollars, payable to the owner or owners of certificate No. 3.

Sec. 7. If on or before the first day of November, 1873, the commissioners hereinbefore named shall, upon due examination, find and determine that the said invention or device has been successfully operated upon the canals, and has been or will be largely adopted, as a motor on said canals, by reason of its superiority over any other known method of propulsion, then and in such case they shall grant a further certificate of that fact, and the comptroller, upon its presentation to him, shall draw his warrant upon the treasurer of the state for the further sum of fifty thousand dollars, payable to the said owner or owners of the said device, or to his or their attorney, out of any money in the treasury not otherwise appropriated; but in case of the granting, by said commissioners, of more than one certificate, as stated in section 6 of this act, then and in that case the sum of fifty thousand dollars, mentioned in this section, shall be divided among and paid to the owners of the said certificates, in the proportion and in the manner as stated in section 6 of this act.

Passed Assembly, April 21, 1871.

Vital Electricity.

There is no evidence, in the opinion of Mr. Cromwell F. Varley, that electricity exists in or about the human body, either as a source of motive power or otherwise; and he would explain all the feeble electricity which has been obtained from the muscles, as due to different chemical conditions of the parts of the muscle itself. The nerves are bad conductors, and are not insulated. The force which is transmitted by them cannot, therefore, be electricity; and the fact that this force is transmitted at a rate about 200,000 times slower than an electric current, is additional proof of their non-identity.

He contends that the sparks produced, in certain cases, by combing the hair, by drawing off silk stockings, or by rubbing the feet on a carpet, are illustrations of frictional electricity which in no way depends on vitality, but are due solely to proper conditions in the substances rubbed together, and in the atmosphere. In explaining how another form of supposed bodily electrification (which has led some to think that the brain is an electrical battery, sending electricity through the nerves to contract the muscles) may be produced, he states that if the two terminals of a very sensitive galvanometer are connected each with a separate basin of water, and if the hands be then placed one in each bason, on squeezing one hand violently a positive current is almost always found to flow from that hand, through the galvanometer, to the other hand, which is not compressed.

While experimenting, night after night, on this subject, in 1854, Mr. Varley found that, after squeezing the hand, opening the clenched fist produced a momentary increase of power instead of decrease; and when the wind was from the southwest, the power was less than one fourth as strong as when it was from the northeast. The former wind was found to be slightly negative to the earth; the latter was invariably powerfully electro-positive. On trying to exhibit those currents on one occasion, and finding them to be very weak, Mr. Varley washed his hands thoroughly in water containing a little liquid ammonia, in order to decompose the grease in the pores of the skin. The result was a diminution instead of an increase of the power. On washing his hands, however, with very weak nitric acid, and afterwards with water, he obtained more power on squeezing his hands than he had ever done during the most persistent east wind. This led to an explanation of the phenomenon, as one due to chemical action alone, the act of squeezing the hand violently forcing some perspiration out of the pores. By dipping one hand in a solution of ammonia, and the other in one of nitric acid, and then washing both in water, squeezing either hand produced a current in the same direction; and when both hands were placed in the water, and a little acid dropped upon both of them, a current was instantly generated, without any muscular exertion.

The Wolfe Rock Light House.

Since the year 1759, several very strong iron beacons had been swept away from Wolfe Rock—a dangerous, rugged porphyry rock, about nine miles south west of the Land's End, England, exposed to the full force of the Atlantic, and overflowed by the sea at high water—and it was determined to erect a lighthouse. In 1860, the design was furnished by the late Mr. James Walker, and its execution was first undertaken by Mr. Douglas, the engineer of the Trinity House, and his brother William, who succeeded him as resident engineer in October, 1863. On the 1st of July, 1861, Mr. Douglas commenced his first survey; and, on returning to the vessel that same day, was hauled on board through the surf by a line fastened round his waist—a mode of embarking frequently afterwards resorted to. The cutting out of the foundation began on the 17th of March, 1862. Only twenty-two landings and eighty-three hours' work could be done during that year.

In succeeding years more frequent landings, and increased working time, were obtained; and, at length, on the 19th of July, 1869, the last stone of the tower was laid by Sir Frederick Arrow, the Deputy-Master of the Trinity House.

The exact height of the tower is 116 ft. 4½ in. Its diameter, at the base, is 41 ft. 8 in. It is built of granite, each face stone being dovetailed horizontally and vertically, and secured by strong bolts of yellow metal. The stone work was prepared at Penzance, and conveyed to the rock in barges by means of a steamer; and in the latter portion of the time, the blocks were lifted into their position by a steam winch—probably the first employment of steam power upon a tidal rock. A fog bell weighing 5 cwt., is fixed on the lantern gallery.

The light, exhibiting alternate flashes of red and white at half minute intervals, is of a purely distinctive character, being a dioptric light of the first order; the arrangement being adopted after experimental observations by Professor Tyndall and Mr. James Douglas. The illuminating power of each beam is estimated at 31,500 English candles, or units of light.

Since the completion of the lighthouse, no shipwreck has occurred on the shores of Mount's Bay, or in the vicinity of the much dreaded Land's End.

Mixture for Gilding, and How to Use It.

A few years ago, says Arlot's "Manual for the Coach Painter," the processes for preparing carriages for gilding were so expensive, that only the most wealthy could afford it. But now, the process is the same as for ornamental striping, with the only difference that the under coats must be entirely hard, and the work done in a perfect manner.

Gold size may be used as a laying coat. However, the mixture of the house-gilders is preferable, and consists of an addition of white lead and chrome yellow, ground very fine with linseed oil.

This mixture must be used quite dry, that is to say, often stirred, and the brush or pencil pressed against the sides of the cup to remove all excess. A good mixture may receive the gold twelve hours after it has been laid down, and the same process answers for bronzing. When the gilder has delivered his work to the painter, the latter must wash it with plenty of water, taking care not to scratch the gold. It is better to wait three or four days before washing. The gold striping receives a first fixing with gelatine dissolved in water, and a second with white varnish diluted with turpentine. When all is dry, the portions of gold which may have stuck against the paint of the groundwork are covered with the same color; or, if we desire to avoid this extra work, we rub the body and gears with a sponge dipped into water containing finely levigated clay.

The second artesian well sunk with a view of determining the thickness of the sulphur beds of Louisiana and the nature of the superincumbent strata, has reached a depth of 522 feet. At a depth of 428 feet it struck the sulphur-bearing stratum. This was 112 feet in thickness, made up of layers of pure crystalline sulphur, alternating with white limestone mixed with sulphur. These were surmounted by forty-one feet of white crystalline limestone, and underlaid by twelve feet of limestone containing some white sulphur. Prof. Hilgard advances the opinion that these deposits had their origin in reactions between gypsum and lignite, the former being in excess.

Prevention of Rust.—Dr. Crace Calvert states that iron immersed for a few minutes in a solution of carbonate of potash or soda will not rust for years, though exposed continually in a damp atmosphere. It was believed long ago by soap and alkali merchants that the caustic alkalies (soda and potash) protected iron and steel from rust, but that the components of these salts preserved the same property as they do in a caustic state now. It does not seem to matter whether the solution be made with fresh or sea water.

Thinking and Speaking.—The more a man knows, the less he is apt to talk; discretion allays his heat, and makes him coolly deliberate what and where to speak.

UNCOMMON FOOD.

We have condensed from *Good Health* the following upon the food of different nations and races. After briefly discussing the use of horseflesh as food (in France during the late war) and stating that 30,000 horses were eaten at Metz during the siege of that town, the writer goes on to say:

It is now about fourteen years ago that the late Isidore Geoffrey de St. Hilaire published a series of letters on alimentary substances, and the flesh of the horse, which was pronounced to be highly nutritious. The Faculty of Paris declared it to be in every respect equal to the flesh of any other animal, with the advantage, that the proportion of fatty substance was less than that of the bullock, and a strong gravy soup might be made, much easier of digestion, and in every way superior to that of beef. In 1858, what may be termed a "horse" banquet was given in Paris at the Grand Hotel du Louvre, which was presided over by the famous *gastronome*, M. Chevet, who had given the advantage of his culinary genius to the preparations. About sixteen persons partook of a variety of dishes, and they were pronounced excellent. In 1865 and the following year, equine banquets on a larger scale took place in Paris, and enthusiastic speeches were made by several well known naturalists, with a view to popularize the subject; and the sale of horse meat in the butchers' shops was permitted by an imperial ordinance.

In the retreat from Moscow, horse flesh furnished the French with the daily rations from the commissariat. In this matter the French have simply followed precedent of Germany, Russia, Belgium, Denmark, and other countries. In Austria, during 1863, nineteen hundred and fifty-four horses were slaughtered for food, and horse flesh has been eaten by different nations from remote periods.

A superior distinction in taste seems to be accorded to the flesh of the donkey, great numbers of which animals have been and are still slaughtered for food by the French. M. Darcel declares, it is to the horse that which veal is to the ox.

Monkeys' flesh is by no means to be despised, though this may seem to some persons a near approach to cannibalism. Mr. Bates, in his "Naturalist on the Amazon," describes the meat of the spider monkey as the best flavored he had ever tasted. It resembled beef, but had a richer and sweeter taste.

The predilection for dog eating is by no means confined to the Chinese, the Esquimaux, amongst others, vastly enjoying this food when the animals are young. A Danish captain who had acquired the dog taste, provided some of this food for a select party of guests, most of whom highly praised his *mutton*. Captain Sir. J. McClintock, who relates this story, adds that baked puppy is a real delicacy all over Polynesia. "At the Sandwich Islands, I was once invited to a feast, and had to feign disappointment as well as I could when told that puppies were so extremely scarce, that one could not be procured in time, and a sucking pig had to be substituted." The same writer bears unqualified testimony to the excellency of seal steaks when cut thin, and deprived of all fat.

The Malabar coolies are very fond of the "coffee rats," which they fry in oil or convert into curry. The pig rat is in similar favor. It attains a weight of two or three pounds, and grows to nearly the length of two feet. Rat pies are eaten in various parts of England; rat suppers used be given periodically at an inn near Nottingham. The porcupine is esteemed a delicacy in Ceylon, and in flavor much resembles a young pig. In Siam the flesh of the crocodile is exposed for sale in the markets. Alligators are sometimes eaten by the natives of South America, Africa, and South Australia. The taste of musk is, however, so strong that few strangers can eat them without being sick afterwards.

Elephants' hearts, we are told by Baldwin, in his "African Hunting," are very tender and good. The feet, baked in a large hole between bricks, are very glutinous and not unlike brawn.

In Peter Martyn's account of the voyages of Columbus, he mentions the disgust experienced by the Spaniards when at St. Domingo, on being invited by the Indians to taste their favorite delicacy the guana, considering it a species of serpent. This dislike was, however, soon overcome. "These serpents are lyke unto crocodiles save in bygness. They call them guanas. Unto that day none of owre men durst adventure to taste of them by reason of theyre horrible deformitie and lothsomness. Yet the Adelantado being entysed by the pleasantnes of the kings sister Anacaona, determined to taste the serpentes. But when he felt the flesh thereof to be so delycate to his tongue, he fel to amain without all feare. The which thing his companions seeing, were not behynd hym in greedynesse, insomuche that they had now none other talke than of the sweetnesse of these serpentes, which they affirme to be of more pleasant taste than eyther our pheasants or partriches."

Partiality for raw food seems to prevail in many countries. Raw fish, thinly sliced, formed one of the delicacies placed before Lord Elgin at a Chinese banquet. Baldwin *tells* us tells that the Kaffirs eat alternately a lump of roasted bull's flesh, and an equal quantity of the inside raw. A species of salmon, unknown in Europe, called in Siberia the nelma, is esteemed by the Russians more delicious in its raw state than when cooked, and is eaten to provoke an appetite. Ernan, in his "Travels in Siberia, says that during intense frost, raw flesh loses its repulsive qualities.

Wrangell adds his testimony to the superior flavor of raw frozen fish, seasoned with salt and pepper. Captain Hall says: My opinion is that the Esquimaux practice of eating their food raw is a good one; at least for the better preservation of their health. Eating meats raw or cooked is quite a matter of education.

The natives of the Sandwich Islands eat turtles, dolphins, flying fishes, etc., raw, considering that the flavor is lost in cooking, and the richest possible treat they can enjoy is to haul a fish from the water and literally eat it to death.

Sir Francis Drake says of the Patagonians, that they feed on seals and other flesh, which they eat nearly raw. Davis, in his second voyage to Greenland, in 1589, describes the natives as eating all their meat raw, drinking salt water, and eating grass and ice with great delight. Captain Hall, in his recent "Life among the Esquimaux," found the natives making a meal of smoking hot seal blood, and on tasting it, found it excellent, much to his surprise.

In new Guinea, the tripang, and similar marine slugs, are cut up into small pieces and eaten raw with salt and lime juice.

Locusts have been eaten from remote antiquity; the Arabs mix them with dough, and make excellent cakes of them. The Hottentots get fat upon them, and prepare from their eggs a brown or coffee colored soup. In the Mahratta country they are salted, and in Barbary they are preferred by the Moors to pigeons. The latter usually boil them in water for half an hour, throwing away the head, and wings, and legs; sprinkling them with salt and pepper, and frying them, adding a little vinegar. At Natal, the locusts are collected in the evening in sacks by millions, and afterwards steamed in close vessels over a fire, then dried in the sunshine, and after being freed from their legs and wings by a kind of winnowing, are stored in baskets in the granaries like corn. The dried locust is ground to powder between stones, and converted into a kind of porridge with water. It appears that the Kaffirs grow quite fat in the locust season. Dr. Livingstone tells us, in his South African travels, that for want of other food, he was compelled to eat locusts; and, strange to say, when roasted, he preferred them to shrimps!

Some entomologist tells us that caterpillars have a taste of almonds, and spiders of nuts. However this may be as regards the former, we are told by Spedman that large quantities of spiders, nearly an inch long, were eaten by the Kaffirs, and in the French colony of New Caledonia. In Europe there are instances of spiders exciting a kind of gourmand taste. Réaumur gives an instance of a young lady who never saw a spider without catching it and eating it. A clever woman—Anna Maria Schurman—used to eat spiders like nuts, as regards the cracking process, and excused her propensity by saying that she was born under the sign Scorpio. Lalande, the famous astronomer, was particularly fond of spider food; and a German is mentioned by Rozel, who used to spread spiders upon bread and butter, observing, in his imperfect knowledge of English, "that he found them very useful."

Humboldt tells us that he has seen Indian children drag out of the earth centipedes eighteen inches long, and more than half an inch broad, which they ate with eagerness. Insects' eggs are eaten by the Arabs and Mexicans; grubs of insects in the West Indies by both white and black men, who wash and roast them. The Mexican Indians prepare a liquor from the beetle, which has stimulating properties.

The Greeks ate grasshoppers, and liked them amazingly; the aborigines of New South Wales used to eat them raw, first taking off their wings. The Chinese thriftily eat the chrysalis of the silk worm, after making use of the silk; the larvæ of a hawk moth are also much relished. The blacks in Jamaica eat the Bagong butter flies after removing the wings, and store them up by pounding and smoking them. The Hottentots eat the termites, or white ants, boiled and raw, and thrive well upon them—the female ant in particular is supposed by the Hindoos to be particularly nutritious; and Broughton in his "Letters written in a Mahratta Camp in 1809," tells us that they were carefully sought after, and preserved for the use of the debilitated Lurjee Rao, Prime Minister of Scindia, chief of the Mahrattas. The natives mix them with flour, and make a variety of pastry: the method is to parch them in pots over a gentle fire, stirring them about as is done in roasting coffee. They eat them by handfuls, as we do comfits: the taste is said to resemble sugared cream, or sweet almond paste. "I have discoursed with several gentlemen," observes Smeathman, "upon the taste of the white ants, and on comparing notes we have always agreed that they are most delicious and delicate eating." Dr. Livingstone says "the white ants, when roasted, are said to be good, and somewhat resemble grains of boiled rice."

Humboldt mentions ants as being eaten by the Marivitunos and Margueratares, with resin as a sauce. Bees are eaten in Ceylon. It is probably bad taste to allude to the mites that we consume in our cheese in myriads. The grub of the palm-weevil, which is the size of a thumb, is a favorite dish in some parts of India. Ælian relates of an Indian king, who for a dessert, instead of fruit, set before his guests a roasted worm taken from a plant (probably the larva of this insect), which was thought very delicious.

Improvement in Lead Furnaces.

What is claimed by the *London Mining Journal* as a wonderfully important improvement in the construction of furnaces for lead smelting, has been effected by Mr. George Metcalf. A vertical partition, or wall, extending for a portion of the length of the furnace and reaching from its crown to the sole, but not extending to the grate or fire bars, forms near this latter a bed which extends the whole breadth of the furnace, while it divides the remainder of the furnace into two compartments, in which the charges are placed, and are gradually led forward to the bed in front of the fire bars. The draft is shut off from each compartment alternately, one compartment being open to the chimney while the other is closed, so that while one set of charges is exposed to the free current of flame, or aeriform or gaseous products of combustion rushing from the fire through the compartments towards the chimney, the other set of charges is subjected only to the action of dead heat, because the draft apertures are closed. The ore, as it is fed in, dries and becomes calcined and wholly or partially desulphurized, as it is passed gradually along the chamber, till at length it reaches the bed or chamber in front of the fire bars. The greatest portion is then removed, in a state of slag or agglomeration, through an opening in the furnace, into a wagon, and is run off therein to a blast furnace, in order to be again subjected to further metallurgical treatment. What lead remains in the furnace is removed by tapping.

The result of the treatment is declared by competent judges to be, as near may be, perfect. The loss by volatilization is much less than usual, and the saving of fuel is enormous, five tuns with the new furnace doing quite as much work as twenty-six or twenty-eight tuns with the old reverberatory furnace.

In a previous number, says the *Exchange and Review*, we took occasion to refer to some of the mechanical and chemico-mechanical devices for collecting the matters volatilized during lead smelting and kindred metallurgical operations. It is questionable if, in this country at least, a proper realization of the vastness of the loss has been reached. Few steps have been taken to prevent such loss, and day after day furnaces pour forth their poisonous metallic smoke and fume with detriment to health and without regard to economical considerations. In England, careful estimates have been made of the amount of loss of metal in lead smelting, and the figures are scarcely credible. A blast hearth furnace treating 267,008 pounds of lead ore with an assay value of 75·75 per cent of metallic lead, and which therefore, should give 202,259 pounds, gave only 67 per cent, or 178,895 pounds. Here is at first a loss of 23,363 pounds, or more than eight per cent of the original assay content of the ore. To this is to be added a further loss in the refining process of 13·4 per cent, while the reduction of the dross from the refinery adds 3·6 per cent more, making the total loss more than twenty-eight per cent of the original amount of lead in the ore, corresponding to 57,643 pounds of lead volatilized from the ore during its treatment for, and conversion into merchantable lead.

Interesting Experiments on Color.

Dr. Clark Maxwell, F.R.S., recently exhibited some remarkable experiments on light and color. Although a mixture of blue and yellow pigments will produce a green color, the mixture of blue and yellow light produces white. He proved this by projecting two large disks of blue and yellow light upon the screen, and causing them to overlap each other; where they overlapped, the color was not green, but a pure white. He then interposed a lead pencil in the path of the rays from the two sources of colored light, so that a double shadow of it fell upon the screen, in the place where the two disks overlapped each other. The one shadow was a brilliant blue color, and the other pure yellow.

In another experiment he mixed red and green rays, and they formed a yellow as brilliant as the pure yellow of the spectrum; he proved this by throwing the pure yellow on to the screen immediately after the removal of the yellow produced by mixing red and green light. He showed that the pure yellow could not be decomposed by the intervention of a prism, whilst the yellow produced by the mixed rays could, by means of a prism, be resolved into the red and green rays of which it was composed.

In the course of the lecture he called attention to the fact that all persons have a yellow spot upon the retina, which tends to make color vision somewhat imperfect. The yellow is more pronounced in dark than in fair persons, and it has a tendency to impair vision more when the individual is tired and overworked than when he is well and active. To make the presence of this spot sensible to the observers, Dr. Maxwell threw a disk of light upon the screen, and colored the disk by making the light pass through a solution of chloride of chromium. The light thus produced is of a red color, mixed very largely with greenish yellow rays which are copiously absorbed by the yellow spot. He then told the observers to wink slowly at the disk, and they nearly all then saw large red cloud-like spots floating over the disk, in consequence of the absorption of most of the rays, with the exception of the red, by the yellow spot in the eye. When the disk was gazed at steadily without winking, the floating red clouds disappeared.

Testing Plated Metal.

To test the genuineness of silver plating on metals, a cold saturated solution of bichromate of potash in nitric acid is applied with a glass rod to the cleaned (with strong alcohol) metallic surface, and immediately washed off with cold water. If pure silver be present, there will appear clearly a blood red colored mark (chromate of silver). Upon German silver, the test liquid appears brown, and after washing with water the blood red colored mark does not appear; the Britannia metal is colored black; on platinum, no action is visible; metallic surfaces, coated with an amalgam of mercury, yield a reddish speck, which, however, is entirely washed off by water; on lead and bismuth, the test liquid forms a yellow colored precipitate; zinc and tin are both strongly acted upon by this test liquid, which, as regards the former metal, is entirely removed by water, while, as regards the latter, the test liquid is colored brownish, and addition of water produces a yellow precipitate, which somewhat adheres to the tin.

IT is a great guilt in any man to allow what mental faculties he may possess to become rusty from disuse, or to submit them implicitly to another.—MCCLINTOCK.

Crampton's Apparatus for Burning Coal Dust.

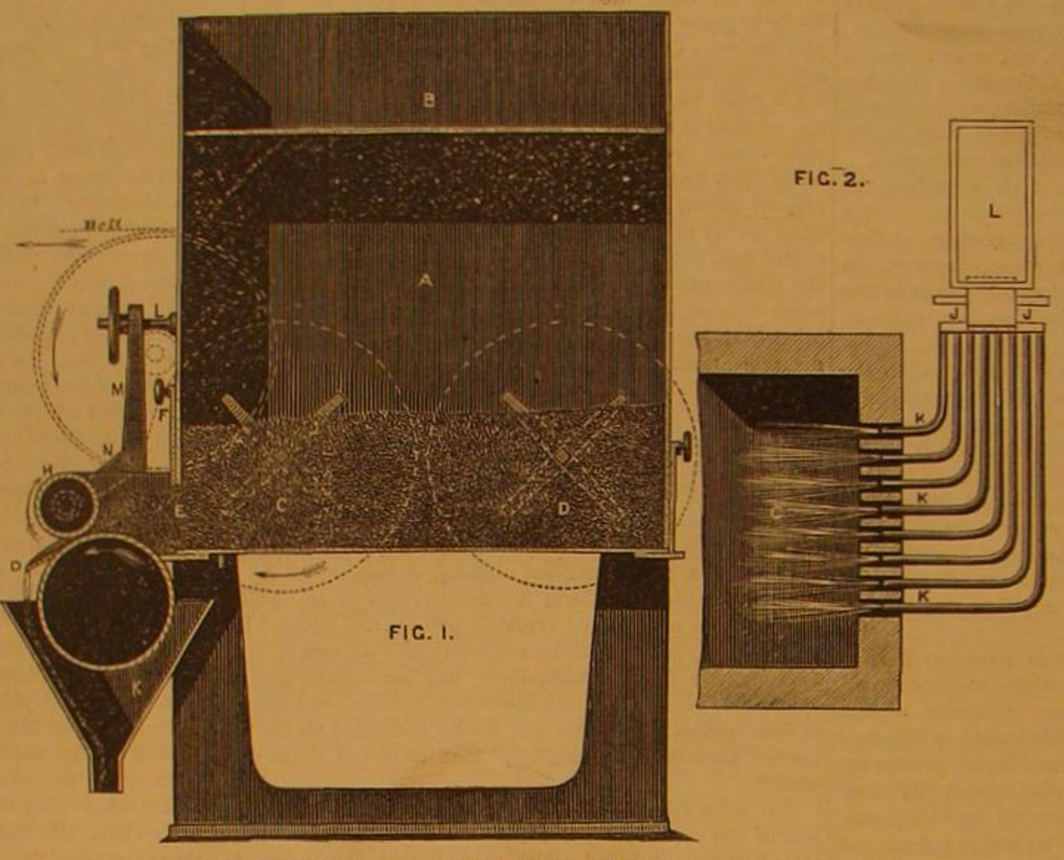
The idea of burning fuel in a powdered state is an old one, a patent for this method of consuming fuel having been taken out as long ago as 1831, while between that time and the present, about twenty other patents have been obtained for different methods of obtaining the same end. Several of these patents are for different modes of injecting the dust fuel by means of air, so that this method of feeding a coal dust furnace, which is employed by Mr. Crampton, is not in itself a novelty; but this by no means detracts from the credit due to Mr. Crampton, as he has been the first to produce a coal dust furnace which has achieved a really practical success, and has stood the ordeal of a lengthened trial. One great trouble met with by the earlier experimenters on the use of powdered coal, was the clogging of the flues by particles of unconsumed fuel, thus causing much inconvenience, as well as being a source of waste. This trouble has, however, been avoided by Mr. Crampton, simply by a recognition of the fact that a certain appreciable *time* is necessary for the combustion of a particle of coal, however intimately it may be brought into contact with the air.

If we suppose a jet of thoroughly mixed air and coal dust to be injected into a furnace, and suitably ignited, there will be produced a flame varying in length according to the velocity of discharge and the size of the particles of fuel; the greater the discharging velocity and the larger the particles, the longer being the flame. Now, in this case, the length of the flame forms a kind of measure of the time required for the combustion of the particles, and in order that this combustion should be complete, it is necessary that the arrangements employed should be such as to maintain the fuel and air in efficient contact during that time. The smaller the particles, the greater is the surface exposed by them in proportion to their weight, and the less, therefore, is the time required for their combustion, and the easier is it to insure that that combustion shall be perfectly effected. In other words, the smaller the particles, the more nearly will they approach the conditions of gaseous fuel. If, therefore, the process of grinding the fuel cost nothing, it would be advisable to reduce it to a perfectly impalpable powder, but commercial considerations forbid this, and it is found necessary practically to employ arrangements which enable the fuel to be burned in a less finely pulverized condition.

In order to obtain success in burning powdered fuel, it is essential, first, that the supply of the fuel to the furnace shall be under perfect control, and that it shall continue to be practically constant without personal attention, so long as a constant supply is required; next, that the powdered fuel shall be thoroughly mixed with the air by which combustion is supported; third, that the currents of flame must follow such a course as to enable the fuel to be completely burnt before the gases pass off from the furnace; fourth, that the combustion chambers and those parts of the furnace exposed to the intense heat must be of such construction as to be readily kept in repair; and fifth, that provision must be made for the collection and discharge of the slag arising from the impurities in the fuel. The modes in which these various requirements have been fulfilled by Mr. Crampton, we shall now proceed to explain.

Coal dust, particularly if it be in a slightly damp state, is by no means an easy thing to feed into a furnace regularly; but after trials of several arrangements, Mr. Crampton has designed and adopted a very simple apparatus for the purpose which answers its purpose perfectly. It is represented by the annexed engraving, and consists of a hopper fitted with a pair of smooth feeding rolls, as shown. The hopper, A, in which the powdered coal is placed, is fitted with a strainer, B, to prevent the entrance of large particles, and it is traversed by two revolving shafts, these shafts carrying stirrers, C D, which keep the coal dust in a loosened state. These stirrers revolve in the direction of the arrows, and thus force the powdered fuel through the opening, E, the extent of which is regulated by the sliding door, F. The opening, E, leads to the box, G, and the upper edge of the opening is kept below the top of the box, so that the fuel is not forced over the latter. If the box becomes full of fuel from the fact of the rollers not taking it away so quickly as it is supplied through the opening, E, the stirrers, C, D, not having force enough to increase the hight of the fuel in the box, G, will, as they revolve, merely agitate the fuel until the rollers have reduced the quantity in the box. From the box, G, the fuel passes between the rollers, H I, which feed it into the shoot, K, leading to the injector. The quantity of fuel fed by the rollers is regulated by means of a screw, L, which acts on the lever, M, and thence on the lever, N, to which are attached the bearings of the roller, H, this arrangement enabling the distance between the rollers to be modified as desired. As the rollers withdraw the fuel from the box, G, it is replenished by the action of the stirrers, the effect being that the fuel in the box, G, is maintained in a comparatively loose state, and furnishes a steady and uniform supply to the rollers, quite independent of the depth of fuel contained in the hopper, A. The rollers, it will be noticed, are fully exposed to view, so that any irregularity, in the supply passing over the scraper, O, can be readily detected. The fuel passing down the shoot, K, falls in a fine stream just in front of a jet, or series of jets, of air, which inject it into the pipe or pipes leading to the furnace. As an instance of the perfection of the arrangements just described, it may be mentioned that, at Woolwich, fifty consecutive heats have been turned out from Mr. Crampton's furnace—each heat averaging thirty cwt. of blooms—without the handles by which the supplies of air and coal are regulated ever having been touched.

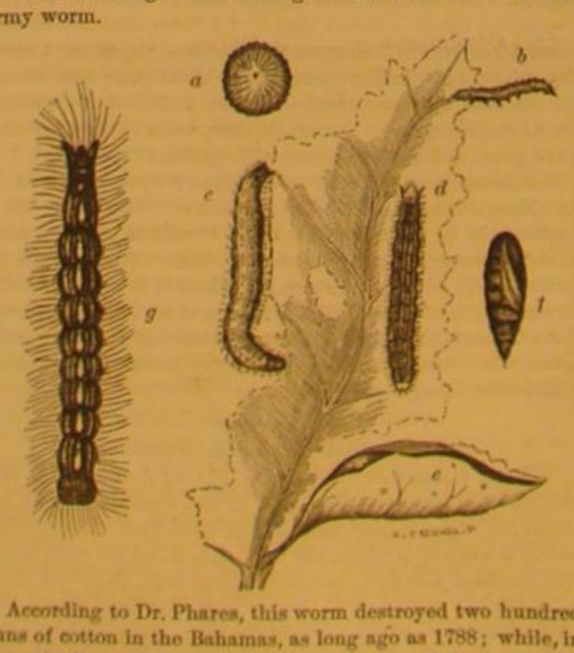
In discharging the jets of mixed air and coal dust into the furnace, it is essential that their direction should be such that an unequal distribution of the coal dust in the air, which may have been caused during its passage through the pipes, shall be remedied. Thus it is found that, when the mixed air and coal dust is carried round a bend in a pipe, the momentum of the particles of coal will cause them, on entering the bend, to be carried against the outer side of the latter. If, after passing the bend, the air and coal dust traverse a long straight length of pipe, they may get perfectly mixed again; but if they are discharged into a furnace directly after leaving a bend, it will be found that one side of the jet (that corresponding to the outside of the bend) will be overcharged with fuel, while the other side will be undercharged. If no means were taken to remedy this, the effect, of igniting such a jet, would be imperfect combustion; but Mr. Crampton has ingeniously converted this separating action into account to effect in some cases a perfect admixture of the air and fuel.



CRAMPTON'S APPARATUS FOR BURNING COAL DUST.

THE COTTON WORM.

The cotton worm (*Anomis xylina*—Say) is very generally known by the name of "the cotton *army* worm," in the South. The term, as applied to this species, is not altogether inappropriate, as the worm frequently appears in immense armies, and, when moved by necessity, will travel over the ground in "solid phalanx"; and, so long as the word "cotton" is attached—its ravages being strictly confined to this plant—there is no danger of its being confounded with the true army worm.



According to Dr. Phares, this worm destroyed two hundred tuns of cotton in the Bahamas, as long ago as 1788; while, in Georgia, it completely destroyed the crop of 1793. It also proved very destructive in 1804, 1825, and 1826. Since the last date, it has done more or less damage, almost annually, to the crop, in some part or other of the cotton growing district. As with the real grass-feeding army worm of the Middle States, it swarms in particular years to such an extent as to utterly ruin the crop; while in other years it is scarcely noticed. This fact has led many to infer that there is a staedt periodicity in its returns in such immense numbers; but the natural history of the worm confutes such an idea, and the records give no foundation for the inference. The sudden increase or decrease of this,as of other species of noxious insects, depends on climatic, as well as other equally potent influences

The egg, *a*, according to Dr. Phares, is shaped precisely like a skull cap, with rows of pinheads from base to apex, as thickly as possible," appearing as if molded in a very deep saucer. These eggs are of a translucent green color, and are deposited upon the under side of the leaves; and, from their small size, are difficult of detection. Each female moth deposits from 400 to 600. According to the late Thomas Affleck, they hatch two days after being deposited, if the weather be warm and moist.

The worms (*b*, one third grown) at first feed upon the parenchyma, or soft fleshy parts of the leaves, but afterwards devour indifferently, not only any portion of the leaves, but also the blossom-bud and blossom, together with the calyx leaves at the bottom of the boll, thus causing the lobes which hold the cotton to fall entirely back, and allow the cotton to drop at the slightest touch.

While young, these worms readily let themselves down by a web when disturbed; but when older, they make less use of this web, and jerk themselves away to a considerable distance when suddenly touched. They cast their skins at five successive periods, and come to their full growth, *g*, in the incredibly short space of fifteen or twenty days.

When they have completed their growth, the worms fold over the edge of a leaf, *e*, and after lining the inside with silk, change to chrysalids, *f*, which are at first green, but soon acquire a chestnut brown color; after remaining in this last state (in which,though the insect is inactive, it is yet full of life, and undergoes wonderful development) from seven to fourteen days, or even longer, the moth escapes, the chrysalis being held fast within the cocoon by means of several very minute hooks, with which the tail is furnished.

The general color of the upper surface of the moth is golden yellow, inclining to buff; the chief characteristic is a dark slate colored or black spot on the fore wings, in which spot there are paler scales, forming almost a double pupil, as represented in the figures, while between this spot and the base of the wings there is a much smaller pure white dot.

According to the best authority, there are three different broods of worms during the year, the first appearing in June or July, and the last, which does the most damage, appearing in August or September, or even later.

"That the cotton moth survives the winter is almost certain. An examination of the neighboring woods, especially after a mild winter, has often been successfully made for that purpose," says Mr. Seabrook; and Dr. Phares states positively that the moth hybernates in piles of cotton seed under shelter, under bark, and in crevices of trees, in dense forests and other secluded places, and that it may often be seen on a pleasant day in winter.

The only successful methods of destroying this injurious insect are by hand picking and by fire.

The World in the Ceiling.

A rounded house in the Strand, London, says *The Builder*, has its top room crowned with a small dome, and this Mr. C. Bowles, one of the firm of American bankers occupying the house, has caused to be painted with a map of the northern half of the world. It is exceedingly well and clearly done, and full of suggestion to those who view it with the mind. Little golden spots mark out the cities and towns; the railways, the telegraphs, through land and sea, are plainly seen, and the degrees of latitude and longitude are shown. The causes which have tended to raise towns and countries to importance, the enormous extent of the Russian empire, the importance of the Suez Canal, the extraordinary railroad recently completed across America, are a few amongst the points that are at once conveyed to the mind of the observer. The value of a silent teacher like this in a great school would be immense, and the idea might usefully be carried out further. Why should not the walls of educational establishments be decorated as we have, before now, suggested, with instructive diagrams, enlarged maps of countries, statements of leading facts in history, outlines of sciences, historical dates,—in fact mind excitents of all sorts? Anyhow, Mr. Bowles has turned his ceiling into what Byron calls the skull, a "dome of thought."

AN improved coloring matter for butter—carotine—has been successfully employed by Dr. Quesneville, as a substitute for annatto, to which it is in every respect superior, although somewhat more expensive. This carotine is the representative in carrot of alizarine in madder, and is obtained by slicing, drying, and grinding the roots to powder, exhausting the powder with sulphide of carbon, and, having removed the solvent, rapidly crystallizing out the carotine from the extract.

COMBINED MILK PAIL AND STRAINER.

This useful device is the invention of J. L. Drake, of Boston, Mass., and was patented in August, 1867. It is designed to secure greater cleanliness in milking, and to strain the milk while the milking is in progress. The receptacle for the milk is provided with a spout and funnel, a gauze strainer being placed across the lower end of the funnel tube. When the milking is finished, the funnel is removed, and the milk is poured out and strained. The funnel being brought up close to the udder of the cow, the milk is not rendered filthy by droppings of dirty water from the sides of the cow in wet

weather, and the receptacle, being placed out of the reach of the cow's foot, is not liable to be kicked over by a vicious animal. The pail can be also used as a stool for the milker.

Value of the Self-acting Mule.

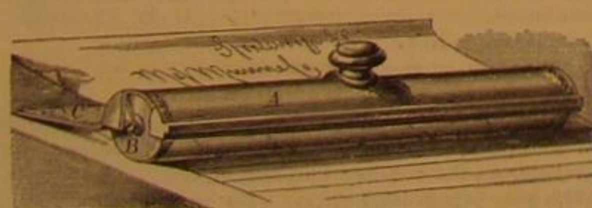
Through the skill of Mr. Roberts, of Manchester, England, the mule was made self-acting, the spinner not having now to work or guide the mule, but simply to see to its being kept in order. The value of these accumulated inventions will be seen, when it is remembered that before the invention of Hargreaves one person could only attend one spindle; at the present time one man, aided by a grown up youth and boy, will tend a pair of mules having 1,200 or 1,300 spindles in each, or 2,600 spindles together. If these facts be carefully examined, it will be seen that one individual, aided by the machinery of the present day, will produce as much yarn as 750 persons could have done a little over one hundred years ago; the result of these improvements being a large diminution in the cost of yarn, and a considerable increase of wages. A spinner in 1760 could only earn from 2s. to 3s. weekly, whereas now he can earn from 30s. to 35s. weekly. In the time of Crompton, which was after considerable improvements had been made in machinery, the cost of spinning weft 40 hanks to the pound was 14s. per pound; 60 hanks, 25s.; and 80 hanks to the pound, 42s. per pound. Now, the cost of producing will be 4d., 7½d., and 1s. per pound, respectively. Such are the advantages resulting from the invention of machinery.

COMBINED BLOTTER, RULER, AND PAPER CUTTER.

The annexed engraving illustrates a very neat and handy device for the counting room and the desks of professional men, including in one implement a blotter, ruler, and paper cutter.

The engraving is a perspective view, with a portion of the semi-cylindrical case, A, broken away, to show the spring which holds one end of the blotter roller, B. The other end of the roller is held by a fixed support, the spring bearing enabling the roller to be inserted or removed for the renewal of the blotting paper

The blotting paper is secured to the cylinder by small metallic bands.



The semi-cylindrical case has a wide thin plate, C, projecting backward, which forms the edge for cutting paper or tearing it across, as shown. The front side of the case has formed upon it a straight edge, which is the ruler. The roller being turned true, it—when rolled upon the paper—advances the ruler in lines constantly parallel to each other, as in the rulers hitherto constructed with rollers.

Patented, through the Scientific American Patent Agency, March 7, 1871, by Hugh S. Ball, whom address for further information, Spartanburgh, S. C.

MUSSEL CLIMBING.

By Rev. S. Lockwood, Ph.D., in the American Naturalist.

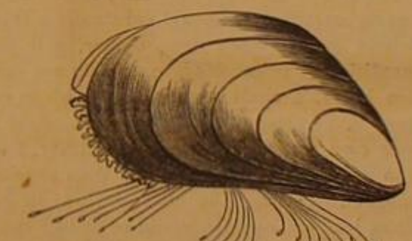
Why should not these pedate bivalves, the mussels, walk? "For want of brains!" says one. You are mistaken, sir. They have brains, the right kind, too, and in the right place—a real pedal nerve-mass, or ganglion; a little bilobed brain at the very base of the "understanding" itself, that is, exactly under the foot, as was fabled of a very agile dancer, that his brains were in his heels.

If seeing be believing, mussels can walk. We once saw a young brown mussel, of the species *Modiola plicatula*, about five eighths of an inch in length, turn his foot to a most excellent account. We had pulled the youngster's beard off, and then had deposited him at the bottom of a deep aquarium. The water was probably but poorly aërated, hence he was evidently ill at ease, and, to our astonishment, he at once began travelling over the pebbly bottom, then up the glass side, with the utmost facility and grace. The foot moved precisely as that of any univalve gasteropod would do, and with the same easy gliding motion. The movement was continued without interruption until he had reached the surface of the water, a distance of not less than 10 inches, which, added to the distance travelled over the bottom, was probably equal to 14 inches. At the surface he lost no time in spinning his byssus, which he fixed to the side for a permanent abode.

For his lively colors, perhaps ruthlessly, we had picked this little fellow out of a large family cluster, snugly packed in a little hole in one of the piles of the dock. It was a large group of all sizes, literally bound together by the silken cords of—attachment, shall we say?

A fellow captive was a full grown, black, edible mussel, torn from his anchorage, a stone near by, at low tide. We afterwards found, ensconced in this black shell, an amount of intelligence which filled us with astonishment. If his youthful fellow prisoner could beat him at walking, he was about to accomplish the feat of climbing to the same position by means of a species of engineering of a very high order.

Placed at the bottom of the aquarium, where he had been for a couple of days, he had succeeded in wriggling himself up to one of the glass sides of the tank. This accomplished, he protruded his large foot, stretching it up as high on the glass as he could reach, this organ seemingly adhering very tightly. A little hole opened near the extreme forward end of the foot. This tiny hole was really the extremity of a folded or closed groove. Out of this a drop of white gluten, or mucus, not larger than the head of a pin, was exuded and pressed against the glass. There was then a slight withdrawing of the foot, simultaneously with an unfolding or opening of the groove, which contained, as if molded there, the already completed delicate thread. This done, the partly contracted foot (not drawn into its shell at all, be it understood) was again extended, this time a little higher than before. The groove or spinneret was again closed, except the little opening on the surface of the foot, whence another little drop of mucus appeared, which also was pressed against the glass. Again the foot was withdrawn a little, the lips of the groove unfolded, and the molded thread set free. This gave thread number two. Each was evidently set at considerable tension. And in this wise, thread after thread was formed and set. (See engraving.) I regret that I did not



record the exact number, but am sure that it was about twelve or sixteen, and the time occupied was between two and three hours, when lo! up went the mussel, about three eighths of an inch high. Yes, he was drawn up by his own cords. He was literally lifted from *terra firma*. Not at all suspecting what was to follow, I mentally exclaimed "This little fellow knows the ropes."

There was next a period of rest. Whether it was due to exhaustion of material, and was meant to allow the secreting gland time to evolve a fresh supply or not, I cannot affirm; but I may say that such was my belief, for after an hour or so it set to work precisely as before, attaching a new cluster of threads. This cluster was set about ⅜ inch higher than the previous one. When this new group of filaments was finished, the same result followed, another lift of a fraction of an inch, but not quite so high as the first. I now suspected its motive—the animal was actually in this singular manner attempting to reach the surface. It wanted to take an airing, and was really in a fair way to bring it about.

While setting its third cluster of threads, I foresaw a serious difficulty in the way, and one against which the spider never has to contend. It was this: after the third lift had been achieved, the threads which had accomplished the first lift had changed direction; that is, the ends of the threads, which had pointed downward when pulling up the mussel, were now pointing upward, and were actually pulling it down. Of course the lowermost thread or threads would exert the most retrograde traction. Thought I, "Sir Musselman, you will have to exercise your wits now." I rejoice to say that the ingenious little engineer was complete master of the situation. The difficulty was overcome in this way—as each lowest thread became taut in an adverse direction, it was snapped off at the end attached to the animal. This, as I think, was done by two processes; the one by softening the end of the thread by the animal's own juices, purposely applied, as the pupa in the cocoon moistens its silk envelope, when wishing to soften the fibers, so that it can break a hole through which the imago may emerge; the other by a moderate upward pulling, thus breaking the filament at its weakest point.

The next day our little engineer had accomplished the wonderful feat of climbing to the surface by ropes fabricated during the ascent. Without delay it moored itself securely, by a cluster of silken lines, at the boundary where sky and water met, and was there allowed to enjoy the airing it had so deservingly won. Bravo! my little Mussel-man! No acrobat can beat thee on the ropes.

And what are we to say to all this? Blind instinct, forsooth! Who believes it? The wise men of the ages have written as the tradition of the elders—"byssus-bound," of our Mytilus. But it can make, of its bonds, mooring lines of safety against the storm, and with consummate skill can build a silken stairway into its own wished-for elysium of delight. It is some three years since the writer witnessed the facts here recorded, and to this day the sight of a mussel inspires him with profound reflection on the ways of Him who made these creeping things of the sea.

Correspondence.

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

Wrought Iron Railway Sleepers.

The new railway sleeper recently patented by Mr. Richard Gammon, of Westbury, England, is likely, it is said, to supersede the whole of those at present in use, especially in tropical countries. The constructors of the railways in India experience the greatest difficulty in making and maintaining the permanent way. The dry rot, and those pests of India the white ants, destroy everything. Sleepers sent from England creosoted and "pickled," are not protected from the influence of the sun and vermin, and seldom or never last more than three years. It was necessary, therefore, to find a substitute impervious to attacks of insects, which might be made perfect and ready to be laid down wherever they should be required.

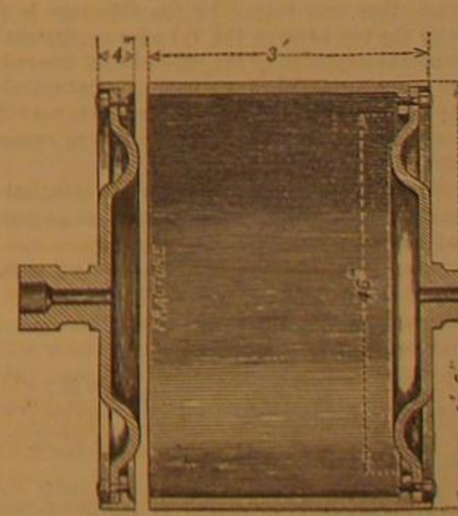
Mr. Gammon's sleeper is made up of a number of webs and plates of rolled iron, riveted together, and pierced with bolt holes for the chairs. This saves about two thirds of the labor of laying, and leaves but little work to be done by native or other labor. The direct cost is not more than 1s. each above that of the best wooden sleepers, and they are calculated to last ten times as long in tropical countries, and three times as long in Europe. Many eminent engineers and railway contractors, who have examined them, believe they will be the railway sleepers of the future. At all events, the invention is highly ingenious, and likely to supply a great want.

Explosion of a Cylinder for Drying Cotton.

MESSRS. EDITORS:—I had occasion recently to examine the ruins caused by the explosion of a cylinder, for drying cotton batting or carpet lining, at the factory of Geo. W. Chipman & Co., Charlestown, Mass., which occurred at about 2 P.M., April 8th. This explosion being so exceptional in its character, I thought it would be well to call the attention of your readers to the fact that cast iron is in many cases a very unreliable material for constructing cylinders exposed to high temperatures, and to withstand high pressures of steam.

The drying apparatus consisted mainly of two cylindric dryers, similar to those used in paper machines, rotated by gears, having a pipe passed through the right hand journal for admitting steam to the boiler, and a similar pipe in the other for removing the water; this drain pipe turned downwards and extended as low as possible in the cylinder, to keep it as free from water as possible, as is usual in arrangements of this kind. In addition to these dryers was a number of rollers carrying aprons for feeding the wet batting to the dryers, and for carrying it away.

The accompanying figure shows a section of the cylinder and the line of fracture. It will be observed that the fracture did not occur exactly in the angle formed by the flange



to which the head is bolted, but at a little distance, say ½ inch, from the plane of the flange, the angle being filleted. The larger part, weighing about 2,600 pounds, was thrown through the side of the building, and a distance of about 90 feet from the machine, plowing up the earth in its course; and the other part, weighing about 700 pounds, was thrown through the opposite side, and entirely through another building, at a distance of perhaps 50 feet. The building, of light wood work, containing the machine, was opened each way, and the attendant blown up through the roof by the force of the explosion, and considerably hurt and scalded, but not to such an extent as to endanger his life. On examining the premises about eighteen hours after the accident, I found everything as it had been left, the edges of the fracture, for about three quarters of the circumference, showing a clean break; the iron being of a bright gray color, corresponding to about No. 2 or 2½ pig, sound and good, with a uniform thickness of fifteen sixteenths of an inch; the other fourth of each part had been plunged into the ground; but, so far as I could judge, would, if clean, have shown the same charac teristics as the rest. The heads were held on by being turned to fit the bored ends of the cylinder, and then each was secured by twenty-eight three-quarter bolts tapped into the flange. The boiler was an ordinary vertical cylinder, with internal fire box; diameter, 42 inches, thickness of sheets, one quarter inch; and was single riveted.

The safety valve worked freely, and was weighted, as nearly as I could judge without seeing the valve itself, at 90 pounds. I could get no reliable evidence as to the pressure carried at the time of the explosion, except that "they were doing all they could." I then made the following calculations, to determine, for comparison, the bursting pressures: And first of the boiler: Taking the maximum tensile strength of boiler plate at 60,000 pounds per square inch of section, and the single riveted joint at half this, or 30,000 pounds, we have $\frac{\frac{1}{2}\times 30{,}000}{42}=357$ lbs. per square inch as the steam pressure required to burst a longitudinal seam of this boiler, provided, of course, that there is no vibration under this load. The safe working pressure, I may here remark, was one sixth of this amount: $\frac{1}{6}\times 357=60$ pounds per square inch.

Of the pressure required to part the 28 tap bolts sustaining the pressure upon the heads of the dryer cylinders, we take 60,000 pounds to express the tension, required to part a bolt having a sectional area of one square inch cross section; in this case the thread cut on the three-quarter inch bolts reduces their diameters for strength to five eighths of an inch; the sectional area of each, then, is 0·3 square inches. The diameter of the head, acted upon by the steam pressure, was 46 inches; its area, then, is 1,662 square inches. Then $\frac{\cdot 3\times 28\times 60{,}000}{1{,}662}=303$ lbs. pressure per square inch. Again, supposing the cast iron cylinder to have been pulled apart by a longitudinal strain, what steam pressure would have been required? Diameter minus approximate thickness $54-1=53$ inches, the circumference of which is about 166 inches, $166\times\frac{15}{16}=156$ square inches of section of metal broken. Then taking only 16,000 pounds as the tension required to part a square inch of this metal, we have $\frac{16{,}000\times 156}{2{,}124}=1{,}100$ pounds per square inch, the 2,124 being nearly the area of a circle 52 inches in diameter, which is the size of the inside of the cylinder. We find, therefore, that this part of the system is nearly three times stronger than any other part, and if a rupture had occurred from simple pressure, it would have been either in a vertical seam of the boiler, or by parting the bolts of the cylinder head. We must then look for another cause. The steam pressure was most likely at some point above 80 pounds. The temperature of steam at 80 pounds is about 312° Fah.; at this temperature, the heads and about four inches of each end of the cylinders was kept. The remaining part must have been cooled by its girdle of damp batting to at least 232° and perhaps 212°. The rate of expansion for cast iron is given at ·000006 times its length for each degree above 32°; then if the diameter of the cylinder at 32° temperature was 54 inches, at 232°, or 200° higher, it would be $(54\times 200\times\cdot 000006)+54=54\cdot 0648$, and at 312°, or 280° higher, it would be $(54\times 200\times\cdot 000006)+54=54\cdot 0907$—a difference of ·026, and quite enough to cause a fracture, if this difference of 80° temperature occurred in a well defined line round the cylinder. The explosion took place when the rotation of the cylinders had been stopped for a moment, they being encircled by the wet or damp batting, and the fracture followed the line marked by its edge, in its course round the cylinder.

The fracture, then, was caused by the difference in the temperature of the two parts of the cylinder contiguous to each other, and the explosion by the expansion of the steam hitherto held in confinement by the strength of that cylinder.

If any of your readers should take the trouble to read this lengthy communication, and can suggest any more reasonable explanation, I would like to see it.

I would remark that my calculations are not intended to be exact, but approximate sufficiently for practical purposes, and serve to illustrate my theory.

Wm. N. Harrison.

Boston, Mass.

Simplicity in Design.

Messrs. Editors:—Next to good fitting, there is nothing which tends so much to the good repute of a mechanic and his products, as persistency in some simple form or style in the finish and ornamentation of his work.

If the work be a machine, all of the visible shaft, bolt, stud, and nut endings should be turned or milled carefully to the same general shape or form. There is nothing so neat and appropriate as the simple reverse curve style, free from corner or bead.

Inward corners should always be avoided. There is nothing so discouraging in machine cleaning as complicated beadings, or in house cleaning as complex moldings; they are only dirt catchers, void of beauty.

It is no light task to keep a complex machine like the railway engine clean and tidy; the finish and ornamentation of such machines should, by all means, be made as simple as possible. Neatness and utility should be the only objects in their construction, and all elaboration in the way of show should be avoided.

I have often questioned the propriety of using so much brass in the external finish of locomotives; it tarnishes so easily, that an almost continual rubbing is necessary to keep it bright, imposing a tremendous tax on patience and muscle. Paint and varnish judiciously applied occasionally, especially to all of the large surfaces, such as cylinder and steam chest casings, would be far more neat, economical, and satisfactory.

F. G. Woodward.

Poisonous Fertilizers.

Messrs. Editors:—The editor of the Boston *Journal of Chemistry* quotes my article on poisonous fertilizers, from page 372 of the last volume of the Scientific American, and makes the following remarks

The above absurd item has been "going the rounds" of the press during the past six months, and it is quite time that it was stopped. This attempt to frighten farmers who are enterprising enough to dissolve bones and prepare their own fertilizers is hurtful to the interests of agriculture and derogatory to science. In the ordinary sulphuric acid of commerce, which is made from Sicilian sulphur and condensed in platinum retorts, the amount of sulphate of lead present is but a mere trace, seldom exceeding one fourth of one per cent. The same may be said of arsenic; some specimens of acids from the best makers do not afford even a trace of this metal or any of its salts. The dunce who started this item, probably read in some old book or journal that specimens of acid, prepared in England some years ago from iron pyrites, were found by Dr. Rees, Mr. Watson, and others, to contain arsenic, and hence seized hold of the idea of making a sensational article on "poisonous fertilizers." Such loose statements are fraught with evil, and cannot be too severely condemned. It may be said that the quantities of lead and arsenic found in the worst specimens of commercial acid would not have the slightest influence upon crops, when presented through the medium of superphosphates. Farmers and horticulturists need have no fear of deleterious effects from the use of any of the acids found in the market.

I never supposed the quantity of lead or arsenic present would produce any immediate perceptible results; and unless friend Nichols denies that small quantities of poisonous minerals accumulate in the body, he surely has no good reason for the assertions that he makes.

Professor Davy, alluded to in my former letter, says: "As arsenic is well known to be an accumulative poison, by the continued use of vegetables containing even a minute proportion of arsenic, that substance may collect in the system till its amount may exercise an injurious effect on the health of men and animals."

In an editorial article, on page 215, Vol. XXI., the Scientific American says: "Lead is one of the most insidious of poisons, accumulating little by little in the system through long periods of time."

And I see no reason why arsenic, lead, and all other poisonous minerals capable of forming insoluble compounds with sulphur, or with phosphoric or carbonic acids, may not meet these in the blood, and thus become fixed. I might produce more evidence to show that poisons accumulate and thus produce injury, but will not occupy space to do it at present.

It is evident that, if my conclusions are right, the old-school practice of medicine is at fault; and it appears important that its practitioners should substantiate their views. If Dr. Nichols, or any other drug doctor, will prove that minute quantities of poisonous minerals do not accumulate and produce harm, I shall be most happy to be convinced.

Dr. N. says that I attempted to frighten farmers from preparing their own fertilizers. On the contrary, I would advise them to prepare their own, rather than purchase those found in market. Perhaps the cheapest way of getting an acid free from lead and arsenic, would be to buy the cheapest acid and precipitate the lead and arsenic by hydrosulphuric acid.

H. A. S.

Charlotte, Maine.

The Use of the Jar in Boring for Oil.

Messrs. Editors:—In your issue of April 15th, there is an article, copied from Blake's "Notices of Mining Machinery," in which there is a mistake with regard to the operation of the "jars" used in oil well boring. "By it (the jar) a blow or sudden jerk may be given upwards, so as to loosen the bit in case it becomes wedged in the hole, while the same device serves to give a blow downwards upon the auger, after the bit strikes the bottom, thus doubling the efficiency of each stroke."

It is not the office of the jars to strike both ways, except on special occasions. When the tools stick, in running down, as is often the case with a "reamer," the jars are struck downwards for the purpose of driving them through the "tight place." The jars are sometimes worked both ways for the purpose of wearing a tool loose that has become fastened on the bottom; but otherwise, in the language of an old driller who read the article, "If they should 'ketch' a man working his jars both ways, in the oil country, they would hang him."

The jar was originally introduced for the purpose of knocking the tools loose, when sticking, and are worked, when all is going right, about three or four inches. More than this is useless, and less does not give the driller to understand whether or not the drill is striking the bottom, especially if working a deep hole.

J. W. Sadler.

Tidoute, Pa.

How to Build a Chimney.

Messrs. Editors:—In looking over your excellent paper of March 18th (page 180 of current volume), I noticed an article, written by Austin B. Culver, of Westfield, N. Y., upon the construction of chimneys, to which I fully subscribe, so far as he goes; but I think that he has overlooked one important matter, which, no doubt, has been the cause of more fires than any other which has come to the notice of the public. That is the improper construction of the water table, made by projecting one course of bricks on each side of the chimney, about an inch over the body of the chimney, at a point where the chimney was brought through the roof. The error is in making it too low. Chimneys are generally built before the building is shingled, and proper allowance is not always made for the thickness of the shingles; hence they are crowded up tight under the water table. If the chimney settles more than the building, or if it be a flue, built upon any part of the wood work, or upon a flue stone resting upon joists too weak to sustain the weight, the result is the separating of the chimney by the water table resting upon the shingles, thereby making an opening at a very dangerous point, where burning soot or sparks can most easily communicate to the shingles.

Isaac Bradfield.

Pomeroy, Ohio.

Early Railroading.

Messrs. Editors:—On page 242 of the present volume of the Scientific American, there appeared an article giving some statements in regard to early railroading, in connection with the name of William Hambright as an old conductor. The facts recited recal the nearly analogous case of the Baltimore and Ohio Railroad, and Captain John Mitchell, of Baltimore. The Lancaster Railway was one among the first railways in this country, but not the first one.

According to my authorities, the first railway was a rather inferior one, which ran a short distance out of Boston. Then followed the Baltimore and Ohio Railroad, whose charter is dated in 1824, and the corner stone of which was laid at Baltimore in 1828. This road ran originally to Ellicott's Mills, a manufacturing site about ten miles from this city, and an attempt was made to use wind sails as the means of propulsion on the road, but they were speedily abandoned for horse power; and, some time after, two locomotives with upright cylinders—commonly called "grasshoppers"—were imported from England. The road extended in 1830-1 to Frederick City, Md., a distance of sixty miles; thence it was laid to Cumberland, and finally to the Ohio river.

John Mitchell, a well known citizen, was appointed mail agent by Hon. Amos Kendall, postmaster general, in 1837, being the first railroad mail agent under the United States government. His route lay from Washington to Philadelphia. He was paid a salary of $800 per annum, and he alternated on the route with John E. Kendall, a nephew of the postmaster general. Capt. Mitchell occupied his post a short time, when he resigned to accept the office of high constable of Baltimore, a position which he held for several successive terms. He is now the captain of one of the police districts of this city, and still a hale, hearty, and active gentleman and officer.

G. W.

Baltimore, Md.

Wooden Railways.

Messrs. Editors:—Noticing considerable discussion in your columns on the subject of wooden railroads, I wish to offer some results of my experience, touching the difference in the material used.

At the Marine Railway at this place, the carriage used in hauling out vessels is 300 feet long; as few vessels on the lakes are over half this length, and the upper part of the carriage is but little used, the track for some years was made of hardwood plank, 2 inches thick by 7½ inches wide, laid upon heavy oak stringers. These planks were rock elm, white oak, and hard maple. So long as they had but to carry the weight of the carriage, they all worked well, but as soon as we began to handle vessels on the upper part of the carriage, the elm and oak plank commenced peeling and winding around the rollers, causing considerable trouble. The maple continued to work well until the whole was replaced by iron.

Here the movement is of course very slow, but the pressure on the rollers is heavier than the tread of any loco motive.

In the account of J. M. Speer, Sr., & Sons' wooden railroad (April 1st), the rails are white oak, and acted just as they did here.

On the Clifton Railroad, I understand they are principally maple. This wood is not so durable as oak in resisting decay, but wears far better under a wheel. The reputation which the Clifton road bears here among those best acquainted with it, and uninterested in it, seems to be quite similar to that of Messrs. Speer with theirs, so far as its permanent value is considered.

G. W. Pearsons.

Ogdensburg, N. Y.

What Women Want.

Messrs. Editors:—I saw some remarks in a late number of your paper about the probability of finding a cheap power, available for the ordinary purposes of every neighborhood. With your permission, I will say a few works regarding some wants of women which, it seems to me, might be served by it. I believe one reason why the lot of the majority of women has not been more alleviated by invention, is that their requirements are not fully understood. That dumb, pathetic patience, with which the household workers toil and wear out, leaves men in the dark as to how to help them. I have had occasion to think a good deal about their necessities, and will explain what seems to me to be the fittest means of satisfying an important one.

I believe few things could be desired which would so much relieve this class of women, as a cheap laundry in every neighborhood. I have long pondered about this, but the want of cheap power seemed to render the accomplishment of such an object impossible. Washing machines for every home do not meet their difficulty, for it is constant work and consequent want of time, and not alone heavy work and want of strength, which needs to be relieved. I do not mean to say washing by hand is not hard labor; but this cannot be relieved by mere mechanical devices without losing in time. Nor could the employment of some other than human force settle the difficulty, since there would be still a mental and physical strain of constant attention.

The care of a household, with its cooking, house cleaning, washing, ironing, sewing, and mending, brings conflicting claims of duty. They harass a woman, because all must be, to some extent, neglected, and no one of the number seems to admit it. Thus the exertion is long continued, the care very great, and this wear and tear breaks down the nervous system, a woman's most sensitive part.

Thus, women need to have their work divided, and done in part by others. It may perhaps be thought that my description of the trouble shows the want of servants. But there can, in the very nature of things, be but a very small minority of the sex who can be thus aided. Wherever the very great majority of women do not marry, there is an artificial state of matters. For my part, I think that the want of good servants, which becomes greater and greater every year, as civilization is diffused, is owing to natural causes, and shows that we must make some other provision to lessen household labors.

If women who have families, could get garments made (leaving them no sewing but the mending); if they could have all the washing done, and that part of the ironing (a good deal) which could be done by machinery; the work which would be left, would neither wear them out nor render mental improvement or enjoyment impossible. It could rarely be very heavy, except in cases where there would be more than one woman in a family to do it.

I am satisfied the sewing could be go trid of, though it is foreign to the present subject to say how.

I suppose two things are needed to make real this fine project of mine for disposing of washing. The first is to obtain cheap power in every neigborhood; and, I presume, if wind could cheaply be made to store up compressed air, thus changing a variable to a constant force, it would be accomplished. The other requirement is machinery so cheap that somebody, in every country neighborhood, would be able to purchase and make a living by it. Perhaps it may sound Utopian to say this, but if clothes could be washed, dried, and ironed (so far as machinery could be made to do this) for twelve and a half or even twenty-five cents a dozen, it would confer a boon on women a million times greater than the ballot.

I suppose most inventors think mainly of the money they may make, and it may be considered a waste of words to speak of blessings to humanity. But in the old-fashioned time and place in which I was raised, money made without a benefit of equal value to the community from which it was obtained, was regarded as a not very honorable possession. As I have never given up this opinion, I refuse to think that honor is dead among others, and I hope there are some inventors who will be influenced, not merely by the prospect of gain, but by the hope of benefitting the sex to which their mothers belonged. BETSY.

Need for Long Lamp Wicks.

MESSRS. EDITORS:—In the number for April 8th, E. W. B. disputes the need for wicks longer than those at present sold by American manufacturers.

For some years I have imported, for my own use, English wicks, which are put up in rolls of one dozen yards. Beside the economy, the mess and trouble of changing a wick is reduced to a minimum.

Should any American manufacturer, who makes a good article, try the plan of selling in rolls, I have no doubt it would either largely increase his business, or compel other makers to adopt the same system.

I know of only two American manufacturers who make really good wicks, but in reference to the English, I can say that the last, of a yard length, burns as well as the first.

CANADENSIS.

Standard Sizes for Rails.

Mr. Bessemer, in his inaugural address as President of the Iron and Steel Institute, makes the following remarks on standard sizes for railway iron:

"In the early days of our railway system, the great Stephenson and his compeers had to feel their way gently in the new career they were pursuing; their engines were mere toys compared with those we now employ, and the loads they drew were small in proportion. It was, therefore, only necessary that they should employ a rail suitable to the traffic of the lines as then worked; but as the railway system began to develop itself, and new lines were opened, the necessity for heavier engines and greater traffic became apparent to the engineers by whom they were designed. Nor was the mere addition of size the only point studied; different modes of laying down the rail were proposed, and were canvassed with great interest. Stone blocks gave way to cross wood sleepers, and these again had their rivals in longitudinal sleepers, and with them came the bridge rail, and the Vignoles rail, and the double-headed rail now commonly in use. Nothing could be more natural than the way in which the profession thus glided imperceptibly into the adoption of rails, of almost every imaginable variety of form and size, nor can any one be blamed for a result almost inevitable under the circumstances.

"But it is now evident that there is no need in practice for this infinite variety of size and form; we know pretty accurately what is the general average traffic on a line, and the weight of our engines. The work which a rail has to perform is so perfectly simple, and so clearly defined, that there cannot at the present day be any difficulty in establishing a standard rail suitable for all purposes.

"Thus, suppose we take the double-headed and the Vignoles rail, as representing the two classes of rails suitable for longitudinal or cross sleepers; and if we make a heavy, medium, and light one, of each of these types of rail, we should have a choice of six sizes, that would supply all the reasonable demands of our present railway system. Taking these three standard sizes of iron rails, of each class, I would then make three other standa ds of steel rails, in which the table or wearing surface was identical in each case with the iron standard, but so reduced in weight per yard as to reduce its power to resist a blow, or to sustain a weight precisely equal to the iron standard; so that in all cases the iron *a b c* rails and the steel *a b c* rails should possess the same powers of resistance to a heavy load, or a sudden concussion. We should thus diminish the great apparent difference in price between the iron and steel rail, for it must be remembered that the price per mile, and not the price per tun, is the real test of the cost of rails. The adoption of a standard rail would afford great facilities to the manufacture, by diminishing his stock of rolls, and allowing him to manufacture in slack times, and to supply any sudden demands from stock. It would lessen the cost of production, and afford the general advantages, to the consumer and producer, which have hitherto resulted, in all cases, from the adoption of universal or standard measures. It is difficult to imagine the state of utter confusion that would have reigned throughout our whole railway system, had the gage differed on every rail to the same extent as the rails. The one instance afforded by the broad gage is sufficient to convince us of the immense disadvantages that would have resulted from such an error, and, I doubt not that, should we happily arrive at an universal *a b c* standard for rails, we shall in the future look back with dismay at our present chaotic state."

Earths and Alkalies used in Pottery, etc.

White American bolus is bright, white, compact, very smooth and soft, not coloring, burns very hard, and at last forms a whitish glass.

Pearl white: light, smooth, not unctuous nor coloring; burns to a very pale yellowish white.

Tobacco-pipe clay: smooth, unctuous, slightly coloring, but is rather hard and very white; used principally to make tobacco pipes and white stone wares.

White lumber stone is used to take stains of grease out of woolen cloth.

Soap rock or Spanish chalk is white, firm, compact, weighty, hard, smooth, unctuous, not coloring; writes upon glass, and, if rubbed off, the marks become again visible by breathing upon the place, and, therefore, very useful in painting on glass, the engraving being afterwards hardened by fire, and, therefore, preferable for staining by fluoric acid.

Kaolin or porcelain clay is dry, friable, unfusible; that of Cornwall is used to make English china and fine pottery; that of Limoges, to make Sèvres china, and is exported to most all countries of the globe. In earlier and the present times, similarly famous for their beautiful gilding and paintings, these articles are made in the manufactures of Meissen, and at Berlin and Passau, to make china for Saxony, Prussia, and Austria.

White chalk is white, soft, will mark linen when newly burned; it grows hot with water, and falls into powder, and is then made into crayons for painters.

Terra cimolia is white, compact, smooth, coloring, burning rather harder, found in the island Argentière; it is used to wash clothes.

Hard chalk is coarse.

Spanish white, *blanc d'espagne, blanc de troyes*, are made from soft chalks by washing and making into large balls for cheap white painting, and covering papers, cards, etc.

Prepared chalk is made by precipitation from a solution of muriate of lime by a solution of sub-carbonate of soda in water, and washing the sediment.

Magnesia is white, and is obtained by precipitating the bittern or liquor left in the boiling of sea water, after the common salt has been separated, by a lye of wood ashes or sub-carbonate of potash.

Sub-carbonate of magnesia is made up while drying into large cubes, the edges beveled; is powdered by being rubbed through a sieve.

Gelatinous alumine, hydrate of alumine, or pure alumine, not dried, but in a moist state, is used to mix cobalt in an oxidised condition, and other oxides, as a basis for the color.

Baum's white of alum: Roman alum, one pound, honey, one half pound, calcined in a shallow dish to whiteness.

Blanc de Bougival or gera earth is silvery, silky, white, very fine and glossy if rolled with a glass roller; used to make enamel surfaces on paper or cardboard; is effervescent with acids, and used as well as fine whiting.—*Professor Dembinsky, in the Mechanics' Magazine.*

Preservation of Meat.

Dr. Baudet, of France, has given details of a variety of experiments by him, made with solutions of carbolic acid, or, as some term it, phenic acid, in the preservation of meats. As the results of the experiments of one process, the acid used in aqueous solutions, he says:

I conclude that phenicated water, in the proportion of from $\frac{1}{1000}$ to even $\frac{5}{10000}$, might be applied to keep raw meat fresh and sweet, without imparting to it either any perceptible smell or taste, provided the meat be kept in well closed vessels, be they casks, tinned iron canisters or other vessels.

Second process; By means of vegetable charcoal, coarsely broken up, and saturated with phenicated water, at from $\frac{5}{10000}$ to $\frac{1}{1000}$. This process is applied as follows: I cover the meat with a thin woven fabric, in order to avoid its direct contact with the charcoal, which might penetrate into the fiber of the meat, which is placed next into barrels, care being taken to place therein first a layer of the phenicated charcoal, then a layer of meat, and so on alternately, until the barrel is quite filled, and all interstices properly taken up by the charcoal.

As regards the importation of raw meat, preserved by this means, from South America, I would suggest that the meat, first covered with any thinly woven fabric, be placed in bags made of raw caoutchouc, very abundantly obtainable in the country alluded to; so that the importation of raw meat and the importation of caoutchouc might go, as it were, hand in hand.

The mode of filling in alternate layers of phenicated charcoal and meat would, of course, remain the same; and there would be no difficulty in hermetically sealing up bags made of caoutchouc, either by soldering the seams together, or by placing a cap of caoutchouc over the mouth of the bag, and soldering the cap on hermetically.

Dangerous Burning-Fluid.

It would appear to be the duty of every scientific journa l to utter a note of warning against the dangerous burning oils with which our country may be said to be literally flooded. The number of accidents arising from the use of adulterated oils is so great that many life insurance companies are disposed to charge higher rates where petroleum is employed in the family of the assured. The community is always deeply shocked at a murder or railroad accident, and a thorough examination is at once held by the coroner; but the burning to death of whole families, the immense destruction of property from fires occasioned by adulterated and dangerous oils, make no more than a passing impression. There appears to be no doubt that the number of deaths from this cause is far greater than from railroad accidents; and the sooner the most stringent measures are adopted to guard the community against the repetition of such calamities, the better for all concerned. We desire to call attention to the mountebanks who travel around the country to exhibit their non-explosive oils. They show that it is impossible to explode their particular brand, and they give as a reason that it has been treated with certain chemicals in a way to remove all danger. The oil, they say, has been "carburetted" or "carbonized," "ozonized," "oxygenized," and is no longer liable to explosion. They put some of the fluid in a can and set fire to it, and sit down on the can. They perform as many tricks as the most experienced master of legerdemain, and perfectly silence unscientific listeners. These men are one and all, impostors, and if you live in the country, call in the hired man and turn them out of doors; if you reside in the city, call in the police and enter a complaint against them then and there, and have free lodgings provided for them in the station house. Nobody pretends that naphtha, alcohol, ether and the like are explosive. They can be lighted and burned quietly and in the most inoffensive manner. It is only when mixed with the oxygen of the air that an explosive compound is produced, and this part of the experiment is naturally omitted by the exhibitor. It requires considerable skill to prepare just the right mixture of light oils and air to insure success, and it is under cover of this difficulty that the dealers in adulterated oils escape detection. Unfortunately, just the proper mixture is sometimes formed in lamps as the oil is exhausted, and the fatal explosion takes place. The number of accidents from the bursting of lamps is very small, and it is not the question of explosion that should attract the most attention. By far the greater number of deaths and losses by fire have arisen from the ignition of the lamps or cans, either from the breaking of a lamp or some careless handling of the petroleum—the ignited fluid spreading over the clothing of the person or on the floor is what does the damage. It ought to be understood that there is no chemical that will make an oil safe; the patents and claims on this subject are sheer impositions. The only way to make an oil safe is by distillation, that is, removing from it all oil or naptha that will take fire below 110° F. Any oil that can be lighted on its surface by a match and will continue to burn without a wick, is unsafe. Sperm oil, rape seed oil, and the refined petroleum can be poured upon the floor and a match applied, but they will not burn; it is necessary to heat them to a high point before any vapor will come off that will take fire from a taper and continue to burn. Any oil that, when poured into a saucer, will take fire from a match and continue to burn, as alcohol does, is unsafe, and ought to be discarded at once. Such an oil contains volatile compounds which can give rise to explosive vapors, and if the lamp breaks, may occasion the most dangerous burns. We must therefore warn all persons from using such oils about the premises.

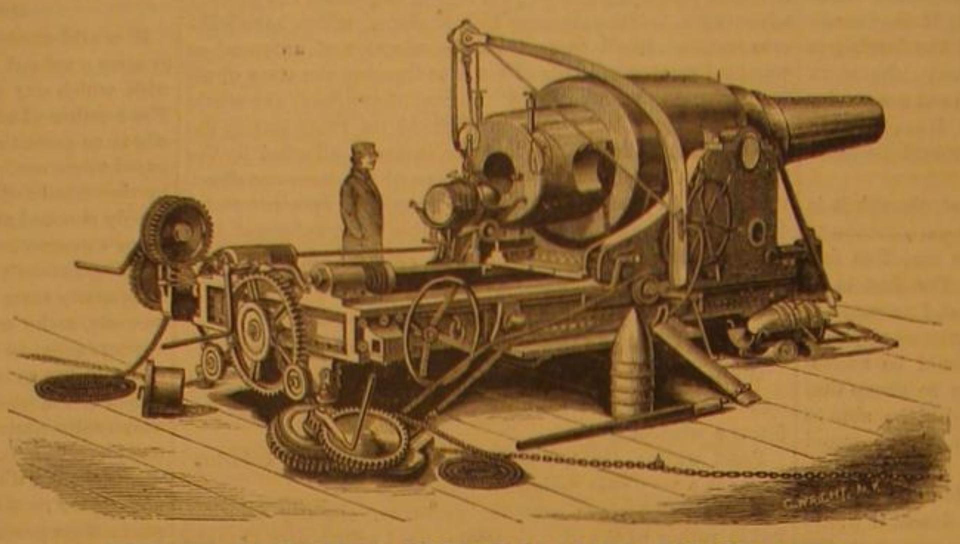
There is another danger to which we wish to call attention and that is the use of cheap fluids in the so called vapor stoves. Next to the use of gunpowder for heating purposes, we know of few things so dangerous as these inventions. Their very utility is founded on the conversion of the oils into a vapor so that it can be readily ignited, and afterwards the heat of combustion keeps up the supply of gas. The persons who use these contrivances first manufacture a vapor that, when mixed with air, is fearfully explosive, and then in defiance of fate, they put a light to it, and ought to be thankful that the whole apparatus is not blown to atoms. The inventors of these infernal machines are fully aware of the danger and hence the long list of precautions that accompanies each package; all of the directions are intended to guard against the formation of the explosive mixture of air and vapor mentioned at the outset of our article. The skill required to manipulate such contrivances is of the highest character. We have used them in laboratories to produce a powerful gas jet for many years, but never allowed any but experienced assistants to attend them. In inexperienced hands or where the greatest care is not constantly exercised, they should never be used. We repeat, trust none of the so called non-explosive oils or patent contrivances to burn them.—*Journal of Applied Chemistry.*

Krupp's Cast-steel Breech-loading Rifled Guns.

The superiority of cast steel over every other material used for guns is now an acknowledged fact, and its general adoption may be regarded as merely a matter of time. The Krupp system of breech-loading steel guns is now used by many of the European governments with much success, and to the wonderful accuracy of range and great penetrating power of these guns may be attributed, in a large measure, the recent victories of the German armies whenever their artillery was used. They are manufactured at Fried. Krupp's great establishment, at Essen, Prussia. An interesting description of these works was published some time ago in the SCIENTIFIC AMERICAN. About two thousand steel guns have, so far, been turned out.

The largest Krupp guns used at the siege of Paris were 24-pounders, or, as they are now called, fifteen centimetres (about six inches). The weight of this gun is about six thousand pounds; charge of powder, four and a half to five and a half pounds; weight of projectile, fifty-five to sixty pounds. The French forts were armed with the largest marine guns of the French fleet, but the accuracy of the 24-pounders soon dismounted them, piercing the casemates and reducing Fort d'Issy to a heap of ruins. During the entire siege operations, as well as in the artillery fights, the loss of the Germans was insignificant.

Our engraving is a view of one of Krupp's eleven-inch, breech-loading steel guns, with self-acting casemate carriages, showing also the mode of charging the gun. An illustration of a fourteen-inch gun, of somewhat similar form, carrying a projectile weighing 1,000 lbs., was published in our paper of Oct. 1, 1870.



KRUPP'S CAST-STEEL BREECH-LOADING RIFLED GUNS.

COMPARATIVE VALUE OF VARIOUS GUNS.

	Weight of gun.	Weight of projectile.	Weight of charge of powder.	Foot-tuns per square inch of section of projectile.
	lbs.	lbs.	lbs.	
24-pounder siege artillery	6,000	55 to 60	4½ to 5½	
" " marine hooped gun	8,000	77	15	47·70
11-inch Krupp gun	55,000	495	83	74·70
15 " Rodman gun	39,000	460	60 to 100	25· to 43·

The above table shows that the penetrating power of a 15-inch Rodman gun, weighing 39,000 lbs., with 60 lbs. of powder, is equal to 26·80 foot-tuns, and with 100 lbs. of powder, equal to 43 foot-tuns, while the 24-pounder Krupp gun, weighing only 8,000 lbs., and with only 15 lbs. of powder, is equal to 47·70 foot-tuns. A ship armed with this light weapon would be more than a match for any vessel with as many 15-inch guns on board as she could carry.

In view of these facts the quicker our government removes the smooth bore Rodman guns from its forts and vessels, the better. It is evident they are good for little except old iron.

The latest competitive trial of steel guns took place on the Steinfeld, at Vienna, in October, 1870, between a Krupp 9 in. breech loading gun and a 9 in. Armstrong muzzle loader.

After 111 rounds (with prismatic powder), the Armstrong gun showed a split 26 inches in length, and was declared to be completely unfit for service.

The Krupp gun fired in the same time 210 rounds—the gun and the breech loading apparatus being pronounced perfect at the close of the trial.

The greatest number of rounds, fired from one of the 11 in. Krupp guns, on record at the works, is about 600, but some of them have, no doubt, fired a much larger number.

The 14 in. guns (50 tuns) were tested two years ago by 18 rounds each, with projectiles of 1100 lbs. and 150 lbs. of powder.

Thos. Prosser & Son, 15 Gold street, New York, are the American agents.

Workmen's Houses.

It is so repugnant to the feelings of an Englishman, says the *Scientific Review*, to be compelled to dwell with several families in one house, that every endeavor to provide cottage accommodation for workmen, who have naturally but a limited amount to dispose of for rent, should receive the utmost possible encouragement; more especially as, from the smaller amount of profit attending the construction of cheap houses, there is less inducement for architects and builders to give their attention to that class of dwelling. To meet, therefore, the wants of workmen, whether artisans or clerks, Mr. John P. Harper, M. E., of Derby, has prepared an admirable series of plans for workmen's houses and semi-detached cottages, which can be so cheaply erected as to permit of their being let at a merely nominal rental, although affording all the comfort and convenience that need be desired.

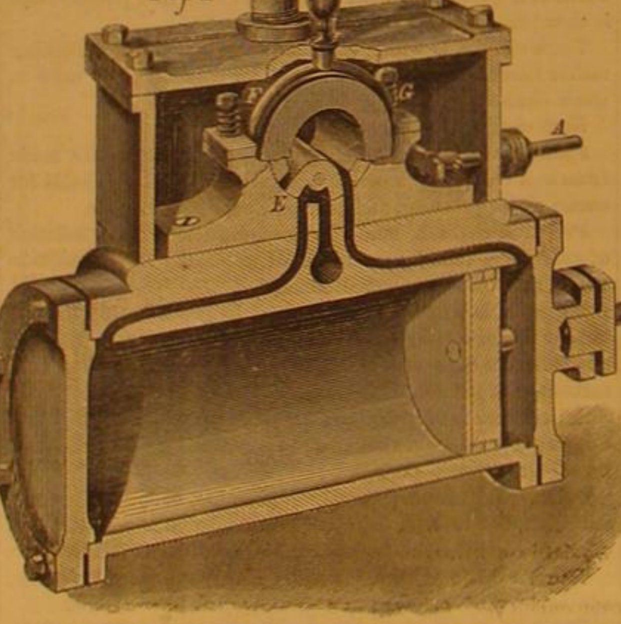
The hollow brick wall is that which Mr. Harper advocates, and as by this means one third of the bricks otherwise necessary are saved, its advantages will be obvious. The hollow walls, moreover, are quite as substantial and durable as solid walls of equal thickness. As in this system of building there is always an air jacket between the inner and outer portions of the walls, the damp cannot enter the rooms, so that the houses are rendered drier, warmer in winter, and cooler in summer. The advantage of the hollow wall system may be judged of from the fact that some of the houses built in dry weather upon that system, by Mr. Harper, have been inhabited before quite completed, without injury to the occupants. As the design of the houses, and the amount of the accommodation given, must, of course, be dependent upon the amount of money that can be expended upon them he has prepared several sets of plans to meet the various requirements, care being taken in all cases to give a moderate-sized living room, and ample bed room accommodation.

In the plan, which seems to have secured the greatest amount of approbation—for Mr. Harper has built a considerable number of houses upon it, and the tenants have always expressed themselves highly satisfied with the arrangements and accommodations afforded—he has given an excellent living room, or kitchen, 15 ft. by 14 ft. 2 in., with a small space (about 8 ft. by 3 ft.) taken out at one corner for stairs and cupboard; a parlor 11 ft. by 9 ft.; and a good cellar pantry 9 ft. by 3 ft. 7 in.; while on the upper floor are three moderate-sized bed rooms—one with a good fireplace in it. The privies, ash pits, and coal stores, are at a distance from the houses, so that their healthfulness is insured. When built in blocks of not less than twelve, these houses can be erected at the rate of £78 each (exclusive of drains), and a small scullery, or wash house, can be added at very little cost. The design appears very good, and is calculated to give good and efficient ventilation in every room.

SEIFERT'S BALANCED STEAM VALVE.

The soul of a steam engine, if we may be allowed such an expression, is in its valve gear. It is this, principally, that

Fig 1



gives an engine its individuality, and upon it, more than on anything else, depends the economy with which a steam motor performs its work.

Many have been the devices by which it has been sought to relieve steam valves from the pressure on their faces.

Fig. 2

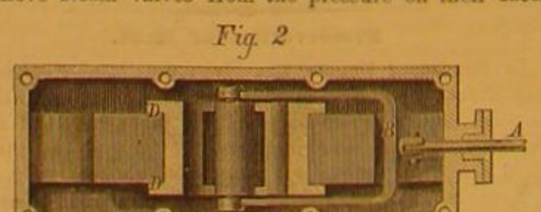
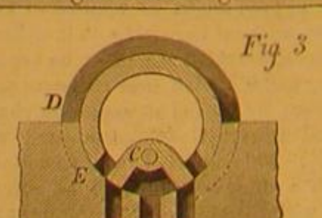


Fig 3



To say that a perfectly balanced valve probably does not exist, is only to reiterate the story of man's constant failure to attain to his ideal, whether in mechanics, art, or morals But although imperfections cannot be wholly eliminated from this class of devices, any more than from anything else man can contrive, a degree of perfection may be, and has been obtained, sufficient to greatly lessen the loss of power expended in overcoming valve friction.

Our engraving shows another competitor in this field, designed primarily for use on locomotives, but adapted to any kind of engine, which, while it is claimed to be as perfectly balanced as others in use, offers advantages not possessed by them.

The valve is cylindrical, and fitted to seat on all sides The steam is admitted through the center of the valve, and pressing equally in all directions, does not press the valve more in one direction than in the opposite direction, so long as the fitting remains steam tight.

Fig. 1 is a vertical and longitudinal section through cylinder, steam chest, and valve. Fig. 2 is a plan view of the valve and its attachments, and Fig. 3 is a sectional elevation of the valve, with a portion of the seat. The valve stem, A, Fig. 2, is pivoted to a yoke, B, which in turn is pivoted to the valve at the lower side, as shown at C, Fig. 3.

On each side of the valve is formed a rim or flange, D, Figs. 2 and 3, which fits steam tight against the sides of the valve seat, E, Figs. 1 and 3, and also tight against the sides of a cap, F. This cap, F, is held down to its place by studs and coiled springs, shown at G, Fig. 1. This allows the valve to rise when the motion of the engine is reversed, or when it is running without steam.

The valve, being simply a slide valve running upon an interior cylindrical surface, retains all the properties of the ordinary slide valve, with this additional characteristic, that, moving on a central axis, which is the geometrical axis of the cylindrical surface of the valve, it has a quicker motion, giving more rapid admission of steam, sharper cut-off, and freer exhaust.

Besides these advantages, it is claimed that it can be made at a cost little exceeding that of the plain slide valve When the engine works water, all sediment tends to run down and escape at the exhaust, instead of spreading over the seat and cutting the surfaces of both valve and seat. The valve can be applied to any engine in use, the new seat being placed over the old one without any injury to the latter. The seat of the valve, except, at most, the areas of the two ports, being always covered, it is not so liable as the old style of valve seat to be injured by rust, when the engine stands unused. In case the yoke should break, it will drop at once down, out of the way of blows from the return stroke of the valve stem, which obviates the breakage of parts in the steam chest under such circumstances. If the valve itself should break, which sometimes occurs, none of the broken parts can get out of place or wedge in the ports, and thus give rise to extensive breakage, as would be the case with the plain slide valve.

It is claimed that on engines with heavy fly wheels, and upon which the demand for power is very unequal, as with those used for driving rolling mills, etc., the quick motion of this valve will act as a controller of speed, enabling the engine to accommodate itself to the work to be performed.

The valve is lubricated by means of a cup with tubes leading down over the cap, as shown in Fig. 1; and it retains oil better than a plane surface.

Patented, through the Scientific American Patent Agency, March 28, 1871, by Seifert and Kane.

Address for rights or license to use, Mr. T. Kane, 222 East Fifty-second street, New York city.

The Star Sirius.

Many things combine to render this brilliant star an object of profound interest. Who can gaze on its pure silvery radiance, and reflect how many ages it has adorned the heavenly dome with its peerless lustre, and how many generations of mankind have rejoiced in it—and among them all the wise and the good and the great of history,—without awe, and admiration!

In ancient Egypt, it was an object of idolatrous interest. It was then of a brilliant red color, but is now a lustrous white; and the cause of this change of color, as well as the nature and period of the revolution it denotes in the star itself, are wholly unknown. Its distance from our earth is not less than 1,300,000 times our distance from the sun; and its light must travel twenty-two years to reach us! Another circumstance of deep interest connected with it is, that it has changed its position, during the life of the human family, by about the apparent diameter of the moon; and that astronomers, detecting some irregularities in its motion, have been convinced that it had a companion star—which they thought to be non-luminous, since their telescopes could not detect it. But Mr. Clark, with his new and powerful achromatic telescope, has found this neighbor of Sirius, hitherto invisible, and verified the conclusions to which astronomers had been led by reasoning on the facts they had ascertained.

HOW TO PRESERVE EGGS.—Apply with a brush a solution of gum-arabic to the shells, or immerse the eggs therein; let them dry, and afterwards pack them in dry charcoal dust. This prevents their being affected by any alterations of temperature.

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NEW YORK, SATURDAY, MAY 6, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

COMPOUND ENGINES.

The idea of exhausting from one cylinder of a steam engine into another, and there utilizing the expansive force remaining in the steam after it has done its work in the first cylinder, is not by any means new. The history of the earlier attempts in this direction is so familiar to engineers that a review of it would be trite. Of late, however, this idea has been revived, and we are now in the midst of a compound engine mania.

A certain class of engineers seem to think that there is some peculiar law which works in a compound engine, by which a large gain in economy can be made. That great gain has been made by the substitution of compound engines for single cylinders, in certain cases, cannot be denied. That this gain is inherent in the compound system *per se* is denied by able engineers. The use of steam expansively, if the expansion be carried to its economical limit, will always show great gain over steam used non-expansively, or imperfectly expanded. Whether the substitution of compound engines for single cylinder engines has accomplished more than would have been done by single cylinders so constructed as to admit of expansion to the same extent, is a question open to debate. A given volume of steam, at a given temperature and pressure, has in it the capacity for the performance of a given amount of work, which theoretical amount of work can never be exceeded by the use of any appliance whatever.

If compound engines can be proved to work steam nearer up to its theoretical limit than single ones can do, their value will be established. It is not established, however, by the comparison of compound engines with single ones confessedly inferior to other single ones. A gain in economy must be clearly traceable to the system as a system, and not only traceable to it, but capable of being explained on rational principles, before it can be accepted as a scientific fact. If there be any such gain, it neither depends upon any occult cause, nor results from anything other than the operation of well known laws of heat and steam.

With the same initial pressure and the same expansion, waiving the effects of friction, radiation, and clearance, the same results would be obtained by engines of either class; but the disadvantages of clearance, radiation, and friction are increased in compound engines, and hence there must be some good reasons for their use, which compensate for these disadvantages.

These reasons may be briefly stated. Improvements in surface condensers enable marine boilers to carry much purer water than they could do formerly; and hence they can carry higher steam. With higher steam, the principle of expansion has become more economically available. Marine engines are for the most part, direct acting, using slide valves with which steam can not be cut off so as to expand in single cylinders to the extent desired. To effect this expansion without the use of an independent cut-off, the compound engine is employed, and it may therefore be considered as a substitute for independent cut-off single engines, designed to produce the same result.

It is evident that in the compound engine, the expansion might be carried to its extreme economical limit, by the proper proportioning of the size of the large cylinder to that of the small one, were it not that some losses occur, alluded to above; a commonly great source of loss arising from the waste space or clearance between the two cylinders.

It is not, then, because any principle is employed in the compound engine, not involved in the action of other engines, that it is found good practice to use them for propelling ships, but simply because their use renders it possible to accomplish a result not otherwise attainable except by the use of complicated valve gear, and by relinquishing other features desirable to retain in marine engines.

For land engines, there is less to be said in their favor. We doubt that any result, not attainable by a good variable and independent cut-off, has ever been shown by them; while at the same time they are more cumbrous and expensive. There have been, however, some statements made in regard to a 150 horse-power compound engine—running at Yonkers, a short distance from New York on the Hudson river—which, if substantiated, will go far to modify our opinion. We have not seen this engine, but are told that it is compact in the extreme, and that it gives an economical result of less than two pounds of coal per horse power per hour.

There is no mistaking the fact that we have entered upon an era of compound engines. Not only are old vessels being refitted with such engines, but some of the best new steamers are supplied with them. The steamship *Oceanic*, recently described in our columns, has a fine specimen of this class of engine, finished in a style worthy of that magnificent craft. A well-known engineer of this city is superintending the construction of several for the United States Navy, while abroad they seem to meet universal favor.

INSPECTION OF STEAM BOILERS.

We are in receipt of the second annual report of Mr. T. J. Lovegrove, Inspector of Steam Engines and Boilers, Philadelphia, Pa., which states that, during the year 1870, only two persons in the department have been injured by steam; one slightly scratched by the explosion of one of the sections of a Harrison boiler; and another scalded by the explosion of another boiler, but only so as to be confined to his residence for two weeks.

It is claimed that the immunity from disastrous explosions in Philadelphia, when contrasted with the large number that occurred during the same year in various parts of the United States, is evidence of the efficiency and utility of boiler inspection in that city.

If proper systems of inspection can be secured, there can be no doubt that steam boiler explosions would become so rare that the dangers attending the use of steam would be reduced to scarcely more than attend the use of water power. The difficulty lies in the selection of inflexible and thoroughly qualified officers, who know enough to perform their duties, and who will not, for any consideration, neglect them. Laws are easily framed, but it is not always easy to obtain their faithful execution.

The inspector regards as safe the class of boilers known as "sectional," which comprises numerous devices of tubes, globes connected by tubes, etc., in which the water is contained, and heated by the external application of the gases of combustion. He thinks such boilers might be properly exempted from inspection.

The increasing use of steam is shown by the fact that 31 new boilers have been put into use in Philadelphia during the year, while 27 old ones have been repaired and re-created, making a total of 58 more than were inspected the previous year, and which will furnish power to establishments employing in all 3,500 operatives.

During the previous year, so large a number of boilers were condemned that in the present year it has only been necessary to condemn one.

The inspector refers, in his report, to an editorial published in this journal (in our issue of April 23, 1870), upon Steam Boiler Inspection; in which we opposed a proposition said to have been made in Chicago, to vest the power of inspection wholly in a steam boiler insurance company. He thinks the other suggestions made in the article referred to would, if adopted in Philadelphia, prove advantageous to its interests. We felt certain, when writing the article in question, that we were reflecting the views of intelligent steam engineers and steam users throughout the country; and we trust that the remarks made on that occasion, in connection with others made before and since, will continue to aid in the efforts now making in different parts of the country to establish thorough systems of boiler inspection.

We also gather from this report, that the system of inspecting and licencing such men as are to have the charge and care of boilers, is working well, although we are surprised that there are so many reported as examined and licenced, considering the fact that there is no penalty attached to the employment, for this purpose, of men who have not passed such an examination, and who possess no licence. To be efficient, such examination should be made compulsory, under penalty for neglect. Without this, it will be little more than a farce.

The average qualifications of men who claim to be able to perform the duties of engine and boiler tenders, is shown by the fact that, out of 56 examined, only 4 were first class: 26 were second class, 22, third class, and 4, fourth class. Out of 39 renewals, only 9 were first class.

We are convinced that the inspection of boilers needs to be supplemented by the thorough examination of boiler tenders, before we can expect the full value of any system of inspection to be fully demonstrated. With good sound boilers, and men thoroughly qualified in all respects to use them, we should rarely hear of disastrous boiler explosions.

ONE HUNDRED THOUSAND DOLLARS REWARD FOR A NEW INVENTION FOR PROPELLING CANAL BOATS.

The Legislature of the State of New York, at its recent session, passed a bill offering a reward of one hundred thousand dollars for the best improvements for the propulsion of canal boats. This bill had not, at the time of our going to press, been signed by the Governor, but his prompt signature is expected, and thereupon it becomes a law. In another column, we publish the full text of the bill.

The reward offered is a handsome one, is not hampered by any obnoxious or narrow conditions, the terms of competition are broad and liberal, and the whole matter is highly creditable to the authorities. In nearly all other examples of public rewards for improvements, it has been made an imperative condition that the inventor should surrender his rights to the patent. In the present case, nothing of this kind is required, but the inventor will be entitled to the offered reward, and to all additional benefits that he may be able to derive from his patents.

These liberal and judicious terms will have a tendency to stimulate the inventive geniuses of our country; and, that some of them will succeed in studying out good and practicable plans, meeting every requirement of the case, we cannot for a moment doubt.

The Commissioners, who are to decide upon the merits of the various plans, embrace some of our most honored and able citizens. Gen. George B. McClellan, of New York city Chief Engineer of the Department of Docks, 348 Broadway is to be chairman of the commission. Rules and regulations for the filing and examination of plans will doubtless be issued by the Commission, which we shall duly place before our readers.

The Commissioners, after examining the plans, will decide as to the best, and may issue in the aggregate three certificates. Should they issue but one certificate, the holder will receive fifty thousand dollars. If two certificates are issued, the holder of number one draws thirty-five thousand dollars, and number two, fifteen thousand. If three certificates are issued, number one draws thirty thousand dollars, number two, fifteen thousand, and number three, five thousand.

After this selection from the plans and payment of rewards, practical trials thereof upon the Erie Canal are to take place, and upon such trials, the Commissioners are to award the further sum of fifty thousand dollars, issuing three additional certificates, as before described, making the total sum of one hundred thousand dollars.

The improved navigation of the Erie Canal is a matter of momentous importance to the State of New York. Upon the economy and expedition with which produce can be transported through the canal depends the question, whether this State is to maintain its pre-eminence as the main highway for Western export and supply, and this city, its proud position as the emporium of shipping and commerce.

THE REMOVAL OF THE HELL GATE OBSTRUCTIONS.

Few who have not visited the scene of operations now in progress for the removal of the Hell Gate obstructions in the East river, have an adequate idea of the extent and difficulties of the undertaking. We have in progress an engraving illustrating the work, which will shortly be published, and we shall accompany it with more detailed description than we have yet given.

The rock which has to be removed in making the headings is a very hard trap rock, extremely difficult to drill. The drills used are the diamond drills of Severance & Holt, illustrated descriptions of several kinds of which have, at different times, appeared in this journal. The style of drill used in this work may be described as follows:

The boiler, a small upright, used extensively in mining work, is stationed in the shaft, and steam is driven through a two inch rubber pipe to the machine proper. This consists of a simple framework of iron, about seven feet high by three feet square, formed by four upright posts, with cross arms at top and bottom. A small double acting oscillating engine, with cylinder three by six inches, drives the rotary drill, which is a hollow tube, upon the end of which is secured a piece of steel somewhat less than two inches in diameter, called the "head." In the face of this head are set four rows of the carbons or black diamonds, three in each row, with four more in the outer circumference, one between each row, making sixteen diamonds in all. The setting of these stones is similar to the setting of a jewel in a finger ring. Although they are diamonds, the value is but a trifle compared with the more common yet less useful carbon bearing that name. The market price is from three to six dollars each.

A small force pump connected with the machine, and worked by it, forces water through the tube or drill, so that the surface upon which the diamonds act is always wet. This prevents the heating of the drill, and at the same time softens in a measure the surface of the stone. The drill is driven at a speed of about 400 revolutions in a minute, and is capable of drilling a two inch hole about six feet per hour, or twenty-four feet each four hours. Three experienced miners will drill a hole of same dimensions three feet in the same time, showing that the machine, with its two attendants and one fireman, will do the work of eight men.

These diamond drills are being used very extensively in the marble and slate quarries of Vermont, and Severance & Holt are extensively engaged in making them. In addition to drilling single holes in the rock, they are used for channeling purposes—a number of drills being used intersecting the holes, so that a complete cutting is made.

MORE HUMOROUS THAN SCIENTIFIC.

The Chicago *Post* is to be congratulated upon having attached to its staff a writer of such rare gifts and acquirements as the gentleman who penned the article, "What shall we Eat?" and which we find floating about through our exchanges. Men who can dress up nonsense in so attractive and spicy a manner, are not numerous, and are a boon to the dailies who can secure their services.

First, he tells us that "when we pour milk into a cup of tea or coffee, the albumen of the milk and the tannin of the tea instantly unite and form leather, or minute flakes of the very same compound which is produced in the texture of the tanned hide, and which makes it leather, as distinguished from the original skin. In the course of a year, a tea drinker of average habits will have imbibed leather enough to make a pair of shoes, if it could be put into the proper shape for the purpose."

Now, we beg our readers and others who have laughed at the fun of this paragraph, and then grown sick at the thought of their stomachs being turned into tanyards, not to give themselves any uneasiness. The humor of this pleasant writer is far greater than his knowledge. It is gelatin, not albumen, that unites with tannin in the manufacture of leather, and gelatin does not exist in milk, unless it is put in by mistake or design.

Again, our funny scientific lecturer says: "A great many things go into the mouth. This is not an original remark. We have seen it somewhere. But it is an alarming fact. We drink, every one of us, a pair of boots a year. We carry iron enough in our blood constantly to make a horseshoe."

Smelting furnaces, as well as tanneries, are we called? Let us see. The average quantity of blood in persons weighing 140 lbs., is one fifth the entire weight—28 lbs., which contains, according to Lecanu, less than 0·002 of its weight of oxide of iron, or less than 0·64 of an ounce, of which less than three fourths, or less than half an ounce, is iron. What sized horses have they in Chicago that wear shoes weighing only half an ounce?

Again, we are told, that "we have clay in our frames enough to make, if properly separated and baked, a dozen of good-sized bricks."

Whereabouts is this clay located in the human system? The statement is, no doubt, based on facts peculiar to Chicago. One brick is about as much as a good-sized New Yorker can carry. Does our friend mean to intimate that people in Chicago can carry a dozen, and good-sized ones at that? Of course, when speaking of frames, he means hat frames, since clay does not enter as an ingredient into the animal economy. "We eat at least a peck of dirt a month—no, that is not too large an estimate." That *may* be true, but we don't think Chicago can beat New York in this particular, no matter how many bricks her citizens can, individually, stagger under. In the matter of dirt eaters, we do believe we have some champions that can beat the world; we will not do violence to their modesty by publicly naming them.

But we are not only charged with being tanneries, iron works, and brickyards, but with being hat factories. Says the scientist of the Chicago *Post*, "The man who carelessly tips a glass of lager into his stomach little reflects that he has begun the manufacture of hats, yet such is the case. The malt of the beer assimilates with the chyle and forms a sort of felt—the very same seen so often in hat factories. But not being instantly utilized, it is lost."

Cannot some inventor make his fortune by inventing a process for saving this felt made, not of lager and chyle, but out of the wool extracted from a Chicago editor's eyes? Certainly his acquaintance with lager is limited, or he does not know chyle.

But we are "marble yards" as well. He goes on to say: "It is estimated that the bones in every adult person require to be fed with lime enough to make a marble mantel every eight months."

This is good, when it is considered in connection with the fact that a dried human body weighs from fourteen to twenty pounds altogether—bones, muscles, and viscera.

Finally, our Chicago physiologist sums up;

"The following astounding aggregate of articles charged to account of physiology, to keep every poor shack on his feet for threescore years and ten:

Men's shoes, 70 years, at 1 pair a year........ 70 pairs.
Horseshoes, 70 years, 1 a month, as our arterial system renews its blood every new moon. 840 shoes.
Bricks, at 12 per 7 years.......................120 bricks.
Hats, not less than 14 a year...................980 hats.
Mantels, at 1½ a year...........................150 mantels.

Here we are surprised to observe that we eat as many shoes as we wear, and a sufficient number of hats to supply a large family of boys; that we float in our blood vessels horseshoes enough to keep a span of grays shod all the while; that we carry in our animated clay, bricks enough to build a modern fireplace, and in our bones marble enough to supply all our neighbors with mantels. We have not figured on the soil, at the rate of a peck a month; but it is safe to say that the real estate that a hearty eater masticates and swallows in the course of a long and eventful career would amount to something worth having, if sold like the corner lots on State street, at $2,000 a front foot."

In this summary the horseshoes, bricks, hats, and mantels are multiplied in a manner that shows its compiler to be just the right man in the right place. Let him alone for making mountains of molehills. Clearly the Chicago *Post* never need be at a loss for something sensational so long as it keeps to itself this astonishing computer, and sees to it that he keeps an ample supply of bricks in his hat.

ARE NOISOME EFFLUVIA INJURIOUS TO HEALTH?

In the last number of the New York *Medical Journal* appears an article from the pen of Wm. C. Roberts, M.D., Vice-President of the New York Academy of Medicine, in which he discusses at length the effect of what he styles "non-specific emanations," on the public health.

In this article, Dr. Roberts refers to a paper read by him some years ago before the New York Academy of Medicine, in which he took the ground that "noisome smells, effluvia, or fetid emanations were not necessarily and in all cases injurious to the health of individuals or communities." In that paper, the author maintained that the importance of such emanations as sources of disease had been overrated; that only under certain circumstances were such odors and exhalations pestilential, and that when non-specific, that is, when not proceeding from matters containing the infection or contagion of specific diseases, such as small-pox, etc., they were, for the most part, innocuous.

In the article under consideration, he admits that, in certain idiosyncrasies, such emanations do occasionally cause a train of disorders, acting partly through the brain and nervous system, and partly through the blood. Among these disorders are enumerated diarrhœa, cholera morbus, dysentery, and typhoid fever.

Dr. Roberts, however, after making these admissions, thinks them of little effect as bearing upon the point at issue—the effect of bad odors upon the general health—and goes on to state, that, in the filthiest and most fetid streets of New York, where the air "reeks with tainted odors of slaughter houses, etc.," the inhabitants do not suffer more than those in cleaner localities; that persons engaged in offensive manufactures enjoy good health; that while, not long ago, small pox prevailed extensively in the city, a certain locality, which, according to his statement, was in too disgusting a condition for description, did not show any special susceptibility to the endemic.

In support of this view, he also cites facts stated and assertions made in a discussion of this question before the British Association, at its annual meeting at Bath, England, in 1864. Some of these facts and assertions we will enumerate as briefly as possible.

The large quantity of sulphureted hydrogen emitted by the volcanoes near Naples does not render that city more susceptible to typhoid fever than other cities. The hospitals of that city are dirty and noisome, yet this condition of affairs does not cause fever. The worst fevers prevail endemically where there are no bad smells. Carbureted hydrogen, which has no smell, is as injurious to health as sulphureted hydrogen, which has a most disgusting smell.

The smell of the water of Leith is offensive to such a degree that it is said "it will knock down the de'il," yet its banks are the healthiest part of the city.

Dr. Livingstone, the great African explorer, believes tha foul odors are not the cause of fevers in Africa. "He stopped with his suite all night at a place down the Nyanzi, where the water, as it came out of a marsh, was as black as ink, and had a most abominable smell, turning the paint on the ships white, etc. This phenomenon did not produce illness in the crews, nor was it known to do so among the natives. It would, he said, be a great mistake to suppose that fevers came from the presence of bad smells."

Dr. Kirk concurred in Dr. Livingstone's opinion. Dr. William Budd, who is distinguished for his researches into the causes and pathology of epidemics, believes that mere smells are innocuous. In 1858 and 1859, when the river Thames stank so grievously that the committee rooms of Parliament were only habitable through the use of deodorizers, and the law courts were broken up; and when the steamers lost their traffic, passengers going miles around to avoid even crossing the bridges, the health of London remained remarkably good. Fever, diarrhœa, and dysentery were even less than in 1857.

Thus much for Dr. Roberts' opinion, and the facts which support it. Before remarking upon them, we will mention a case in point, which adds to the strength of his argument. Gloversville, in central New York, produces annually a very large quantity of gloves, the leather for which is tanned in and about the village. There is in summer a constant smell pervading the air, resembling that of carrion, extremely offensive to those not accustomed to it. Yet the average health of the community is as good as that of other villages in the same county, exempt from this odor.

It is, in the opinion of Dr. Roberts and of other authorities cited, necessary to remove and disinfect the substances emitting foul smells, not because they are necessarily inimical to health, but because they *may* contain the germs of specific diseases; therefore, for the safety of the public, they should not merely be deodorized, but *disinfected* also.

While, in the main, agreeing with the opinions above set forth, and not disputing the alleged facts brought forward to support them, we still believe that foul odors, emanating from organic substances in a state of decay, even if free from contagion, do, through their debilitating effect, predispose or fit the human system for certain kinds of disease; so that, while there may be no greater number of cases in which such complaints originate, those who are attacked are less liable to resist the attacks, and recover more slowly.

It is also admitted by many, who do not believe specific diseases can be generated by foul smells *per se* that such smells produce disturbance in the digestive organs; and disturbance in any function of the human economy certainly may lead to positive disease, even if not of the class called specific.

We are greatly averse to any excuse for filth. Dirt is a foe to good morals, and bad morals are a fruitful source of disease, so that indirectly, if not directly, dirt is inimical to good health.

SCIENTIFIC INTELLIGENCE.

TO DISTINGUISH COAL TAR BENZOLE FROM THAT MADE FROM PETROLEUM.

Brandberg recommends a piece of pitch for this purpose. Pour the liquid to be examined on to a small piece of pitch in a test tube. Genuine benzole dissolves pitch in a few moments to a tarry liquid, while that made from petroleum, as well as petroleum ether and ligroin, is scarcely colored by it, even after having been left in contact with it for several hours. The properties and uses of benzole vary considerably, according to its source, and the above test will therefore be found convenient.

A NEW GALVANIC BATTERY.

M. Laschinoff recommends a convenient form of battery for lecture room experiments. It is a modification of Bunsen's, and is so constructed that both caps can be emptied by inverting the battery, or refilled by turning it back to its original position. In this way, the battery can be got ready at a moment's notice, and the tedious operation of filling and emptying is avoided. It would be impossible, without an illustration, to convey an idea of the contrivance; but our readers may be able to invent something of the kind, now that they know the thing has been done.

A NEW CINCHONA ALKALOID.

D. Howard observed that, in analyzing certain quinine salts, a considerable loss was always encountered. This led to a systematic examination of the subject, and he discovered a new alkaloid, differing in its chemical properties from quinine and cinchonine. What peculiar physiological properties the new alkaloid may have has not been determined, nor has the author given a name to his bantling. The probabilities are that it is nearly identical with quinine, and that it is contained in most cinchona bark. It is said that Liebig's extract of meat contains an alkaloid analogous to caffein and theobroma, which may account for the peculiar action of this form of meat.

A CASE OF POISONING WITH NITRO-BENZOLE.

A British medical journal reports a case of poisoning with nitro-benzole; and as this article is extensively employed as a substitute for bitter almonds, in confectionery and cake, it is well to caution the public against its use. A healthy workman, in sucking some of the nitro-benzole, in a syphon, accidentally swallowed a small quantity. He continued for two hours at his work, when he was seized with headache, loss of memory, and difficulty of speech; his countenance was livid; then followed convulsions and unconsciousness. Five hours after the accident, the physician observed cold extremities, enlarged pupils, unconscious urinal and excremental passages, then vomiting. Although every effort was made to save the man's life, all remedies proved in vain, and he died after three days of great suffering. It is thus conclusively shown that nitro benzole, like its derivative aniline, is a poisonous substance, and one that ought to be handled with care.

NEW SOURCE FOR BENZOIC ACID.

The urine of horses and cattle is utilized in Northern Prussia for the manufacture of benzoic acid. One house at Königsberg supplies the market from this source. The establishment makes 7,700 lbs. of benzoic acid annually, for which 3,850,000 lbs. of urine are required, not to speak of ship loads of fuel to evaporate it. Benzoic acid is now chiefly used in the manufacture of a red color for woolen goods, and is also highly prized in making certain kinds of perfumery.

PREMATURE DISCHARGE OF NITRO-GLYCERIN AT HOOSAC TUNNEL.

There appears to be some danger in employing electrical discharges during a thunder storm. At Hoosac, the connection was made with a battery ready to explode a large quantity of nitro-glycerin, when the whole series of drill holes was fired by the sudden passage of an electric cloud, before all the workmen could get out of the way. A similar experience in Europe ought to teach greater caution in making connections with the electric wires during thunder storms. Telegraphic operators understand the danger and keep out of the way. Miners ought to be equally cautious.

PREVENTING RUST.—To make an improved anti-rust composition, Mr. E. J. Powell, of Birmingham, takes equal parts of Russian tallow and the greasy matter obtained by the distillation of resin oil, and called anti-friction grease. He fuses the said tallow and grease together, in a vessel heated by steam or hot water, and to each 100 lb. of the mixture he adds two pounds of mercurial ointment, and one pound of lampblack. He first melts and thoroughly incorporates the tallow and grease, before adding the other ingredients, and when the whole has been thoroughly incorporated, the composition is either cast into blocks or masses of a convenient size, or allowed to cool in the vessel in which it is made, and afterwards removed.

The Firing of Gunpowder in Closed Chambers.

Captain Andrew Noble, F. R. S., recently gave a lecture on the pressure of fired gunpowder, at the Royal Institution, and made known some experiments of late date, in which large charges of powder were fired in closed chambers.

He said that Rumford only succeeded, in determining the tension of the powder gases, when the powder occupied less than 70 per cent of the chamber in which it was fired; his charges were also insignificant, and his results were extravagantly high. Rodman's results were also too high, and he did not determine the tension where the powder occupied a larger proportion of the space than 50 per cent.

At Elswick, however, they had been able not only to determine the tension of the gases at various densities, but had exploded large charges filling entirely the chambers of closed vessels, and had altogether retained, and, by means of a special arrangement, discharged at pleasure the gaseous products of combustion.

The inflamed products are confined in a chamber, and the pressure is determined by means of a "crusher" arrangement, in which the pressure of the gases exerts itself on a steel piston, which then crushes, more or less, a copper cylinder. The charge is exploded by one of Mr. Abel's fuses. The current passes through an insulated cone, which, the moment the charge is fired, destroys the insulating material and effectually closes the passage. On taking out the crusher apparatus, it was found that a portion of the solid steel projecting into the charge had been melted, and apparently run; also the head of a hardened steel screw had evidently fused. These effects were produced in the exceedingly short time of 32 seconds. By way of comparison Captain Noble put, for 37 seconds, a similar piece of steel into one of the hottest of Siemens' regenerative furnaces, at a temperature probably of about 3300 degrees Fah. The steel was raised to a temperature of about 180 degrees Fah. The temperature of the fusion already mentioned may have been affected by chemical changes through which the fused metal may have passed.

In the preceding experiment Captain Noble determined the tension of three quarters of a pound of R. L. G. powder, completely filling the chamber in which it was fired, and having no escape whatever, to be about 32 tons on the square inch. For the purpose of that lecture at the Royal Institution, he had determined to make a similar arrangement with L. G. and pellet. He had done so, the results were successful, and the gas was entirely confined. But in the first case, when he got up to the cylinder, it was making a singular crepitating noise, due probably to the sudden application of great internal heat. The temperature of the exterior of the cylinder rose rapidly to 111° Fah., and then remained nearly stationary for some time. He then let the gases escape, which they did with a sharp hissing noise, rising to a scream when any obstacle was placed on the orifice. With the escaping gases there was not the slightest appearance of smoke, vapor, or color of any kind. The pressure indicated by the L. G. was 37 tons on the square inch, or about 5,600 atmospheres.

He had upon the lecture table, in sealed bottles, the solid residues of combustion from the L. G. and also from pebble. In each cylinder had been placed platinum wire and foil of different degrees of thickness. These had disappeared, and he was unable to say in what chemical state they were until the residues had been examined. He looked upon the success of these experiments as being of great importance, for not only, with the assistance of his friend and colleague in the researches, Mr. Abel, would it be possible to determine the various products of combustion when the powder was fired at its maximum pressure, but they would be able to determine whether any, and if so what, change in the products is due to combustion under varying pressure; they would be able to determine the heat of combustion, and to solve important questions.

To show the accuracy of the results of the experiments, he called attention to the fact that the curves of tension and density of the powder gases in close chambers, agree very nearly with the curves obtained from observations of the tensions in the bores of guns.

The following are the practical conclusions deduced from the investigations:—(1) The maximum of pressure of fired gunpowder, unrelieved by expansion, is not much above 40 tons to the square inch. (2) In large guns, owing to the violent oscillations produced by the ignition of a large mass of powder, the pressure of the gas is liable to be locally exalted even above its normal tension in a perfectly closed vessel, and this intensification of pressure endangers the gun, without adding to useful effect. (3) Where large charges are made, quick-burning powder increases the strain upon the gun, without augmenting the velocity of the shot. (4) The position of the vent or firing point exercises an important influence on the intensity of wave action, and in further enlarging the dimensions of heavy guns we must look to improved powder and improved methods of firing the charge, so as to avoid as much as possible throwing the ignited gases into violent oscillation. (5) That in all cases it is desirable to have the charges as short as possible, so as to reduce the run of the ga to the shortest limit. Hence increase of the diameter of the gun, by shortening the charge, tends to save the gun from abnormal strains.

Composition of Meteors.

Professor J. E. Willet gives an account, in the *American Journal of Science*, of the meteor which fell in Stewart county, Ga., on October 6, 1869, and Professor Lawrence Smith contributes an analysis of the stone. From these we find that at the time of the occurrence, the sky was clear, and a series of explosions, with a rushing sound, was heard over an extensive region. The stone was seen to fall, and was found to have penetrated the soil to a depth of about ten inches. It weighed nearly thirteen ounces, and was covered with a black crust. The fractured surface exhibited numerous greenish globules imbedded in a whitish granular material, particles of nickeliferous iron, some pyrites, and a few specks of chrome iron being visible throughout its mass. The analysis gave the following result: nickeliferous iron, 7·0; magnetic pyrites, 6·10; bronzite (or hornblende), olivine, albite (or oligoclase), and chrome iron, estimated in mass, 86·90.

Coal in Wyoming Territory.

According to Prof. Hayden, the coal measures of this territory cover an area of about 100,000 square miles. The whole country, from a point one hundred miles west of Cheyenne to the extreme western boundary of the territory, is underlaid with one immense layer of coal, at an average depth of eighty feet. The Wyoming coal regions are greater in extent than those of Pennsylvania, and equal in area to all yet west of the Wabash and south of the Ohio river.

The mines are now being worked are along the Union Pacific Railroad, at different points between Laramie and Wasatch. The first that we come to, in going west, is the Carbon mine, 140 miles west of Cheyenne. The coal here is reached by a perpendicular shaft seventy feet in depth. The vein is from six to nine feet.

The Carbon coal is the best for making gas that has been found in the territories; the works at Denver and Omaha are using it. Hallville, 283 miles west of Cheyenne, is on Bitter Creek, Carter county. There are two workable veins here—the upper ten, and the lower six feet thick—with a strata of soapstone between.

The coal is of great purity, and used mostly for domestic purposes. Fifteen thousand tuns of this coal were sold in Omaha this year. Forty miles west of Hallville is the Vandyke mine. This coal is used all through the territories for steam and blacksmithing purposes. Eighty thousand tuns of it were consumed in the machine shops at Omaha during last year. Nine miles east of the Vandyke mines are Rock springs. Here is an open drift mine, in the side of a hill, an eight-foot vein. The product is about 3,500 tuns a month.

All the coal banks in Wyoming are now producing a total of about 1,500 tuns a day. New openings are being made at various points. Analyses of three different beds gives the following result:

	Point of Rocks.	Carbon.	Rock Creek.
Carbon	64·70	51·67	6·134
Ash	4·40	6·17	1·50
Sulphur	0·42	2·88	2·00
Volatile matter	30·48	27·68	35·16

It is Prof. Hayden's opinion that Wyoming coal is the best west of the Missouri, except that of Boulder county, Colorado. In general heating properties, in freedom from sulphur, and in impassive resistance to atmospheric influence, it is certainly superior. A Philadelphia journal, commenting on its merits, says: "It is claimed that it will make more steam than the same quantity of Lehigh coal; that it is better for domestic uses, or for propelling machinery, and especially for gas generation, averaging 10,000 feet per tun, while Pittsburgh coal averages only 8,500. It has less waste, showing a smaller proportion of ashes and clinkers. It is said that, while on the Pennsylvania Central Railroad a tun of anthracite will run an engine forty miles, a tun of Wyoming coal will propel it at least seventy-five miles. It is said, also, to excel anthracite as a smelting coal, being used with great success at Omaha in making iron; it adds to the grain and toughness of the metal."

The utility of these vast coal deposits becomes the more apparent when we look at the remarkable iron beds found in their immediate vicinity.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of March, 1871:

During the month, there were 618 visits of inspection made, and 1,346 boilers examined—1,289 externally and 298 internally, while there were 118 tested by hydraulic pressure. The number of defects in all discovered were 511, of which 100 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 20—1 dangerous; fractures, in all, 32—13 dangerous; burned plates, 35—9 dangerous; blistered plates, 53—4 dangerous; cases of sediment and deposit, 55—6 dangerous. Care should be taken that the water for supplying boilers is taken from where it is free from dirt. In saw mills, especially those located in the lumber districts, sufficient attention is not given to this matter. The suction pipe of the pump is run into the nearest water, which may be shallow and liable to get muddy, or filled at times with floating matter, that sooner or later gives trouble. Here is a case in point. An inspector writes: "In the boilers of a saw mill I found saw dust nearly to the top of the tubes, the boiler was in danger of being burned, and the valves were clogged and working badly. I regard this as a dangerous case." The difficulty was remedied, and will not probably occur again. In another case: "For want of being properly cleaned, the back sheet came down, and extensive repairs were necessary." If the water with which boilers are filled and supplied be of a character to make a deposit continually, there must be hand holes easy of access—so that the interior of the boiler can be examined and cleaned, if need be, at least once a week. Cases of incrustation and scale, 70—8 dangerous; cases of external corrosion, 30—4 dangerous; cases of internal corrosion, 10—2 dangerous; cases of internal grooving, 10; water gages out of order, 38—4 dangerous; blow-out apparatus out of order, 5—1 dangerous; safety valves overloaded and out of order, 25—18 dangerous; pressure gages out of order, 80—7 dangerous, varying from —7 to + 20; boilers without gages, 3—1 dangerous; cases of deficiency of water, 17—4 dangerous; broken braces and stays, 16—15 dangerous. An inspector says: "In one set of boilers that were ready to be filled with water preparatory to starting, I found 6 broken stays, in another 3, in another 2, and in another a cracked plate. These boilers had all been examined by the engineer, and in some instances by boiler makers. Boilers condemned, 3—all dangerous.

There were 7 boiler explosions, during the month, by which 9 persons were 9 killed and 5 wounded. The loss in one case is estimated at $30,000.

The Planet Mercury.

In closest proximity to the sun wheels Mercury; in mass not more one fifteenth that of the earth, circling around the sun in less than three of our months, and rotating on his own axis in a time but a few minutes longer than our own day. Owing to the eccentricity of his orbit, the amount of heat and light he receives from the sun is extremely variable, ranging between five and ten times as much as that which reaches the earth. Even under the most favorable of the positions of Mercury, the sun blazes in his skies with a disk nearly five times larger than that which it offers to the observer on the earth.

These certainly are not peculiarities which would encourage the belief that any creatures resembling those with which we are familiar could subsist on this globe. We know too little of the inclination of Mercury's equator to the plane of his orbit to judge much of the nature of his short seasons; but with the high angle usually claimed, it must be admitted that no—to us known—form of life could possibly exist. But climatic conditions may perhaps be modified, rendered, it may be, more dense; or perhaps there may be recognized "in the polar regions places," says Proctor, "suitable for organic existences, while the equatorial and neighboring regions are zones of fire whose dangers the bravest Mercurials, the very Livingstones of that planet, would not dare to face."

The New York and Brooklyn Suspension Bridge.

The caisson or foundation on which the New York tower is to rest, differs in some respects from the caisson of the Brooklyn tower. The latter, as our readers are aware, has been sunk into its place, and the granite work of the tower is now progressing.

The caisson for the New York tower is nearly completed, and will be launched in the course of a few days. We recently gave particulars as to its dimensions, iron lining, etc.

Owing to the peculiarity of the excavations to be made on the New York side—sand being expected almost entirely to be met with there, and not boulders, as on the Brooklyn side—pipes for the sand pumps are being introduced into the New York caisson. About fifty of these pumps will be in operation, having pistons from three and a half to four inches in diameter, which are expected to throw the sand to the surface in great quantities. Another improvement introduced into the New York structure is the number and character of the supply shafts. The number is four instead of two, and the character cylindrical instead of square as in the Brooklyn caisson. Besides this, the cylinders are larger, and it is expected that twenty men can carry on operations comfortably in each.

Heliographic Printing.

A patent has been recently taken in England, which consists in an improved method of preparing caseine or curd of milk for subsequent use in the formation of casting blocks, printing blocks, and in preparing the surfaces of paper. The inventors take milk which has become sour and set by keeping, and separate from it the grease and other extractive matters by the following process:—The milk is churned, when sour and set by natural causes, and put into a bag and allowed to drain for about twenty-four hours; boiling water is then poured on it, and it is subjected to a squeezing process. After this the best result is obtained by pouring water at about half boiling temperature on it. It is again squeezed and allowed to stand until it has cooled down, and then washed well in clear cold water with continuous squeezing to remove all the grease and milk they can. When dry, the residuum becomes hard and granular, and is the substance or caseine which is the object of the invention.

Manufacture of Wire.

An English inventor has patented a method, by which the heat is retained in the metal during the process of treating wire. This, it is claimed, produces much better and stronger wire than the old process. His specification states that he secures the end of the wire, as it leaves the first pair of rolls, upon a revolving drum, which takes up the wire in a hot state, so that it coils itself in layers thereon, whereby the heat which is contained is kept in it. The drum may be enclosed in a suitable casing or jacket, to which, if desired, the heat from a fire or other source may be applied, or the drum may be employed without a casing or jacket. When the full length of wire has passed through the first pair of rolls and on to the drum, the action is reversed, and the wire passed through fresh rolls, when it is taken up by another drum and so on, until the wire is sufficiently reduced. By this means, it is said, that the inventor is enabled to produce longer lengths of wire and of a better finish than heretofore.

WE know not our own motives; how, then, can we pretend to know the motives of others?—LA ROCHEFOUCAULD

Dr. E. Schunck, in a paper read before the Manchester Literary and Philosophical Society at the last meeting, described a new acid—anthraflavic acid—which occurs as a yellow coloring matter accompanying artificial alizarine. When crystallized from alcohol and dried, it has the appearance of a dark lemon yellow silky mass, which under the microscope is seen to consist of slender foursided prisms. The acid is only slightly soluble in boiling water, and almost insoluble in cold. If pure anthraflavic acid be dissolved in an excess of caustic potash, and the solution be boiled down to dryness, a yellow residue is left, which after being carefully heated, almost to fusion, dissolves in water with a red color. By the action of caustic potash, anthraflavic acid is converted into alizarine, the process being doubtless one of oxidation.

Manufacture of Chlorine.—A recent English patent consists in the employment of a column or tower, or a number of columns or towers connected together in a series, and made of iron or brickwork, or of both, filled with some active reagent or with tiles, bricks, or pieces of burnt clay, or other suitable material, soaked with a solution of such reagent. Through the columns or towers a heated mixture of hydrochloric acid gas and atmospheric air, or oxygen, is caused to pass, whereby chlorine is produced from the hydrochloric acid gas. The columns or towers may be surrounded by suitable coverings, or air spaces, or flues, for the purpose of preventing loss of heat, or of imparting or regulating the heat as the circumstances of the manufacture require.

Answers to Correspondents.

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

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

Annealing Steel.—F. A. K. asks for the best way of annealing steel. The method I use is: Heat the steel slowly to a bright cherry red, in a charcoal fire, then put it in charcoal dust till cold.—W. F., of Ill.

Diameter and Pitch of Toothed Wheels.—Rule: Multiply the pitch by the number of teeth, and you will have the circumference at the pitch line; divide the result by 3·1416, and you will have the diameter near enough for any practical purpose. To determine the pitch, the diameter and number of teeth being given: Multiply the diameter by 3·1416, and divide the result by the number of teeth.—W. F., of Ill.

Pitch and Diameter of Toothed Wheels.—Let J. W. multiply the number of teeth in the wheel, by the number of 32nds of an inch in the pitch, and cut off the two right-hand figures as decimals. Example: Wheel of 84 teeth, spaces on pitch line 27-32 of an inch; 84 x 27 = 22·68 inches in diameter. If any one can give as simple a rule as this, giving a closer approximation to exactness, I would like to see it.—G. W. P., of N. Y.

D. T., of Cal.—In regard to enamel surfaces for writing, we gave, in the item you refer to, all the information we have yet obtained in regard to it.

W. D., of Ill., asks if a dam six miles below rapids, if it sets the water back to the foot of the rapids, will affect the flow above the rapids, the rapids having six feet fall? Practically it would not. Also, he wishes to know whether if an intermediate dam, one mile above the first, should be erected, the water being all returned to the river, it would lessen the power at the lower dam? Answer: No.

Polish for Wood in the Lathe.—Let W. H. B. dissolve sandarac in spirits of wine (alcohol) in the proportion of one ounce of sandarac to half a pint of spirit; next, shave beeswax one ounce, and dissolve in turpentine to make it into a paste; add the former mixture by degrees to it; then, with a woolen cloth, apply to the work while it is in motion in the lathe, and polish it with a soft linen rag. It will appear as if highly varnished. I find this recipe in the "Cabinet Maker's Companion."—J. B., Jr., Ohio.

M. R. & Co., of ——, wish to know which is the most economical for them, an eighty horse power engine, or two engines of forty horse power each? They need to use eighty horse power only half the time; and the other half, only about forty horse power is required. As a matter of economy there would be little difference. The large engine would lose less by radiation in proportion to power, while it would lose more by friction in proportion to power, when running at only half its capacity. Again, the two engines at forty horse power would together lose more by friction in proportion to power, when running to their full capacity, than one engine giving the same power, when all other things are equal. The question is rather one of convenience than economy.

Case Hardening.—E. B. T., would like to know how to case-harden iron. Here is one way, although there are over a dozen: Take a sheet-iron box, and put in the iron you want to harden, and at the same time put in small pieces of old leather, horn, bones, or cuttings from horses' hoofs, as found at any blacksmith's shop, and then cover the box with a good coat of fire clay, so as to make it air tight. Put it in a fire where you can heat it to a good red heat; keep it so for an hour, then take it out and throw it into cold water, box and all, and your iron will be turned into steel, that is, the surface will be, for about one eighth of an inch in thickness.—A. B., of Ill.

The Sea Horse.—A correspondent sends us a dried specimen of a very curious appearance, asking what it is. We reply, it is a sea-horse—a small fish, found on our Southern coasts, and it swims in upright position, neck and head resembling a horse. Altogether, it is a very singular fish. We shall shortly represent it by an engraving.

H. C. M., of Me.—There is a difference of opinion as to which is the best published method of short-hand writing. We like Pitman's Phonography the best. There is a system called Tachigraphy, but it will not do for reporting.

T. H., of Mich.—If you are not accustomed to chemical manipulation, you will not be very likely to succeed in making a good article of gun cotton. Twine of gun cotton, is not, so far as we are aware, kept for sale. You could twist it for yourself, with proper care, if you had the gun cotton. This you can order, cheaper than you can make it, from any dealer in photograph materials.

Cleaning Guns.—I have been using a rifle gun for fifteen years, and have to wipe or clean it yet for the first time; and I have fired it as much as 100 rounds in a day. All I do is to rub the patch on some tallow, placed in the box, on the butt of the gun. My gun is in better order today than it was when I brought it from the shop. If this be of any use to G. D. and others, they are welcome.—F. S. S., of Ohio.

J. A. F., of Mo.—Condensation never changes sensible heat to latent. Steam in the low pressure engine does not condense itself, but is condensed by having its heat extracted. Heat always aids the expansion and the extraction of heat always assists the compression of gases.

L. C. M.—There has, so far as we know, been no limit discovered to the the contraction of iron by cold. A bar of iron is shorter at —40° than at zero. The weights of different bodies do not affect their rates of descent by gravity. Bodies of different weights rolling down one incline, and starting from the same point, will, all else being equal, reach the bottom at the same instant, and would then roll up another inclined plane to the same point before stopping.

NEW BOOKS AND PUBLICATIONS.

The Life and Letters of Hugh Miller. By Peter Bayne, M.A., author of "The Christian Life," etc. In two volumes. Boston: Gould & Lincoln, 59 Washington street New York: Sheldon & Co.; Cincinnati: Geo. S. Blanchard & Co.

We venture to say the year has not yet given to the world a book of greater general interest than this. The inner life of a great man, as Hugh Miller unquestionably was, is always a useful and entertaining study. In no other way can we get such an insight into private and domestic character as through letters. In them we find innumerable clues to heart secrets, to habits of thought, to impulses and emotions, which we seek in vain in the elaborate writings or public speeches of prominent men. No man will read these letters of Hugh Miller without increased respect for the author. They show that he sought earnestly for truth; that he was charitable, honest, and fearless in the expression of opinion; that in his domestic relations he was kind and affectionate, and endowed with all those qualities which secure esteem and love. The author and publishers have done the world a real service in the production of these volumes. No man, woman, or child can read them without being improved. The printing, binding, and general sty the work are all first class.

Patent Laws and Practice of Obtaining Letters Patent for Inventions, in the United States and Foreign Countries, including Copyright and Trademark Laws. By Charles Sidney Whitman, of the Supreme Court of the United States. Washington: W. H. & O. H. Morrison, Publishers.

This is an octavo volume of over 700 pages, in binding of the usual style of law books. The title sufficiently sets forth the character of its contents, which are copiously indexed. While it contains but little not found in other works, it has condensed in a convenient manner a great deal of information important to inventors and patentees.

A Correction.—We regret that in our notice of "Specimens of Engraving on Wood," by S. S. Kilburn, of No. 96 Washington street, Boston, Mass. published on page 252, current volume, a printer's error gave the address as Brooklyn.

The *Phrenological Journal*, for May, contains a biography of Edward Harris, the eminent manufacturer of Woonsocket, R. I., as its first article. This interesting article is followed by the usual variety of entertaining and instructive reading, monthly provided in this popular journal. Samuel R. Wells, publisher, 389 Broadway, New York.

The *Southern Magazine*, a new cotemporary, has reached its fifth number It bids fair to rival, in interest, its older competitors. Its table of contents for May is varied and entertaining, embracing tales, essays, and poems, with an editorial *melange* as dessert, entitled the "Green Table." Published by Murdoch, Browne & Hill, 166 Baltimore street, Baltimore, Md.

Lippincott's Magazine, for May, contains a poem by Margaret F. Preston, entitled, "Vittoria Colonna to Michael Angelo," a fine essay on the "Monuments of Ancient America," by Charles Morris; "Curiosities of the 'Pay Streak,'", by Prentice Mulford; an instalment of the interesting story 'Bookstone," by Katherine S. Macquoid, and much other matter of interest and value. Published by J. B. Lippincott & Co., Philadelphia; New York Agency, 25 Bond street.

The *Atlantic Monthly*, for May, opens with a most readable article, entitled the "Descent of Fire," by John Fiske. Among the heavier articles which follow, is a thoughtful one on the "Organization of Labor," by Richard F. Hinton. Longfellow contributes a short poem, "Vox Populi," Clarence King gives us an entertaining sketch of "Mountaineering in the Sierra Nevada," and Dr. Williams continues to instruct us in the matter of "Eyes, and How to Use them." This strong framework is gracefully adorned by lighter articles and tales. The number is more than usually excellent. Fields, Osgood & Co., Boston, Publishers. New York and Brooklyn office, 713 Broadway, New York.

Wood's Household Magazine, published by S. S. Wood, Newburgh, N. Y. is a ten cent monthly, which gives as much for the price as any published, as a glance at the May number will prove.

Drake's Magazine for Boys and Girls, is a tastefully illustrated monthly, full of entertaining reading for the little folks; combining, in a skillful manner, instruction with amusement. J. W. Burke & Co., Macon, Ga.

The *New York Medical Journal*, for April, published by D. Appleton & Co., fully sustains its character as a leading exponent of medical progress. No journal of this kind published on this continent has more able contributors, and the style in which the magazine is printed is an honor to medical literature.

Among other medical journals which come to us as exchanges, the following are all good live publications: The *Chicago Medical Journal*, W. B. Keen & Cooke, 113 and 115 State street, Chicago, Ill.; the *Northwestern Medical and Surgical Journal*, Alexander J. Stone, editor and proprietor, St. Paul, Minn.; the *Journal of Materia Medica*, Tilden & Co., New Lebanon N. Y.; the *Richmond and Louisville Medical Journal*, E. S. Gaillard, M.D. editor and proprietor, Louisville, Ky.; the *Ohio Medical and Surgical Reporter*, L. H. Witte, 17 Monumental Park, Cleveland, Ohio (a bi-monthly); the *Atlanta Medical and Surgical Journal*, Drs. W. F. and J. G. Westmoreland, editors, Atlanta, Ga.; the *Medical and Surgical Reporter* (a weekly) S. W. Butler, proprietor, 115 South Seventh street, Philadelphia, Pa.; office in New York, Z. P. Hatch, 137 Broadway.

No. 3 of the *Workshop*, E. Steiger, publisher, 22 and 24 Frankfort street, New York, sustains its fine reputation as a repertory of industrial design.

Hall's Journal of Health, for May, published by Hurd & Houghton, 13 Astor Place, New York, is a spicily written collation of short essays on health topics mainly, moral health as well as physical receiving attention. If not always correct in its statement of facts, it is always readable.

The *Herald of Health and Journal of Physical Culture*, published by Wood & Holbrook 13 and 15 Laight street, New York, is doing good work in imparting a general knowledge of the principles of hygiene. It is one of the most readable of this class of publications.

Good Health: A Journal of Physical and Mental Culture. Alexander Moore, publisher, Boston, Mass. This journal makes a distinctive feature of describing, in a popular style, such diseases as are most common, and which may be avoided by reasonable prudence. It also publishes many useful articles upon collateral subjects, and is altogether a publication well adapted to family instruction.

Recent American and Foreign Patents.

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

PUTTING UP ICE CREAM, ETC.—Ignazio Allegretti, Philadelphia, Pa.—It is common, in this city, when you want ice cream to take home, to call in at the confectioner's, have the cream put up in a paper, and take it with you. Thus put up, cream will not begin to melt for some time. The inventor has made a slight improvement in this line, for which he has lately received a patent. In his specification he says: The ice cream or water ice to be packed and served up by my improved method, is first frozen in any ordinary known manner; it is then put up in metallic molds, preferably of parallelopipedic form; but of any form, if desired. The metallic mold containing the ice cream is then placed in a dry atmosphere, kept at a very low temperature (in some cases it is kept as low as 30° below zero), and there it is kept long enough for the whole mass to absorb, and be reduced to the low temperature. Meanwhile I prepare boxes of non-conductor-of-heat material, such as open porous pasteboard, of the shape, but slightly larger than, the block of ice cream; and I place the boxes also in a cold dry atmosphere for a certain time. The block of ice cream is taken out of the mold, immediately wrapped in a piece of paper, and placed in the refrigerated pasteboard box, the laps of the paper being folded over, and, if desired, a spoon placed thereon; the lid is put on, and the cream is ready to be delivered or served up; or it may be replaced in a cold dry air refrigerator, and there kept for any length of time without losing any of its qualities. The cream or water ice put up in this manner will remain firm and solid for a length of time lasting from one to four hours, according to the state of the weather. I claim, as a new article of manufacture and commerce, ice creams or water ices, put up in the manner herein specified, and kept for sale ready for use in rations, as it were, substantially as herein specified.

CORN PLANTER.—J. Dyson Delap, Tyrone, Pa.—This invention consists in a rod arranged to reciprocate within a seed discharging tube, for the purpose of causing the seed to be delivered in the furrow with uniformity; also, in a seed slide arranged to reciprocate in the bottom of the seed box, and provided with an aperture in which the seed lodges, and from which it is delivered by a spring rod operated by a tappet arm on an oscillating bar, which derives motion from the covering roller.

WATER WHEEL.—John S. Warren, Fishkill-on-the-Hudson, N. Y.—This invention is intended to supply a mode of operating the chutes of water wheels, whereby objections to the ordinary mode are obviated, and an increase of power is obtained. The improvement is especially adapted to wheels operating upon the turbine principle. By turning the hub pieces simultaneously, all the chutes are given two distinct motions: they will move endwise, or slide forward in contact with the stationary plates, and will be thrown bodily towards the wheel at the same time, thus reducing the thickness or breadth of the water apertures, while preserving the true curve or line of contact of the water with the buckets of the wheel.

FIRE-PLACE GRATE.—William H. Garrett, Cannonsburg, Pa.—This invention consists of a metal sifter suspended under the grate, by resting at the rear, on studs projecting from the back wall, and at the front by chains from the top bars of the grate, or on studs in the wall thereabout, so that it may be swung back and forth for sifting the cinders, and then be brought forward and its contents emptied on the fire.

COMPOSITION FOR COATING PHOTOGRAPHIC PICTURES.—Henry Happel, New York city.—This invention relates to a compound made of a solution of shellac or other gum in alcohol, and mixed with aniline red or other pigment, in such a manner that, when a photographic picture is coated with this compound, a certain lively appearance is imparted to the same, and its effect is materially improved. The proportion in which the pigment is mixed with the lacker must be determined by experience, and in some cases blue or other pigments may be used instead of red; but on ordinary photographic pictures the best result is obtained by preparing a lacker of purified shellac dissolved in alcohol, and mixing therewith a small quantity of aniline red, which readily dissolves in alcohol, and can therefore be easily introduced in said lacker.

PACKAGE FOR OYSTERS, CLAMS, ETC.—M. W. Brown, New York city.—I take paper or cloth, and treat the same with a compound of glycerin and caustic potash, or with any other compound or material which will render the paper or cloth tough, pliable, and impervious to air, water or fat. From the paper or cloth thus produced, I make bags or packages of any suitable form or shape, by preference in the form of paper bags, the edges of the paper or cloth being united by a suitable cement, and after these bags have been charged with oysters, they are tied like flour bags; or they may be sealed by securing in their mouth a tube or other material, and stopping up said tube with cork or other suitable material, and they are ready for the market or for transportation. By these means, a package for oysters or clams is obtained, which is much cheaper than the tin cans at present used for this purpose; and, furthermore, the package can be opened and reclosed without trouble.

SPARK ARRESTER.—William W. Elliott, Elliott's Mills, Miss.—This invention has for its object to arrest the sparks, cinders, etc., that come from the fire flues of a steam boiler, and hold them in a chamber provided for their reception until they become dead and harmless. This chamber is formed by a hinged box applied to the front of the locomotive boiler.

PILE FOR NUT BLANKS, TUBES, ETC.—Jonathan Ostrander, Manchester, Va.—This invention consists of a pile, oblong or square in cross section, and made up of six pieces, viz: a top piece, bottom piece, two side pieces, and two double-headed, wornout railroad rails, placed between the top and bottom pieces, and in contact with the side pieces; said top, bottom, and side pieces being rolled, so as to fit those parts of the rails which they respectively join.

PILE FOR NUT BLANKS, TUBES, ETC.—Jonathan Ostrander, Manchester, Va.—This invention relates to a pile to be welded by rolling into a skelp, from which nut blanks may be sawn off, or hollow shafting or tubing be rolled. The pile has a cylindrical bore, and is made up of two longitudinal halves, each triangular in cross section, so that, when the dividing plane runs diagonally of the pile, it consequently presents the greatest amount of welding surface that can be obtained in right lines.

WATER ELEVATOR AND CARRIER.—Archibald A. and Robert P. McPheeters, Arbor Hill, Va.—This invention consists in rollers placed lengthwise of the carrier, one at each side of the chain wheel, for the purpose of preventing the chain from slipping off the wheel in raising a bucket from a point not directly beneath it; and in a cross bar attached to the lower side of the carrier, and bearing in its ends spring bolts, which pass under the rails of the elevated track, and serve to prevent the wheels from being thrown therefrom, the spring bolts slipping back when passing the supports.

TONGUE FOR HARVESTERS.—Martin Rohrer, Polo, Ill.—This invention has for its object to enable a harvester to be turned in the smallest possible space, and it therefore relates to a tongue made in two parts, which are hinged together, and provided with a latch device for holding the two parts of the tongue in line as long as the draft is forward, which latch device is to be raised, and the forward part of the tongue swung to one side, prior to the turning of the machine.

CAMERA BOX.—Orin Ackerman, Carthage, N. Y.—This invention includes a novel mechanism for enabling pictures of any size, and in any desired number, at one sitting, to be taken by the use of one and the same camera box, which is made movable vertically and laterally, outside of an independent stationary box; also a novel mechanism for adjusting the pitch of the camera box, and an application of a looking-glass to the camera box in such a manner as to enable the operator to watch the sitter while turning his back toward him.

GATE.—Noah Parker, Bedford Springs, Ky.—This invention relates to improvements in gates, more especially designed for farm use, whereby a gate may be secured at various elevations above the surface of the ground, in order to avoid the necessity of clearing away snow, or other obstructions, and to accommodate the passage of the smaller animals, such as sheep and hogs, fowls, etc., while the larger, such as horses and bullocks, are retained in the inclosure.

CORN PLANTER.—Henry Baughman, Sandusky, Ohio.—This invention relates to a corn planter, in which the plows are attached to a frame, hinged at its rear side to the axle of the transporting wheels, and supported at its front side upon a main frame, which is supported at its rear end upon the axle, and at its front end upon tracks.

ASH SIFTER.—George W. Taylor, Baltimore, Md.—This invention consists in the combination of a cylindrical vessel, having a closely fitting removable cover, and a perforated bottom, fitting it to discharge the office of a sifter for coal-cinders, with a pan on which the sifter sits, and on which it may be vibrated, so as to cause the ashes to fall through the sifter into the pan, whence they are prevented from rising by the close connection between pan and sifter at the top of the former.

POTATO DIGGER.—Sherman E. Anthony, Stillwater, N. Y.—This invention consists in a machine that first loosens up the roots and earth in a row of potato hills, by means of tines that run beneath the hills, said tines being inclined downward and backward and attached to parallel bars. The said machine is also provided with a vertical disk fixed on a horizontal shaft, which is mounted in the same frame that supports the aforesaid bars and tines, said disk bearing a row of radial teeth, which, by the rotation of the disk, effect the separation of the potatoes from the loosened earth.

GRIST MILL AND COTTON SEED HULLER.—James W. Smith, Columbus, Ga.—This invention relates to certain improvements in the grist mill for which letters patent No. 81,725 were issued to George N. Annan, Sept. 1, 1868, by which said grist mill is adapted also to the function of hulling cotton seed.

LAMP CHIMNEYS FOR SIGNAL AND OTHER PURPOSES.—Thomas A. Davies, New York city.—This invention relates to a chimney for the head light of a locomotive, and it consists in such a chimney when made parti-colored, in bands running either lengthwise of the chimney or crosswise of the same circumferentially, so as to enable the same chimney, by revolving on its axis, or by vertical adjustment, according to the direction of its colored bands, to show lights of different hues.

DIRECT ACTION TRIPLE VENT WATER WHEEL.—Ephraim L. Small, Urbana, Ohio.—This invention relates to a water wheel, constructed on the theory that all the effect produced by the water is due to its direct action on the buckets, and not all to its reactive force. The invention aims at such a construction of the gates, chutes, wheel and case, as facilitates to the greatest extent both the direct action of the water, and its escape from the wheel, after the direct action has ceased.

Queries.

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

1.—SOLUTION FOR ELECTRO GILDING.—Will some one inform me how I can prepare a gold solution for electro gilding that will, when used, give me the red coin color?—C. E. B.

2.—DRAFT TUBES FOR TURBINES.—In practice do draft tubes, applied to water wheels, utilize as fully the effect of a given head of water, as when the wheel is put at the bottom of fall?—L. P. & B.

3.—PRUSSIAN BLUE.—Can any of your correspondents tell me, through your "Answers" column, how to make Turnbull's Prussian blue?—J. B.

4.—BLOWING OFF BOILERS.—Will some of your intelligent readers give me their views on the following subject? I have two boilers running continually, and I blow them off on alternate Saturday nights. In about ten or fifteen minutes after, I draw my fire at a pressure of about twenty-five or thirty pounds, which I consider is all right for safety and prevention of too sudden a contraction of the boiler. But, I have a boss—would be—who says "he has talked a good deal on the theory of boiler tending," and he contends, with the advice of others, that it is better and safer to keep the fire in the furnace, after opening the blow-off valve, until the water is going out of sight in the water gage glass indicator, and then haul out the fire. I would like to have the advice of some of the boiler inspectors of the Hartford Boiler Insurance Company on this subject.—C. T.

5.—SAFETY VALVE.—I would like to have a practical rule to graduate the lever of a safety valve, the following things being given: weight of ball, weight of lever and valve, diameter of valve, and pressure of steam per square inch; also to find the distance from fulcrum to the center of ball.—C. K.

6.—BLEACHING WAX.—Is there any process for whitening yellow beeswax, other than the one followed in this country—that is, by melting the wax, and pouring it into shavings or ribbons, and exposing it to the sun and dew until it loses its brown color?—J. C.

7.—HANGING IRON SHUTTERS.—I wish to know the best mode of hanging iron shutters to brick buildings, where there are no arrangements made for such blinds in the building.—O. A., Jr.

8.—ETCHING STEEL.—I would like a recipe for etching steel plates in large quantities, in the most expeditious manner. Can any subscriber furnish the recipe?—J. O.

9.—SOLUTION FOR ELECTRO COPPERING.—Would some one give me a recipe for a solution (bath) for copper plating, on iron or steel, without heat, articles of the size, for instance, of hames for carriage harness?—F. R. A.

10.—BRONZING STATUETTES.—Will some of your numerous readers give me a recipe for bronzing plaster and wood statuettes in imitation of French bronzes?—W. H. S. B.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

890.—SEPARATING TIN FROM TINNED IRON.—A. Ott, New York city. April 4, 1871.

892.—SUGAR CANE MILL.—G. La F. and H. C. Squier, Buffalo, N. Y. April 4, 1871.

897.—PACKING FOR PISTON RODS.—W. S. Fish, Mystic, Conn. April 4, 1871.

901.—LUBRICATOR.—Joseph Moore, San Francisco, Cal. April 5, 1871.

907.—PYROMETER.—Robert Spencer, New York city. April 5, 1871.

908.—COMBINED SAD AND FLUTING IRON.—F. Myers, New York city. April 5, 1871.

910.—FURNACES AND BOILERS.—F. A. Woodson, Selma, Ala. April 5, 1871.

916.—SELF-RAISING FLOUR.—Gorham Gray, Boston, Mass. April 6, 1871.

925.—ASPHALTE ROADS AND PAVEMENTS.—J. L. Graham, New York city. April 8, 1871.

929.—BREECH-LOADING FIREARMS.—F. J. Abbey and J. H. Foster, Chicago, Ill. April 8, 1871.

937.—BOOT SEWING MACHINERY.—Charles Goodyear, Jr., New York city. April 8, 1871.

Foreign Patents.

The population of Great Britain, is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars, with full information on foreign patents, furnished free.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING APRIL 25, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
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Patent Solicitors, 37 Park Row, New York.

113,961.—CHIMNEY COWL.—W. N. Abbott, New York city.
113,962.—SEWING MACHINE.—Hosea P. Aldrich, Boston, Mass
113,963.—CANNON.—Hiram J. Allen, Arkadelphia, Ark.
113,964.—SKEWERS.—Chauncey Andrews, Paterson, N. J.
113,965.—KNITTING MACHINE.—J. M. Armour, Syracuse, N.Y
113,966.—DUMB BELL.—Ellis Ballou, Zanesville, Ohio.
113,967.—CHAIR.—Franklin Barber, Detroit, Mich.
113,968.—CARBURETING AIR.—C. C. Beers, Boston, Mass.
113,969.—STOVE.—G. C. Benton, Port Huron, Mich.
113,970.—CLOCK.—I. G. Blake, Worcester, Mass.
113,971.—CULINARY VESSEL.—W. H. Bloom, Tiffin, O.
113,972.—BOLT REEL.—J. R. Bradfield, Ada, Mich.
113,973.—FILTERING MATERIAL.—L. Brandeis, Brooklyn, N.Y.
113,974.—TRUNK FASTENER.—D. W. Brockway, Dover, Me.
113,975.—HAY FORK.—J. T. H. Brown, Greenup, Ill.
113,976.—TELEGRAPH RELAY.—H. S. L. Bryan, Cedar Rapids, Iowa.
113,977.—PICKS.—Augustus Buerkle, Pittsburgh, Pa.
113,978.—VAPORIZING HYRROCARBONS.—John Butler, New York city.
113,979.—BABY TENDER.—A. H. Carson, Newport, R. I., and Andrew Brown, Troy, N. Y.
113,980.—SMOKE STACK.—E. A. Castellaw, Savannah, Ga.
113,981.—BOAT DETACHING.—D. L. Cohen, Pensacola, Fla.
113,982.—LAMP SHADE.—M. H. Collins, Chelsea, Mass.
113,983.—REEFING SAILS.—A. G. Crossman, Huntington, N.Y.
113,984.—CENTER BOARD.—A. G. Crossman, Huntington, N.Y.
113,985.—DUST PAN.—F.L.Daniels and J.Russell, Boston, Mass.
113,986.—CASTING PIPE.—John Demarest, Mott Haven, N. Y
113,987.—WASHING MACHINE.—J. H. Doll, Etna, Ill.
113,988.—TIME DETECTOR.—James Dunning, Bangor, Me.
113,989.—STEAM ENGINE.—Thos. Edwards, Birmingham, Eng.
113,990.—HARVESTER.—John H. Elwood, Polo, Ill.
113,991.—PAPER FILE.—Geo. W. Emerson, Chicago, Ill.
113,992.—SAW.—Jas. E. Emerson, Trenton, N. J.
113,993.—SAW FOR STONE.—Jas. E. Emerson, Trenton, N. J.
113,994.—MELODEON.—Peter Engers, Jefferson Furnace, Pa
113,995.—MEDICAL COMPOUND.—W. H. Farrar, Richmond, Va.
113,996.—BATTERY GUN.—William Fields, Wilmington, Del
113,997.—GRAIN MASHING.—C. H. Frings, Centreton, Mo.
113,998.—GATE HINGE.—George Garrett, Elkhart, Ill.
113,999.—STAMPING WEARING APPAREL, ETC.—Chas. Gernert Philadelphia, Pa.
114,000.—BUGGY.—James R. Gilman, South Bend, Ind.
114,001.—BURGLAR ALARM.—Louis C. Gosson, Trenton, N. J
114,002.—PLOWS.—Jos. S. Godfrey, Rochester, Pa.
114,003.—HARVESTERS.—Phineas Gregg, Brownsville, Mich
114,004.—SLITTING RAGS FOR CARPETS.—Marion Green, Coldwater, Mich.
114,005.—BATTERY ZINC.—Edward A. Hill, Chicago, Ill.
114,006.—GALVANIC BATTERY.—Edward A. Hill, Chicago, Ill
114,007.—HOTEL ANNUNCIATOR.—Edward A. Hill, Chicago, Ill.
114,008.—TATTING SHUTTLE.—C. Hingher, New Brunswick, N.J
114,009.—HINGE.—Phillip Hires, Columbus, Ky.
114,010.—CUT-OFF.—Birdsill Holly, Lockport, N. Y.
114,011.—BRICK MACHINE.—D. J. Hunter, Somerville, Mass.
114,012.—COFFEE POT.—P. H. Inman and C. B. Withington Janesville, Wis.
114,013.—HEATING AND VENTILATING DRUM.—Royal Jennings, Shelbyville, Ind.
114,014.—LEVEL AND CLINOMETER.—Wm. Johnson, Edisto Island, S. C.
114,015.—CAR COUPLING.—J. W. Jones of Philip De Catesby, Hereford, Md.
114,016.—CHURN DASHER.—Wm. F. Jones, Easton, Kan.
114,017.—PAINT.—Wm. N. Jordan, Cambridge, Mass.
114,018.—COOKING STOVE.—John H. Keyser, New York city.
114,019.—STRAP HINGE.—Wm. J. Lewis, Pittsburgh, Pa.
114,020.—PRINTING PRESS.—J. C. MacDonald, Waddon, and Joseph Calverly, Camberwell, Eng.
114,021.—THRASHING MACHINE.—M. H. Mansfield, Ashland, O.
114,022.—PADDLE WHEEL.—E. Mathers, Harrisville, W. Va.
114,023.—GRAIN SEPARATOR.—Jos. Miller, Detroit, Mich.
114,024.—STEAM BOILER.—Thomas F. Morrison, Bryan, O.
114,025.—CARRIAGE STEPS.—F. B. Morse, Plantsville, Conn.
114,026.—FELLY PLATES.—F. B. Morse, Plantsville, Conn.
114,027.—SPIRIT LEVEL.—Joab Morss and Franklin B. Abel Philadelphia, Pa.
114,028.—KING BOLT FOR CARS.—S. W. Murray and B. P Lamason, Milton, Pa.
114,029.—WIRE FENCE.—Z. Nicholson, Haddonfield, N. J.
114,030.—WASHING MACHINE.—J. M. Noble, Delhi, Iowa.
114,031.—PAPER-FEEDING MACHINE.—O. Norelius, Minneapolis, Minn.
114,032.—ADDRESSING MACHINE.—P. O'Conner, Youngstown Ohio.
114,033.—GANG PLOW.—Jos. Oler, Eagle Point, Ill.
114,034.—SCAFFOLDING.—J. D. Pettit, Rochester, Ind.
114,035.—HOT AIR FURNACE.—J. L. Pfau, Jr., Quincy, Ill.
114,036.—CURTAIN FIXTURE.—P. W. Phillips, Salem, Mass.
114,037.—SHUTTER FASTENER.—J. D. Phyfe and J. D. Perrine New York city.
114,038.—WOOD PAVEMENT.—Albert Potts, Philadelphia, Pa.
114,039.—TRUSS BRIDGE.—T. W. Pratt, Boston, Mass.
114,040.—CULTIVATOR.—I. N. Pyle, Pleasant Mills, Ind.
114,041.—POTATO DIGGER.—S. Ransome, Kingsville, Ohio.
114,042.—SULPHURIC ACID.—St. J. Ravenel, Charleston, S.C.
114,043.—SAW MILL.—John Richards, Philadelphia, Pa.
114,044.—PLOW MOLD BOARD.—L. P. Rider, Pittsburgh, Pa Antedated April 12, 1871.
114,045.—FIREPLACE.—P. M. Roche, Cleveland, Ohio.
114,046.—STOVE.—P. Rohdin and C. Ostergren, Chicago, Ill.
114,047.—SEED PLANTER.—C. R. Sargent, Newburyport, Mass
114,048.—OILING WOOL, ETC.—C. G. Sargent, Westford, Mass.
114,049.—WATER ELEVATOR.—P. W. Sawyer, Gray, Me.
114,050.—CHURN.—H. Shultdrees, Brookville, Ind.
114,051.—CARRIAGE CLIPS.—M. Seward, New Haven, Conn.

114,052.—Steam Boilers.—George Sewell, Brooklyn, N. Y. Antedated April 22, 1871.
114,053.—Carpet Stretcher.—E. P. Shaffer, Rochester, N. Y.
114,054.—Wagon Brake.—R. C. Shockley, Fayette, Wis.
114,055.—Stove.—A. S. Shontz, Quincy, Ill.
114,056.—Cotton Press.—F. Simmons, New Orleans, La.
114,057.—Fence.—A. C. Sisson, Factoryville, Pa.
114,058.—Carriage Wheel.—J. Y. Sitton, Due West, S. C.
114,059.—Spinning Mules.—Jos. Smith, Preston, England.
114,060.—Passenger Register.—M. Springwoter, Louisville, Ky.
114,061.—Caster.—A. G. Stevens, Manchester, N. H.
114,062.—Animal Trap.—J. N. Stow and R. Loop, Camden, O.
114,063.—Making Soap.—J. D. Sturges, Chicago, Ill.
114,064.—Drawing Frame.—G. E. Taft, Northbridge, Mass.
114,065.—Hay Rake.—F. A. Thayer, Sheldonville, Mass.
114,066.—Seed Planter.—C. J. Turner, M. L. Wilkinson, Olean, N. Y.
114,067.—Shoe.—Charles E. Tyler, Georgetown, Mass.
114,068.—Punching Metal.—I. Van Hagen, Chicago, Ill.
114,069.—Recoloring Fabrics.—J. M. Wallace, New York.
114,070.—Grater.—H. C. White, Philadelphia, Pa.
114,071.—Sewing Machine.—F. E. Whiteside, Oxford, Pa.
114,072.—Gear for Carriages.—Eli Wigle, Bay City, Mich.
114,073.—Stave Equalizer.—H. S. Wiley, Madison, Ind.
114,074.—Spinning Machine.—S. M. Williams and H. M. Williams, Coldwater, Mich.
114,075.—Fireplace.—J. E. Wood, Webster, Ohio.
114,076.—Corn Harvester.—A. N. Woodard, Fentonville, Mich.
114,077.—Knitting Machine.—H. Woodman, Saco, Me.
114,078.—Valve.—P. N. Woods, Fairfield, Iowa.
114,079.—Gain Cutter.—E. H. Woodsum, Harrison, Me.
114,080.—Fork.—B. Wright and W. C. Park, Cardiff, N. Y.
114,081.—Firearm.—J. Abbey and J. H. Foster, Chicago, Ill.
114,082.—Camera Boxes.—O. Ackerman, Carthage, N. Y.
114,083.—Vacuum Engine.—H. W. Adams, Philadelphia, Pa.
114,084.—Passenger Recorder.—G. H. Aldrich, New York.
114,085.—Plane Iron.—I. Almy and S. A. Drake, Covert, N. Y.
114,086.—Paint Brush.—J. Ames, Jr., Lansingburg, N. Y.
114,087.—Paper Feeding Machine.—E. R. Andrews, R. B. Randall, and W. H. Clague, Rochester, N. Y.
114,088.—Potato Digger.—S. E. Anthony, Stillwater, N. Y.
114,089.—Cooper's Croze.—J. F. Applegate and C. Feicek, Albany, Ind.
114,090.—Flux for Iron and Steel.—E. T. Atwood, Minerva, Ohio.
114,091.—Glove.—E. W. and A. A. Avery, Plymouth, N. H.
114,092.—Elevating Water.—J. A. Ayres, Hartford, Conn.
114,093.—Washing Machine.—J. S. Balsly, North Bend, Ky.
114,094.—Harvester Rake.—John Barnes, Rockford, Ill.
114,095.—Kiln.—Arthur Batchelar, Brockham, England.
114,096.—Bevel.—E. A. Bell, Meriden, Conn.
114,097.—Grain Separator.—Daniel Best, Yuba, Cal.
114,098.—Polishing Machine.—S. Bevan, Philadelphia, Pa.
114,099.—Ticket Case.—J. F. Birchard, Milwaukee, Wis.
114,100.—Brake.—S. R. Bolton, Prescott, Mo.
114,101.—Gate.—R. T. Browne, Fallston, Md.
114,102.—Ventilator.—John Bradley, New York city.
114,103.—Buckwheat Refiner.—Daniel D. Brewster, West Laurens, N. Y.
114,104.—Lime Oven.—August Califf, Danville, Ill.
114,105.—Printing Press.—A. Campbell, Brooklyn, N. Y.
114,106.—Printing Press.—A. Campbell, Brooklyn, N. Y.
114,107.—Safe.—J. W. Campbell, Sr., New York city.
114,108.—Key Tag.—C. L. Carter, Washington, D. C.
114,109.—Bessemer Steel.—H. Chisholm, Cleveland, Ohio.
114,110.—Pencil Case.—J. M. Clark, Jersey City, N. J.
114,111.—Mechanical Movement.—John Corley, Kansas.
114,112.—Bed Spring.—D. V. Crandall, Chicago, Ill.
114,113.—Lamp Chimney.—T. A. Davies, New York city.
114,114.—Thread Measuring.—L. Dimock, Leeds, Mass.
114,115.—Forge Bonnet.—W. Dunkerly, Woonsocket, R. I.
114,116.—Double Tree.—M. Durnell and W. Milner, Leesburg, O.
114,117.—Spark Arrester.—W. W. Elliott, Elliott's Mills, Miss.
114,118.—Weather Strip.—L. H. Ellsworth, W. E. Wilcox, and S. Seabury, Peoria, Ill.
114,119.—Fire Escape.—G. A. England, Ripon, Wis.
114,120.—Broom Head.—C. Fiscus, Washington, D. C.
114,121.—Heel Die.—B. F. Fisk and M. B. Stone, Haverhill, Mass.
114,122.—Axle Box.—W. H. Fitz Gerald, Brooklyn, N. Y.
114,123.—Switch.—T. Fogg, St. Mary's, Canada.
114,124.—Car Coupling.—E. L. Fareman, Rantoul, Ill.
114,125.—Steam Engine.—D. R. Fraser, Chicago, Ill.
114,126.—Washing Machine.—H. A. Gaston, San Francisco, Cal.
114,127.—Cotton and Corn Chopper.—J. H. Gatling, Murfreesborough, N. C.
114,128.—Booms for Masts.—A. Gill, Holmes' Hole, Mass.
114,129.—Pulley.—J. Goodrich and H. J. Colburn, Fitchburg, Mass.
114,130.—Printing Press.—J. Gough, London, Eng.
114,131.—Horse Collar.—W. H. Gray, New York city.
114,132.—Feed-water Heater.—C. S. S. Griffing, Salem, O.
114,133.—Fertilizer.—W. B. Hamilton, New Orleans, La.
114,134.—Veneer Cutter.—T. Hanvey, Rochester, N. Y.
114,135.—Wheel Skate.—G. W. Hawk, Chicago, Ill. Antedated April 18, 1871.
114,136.—Car Spring.—B. Hershey, Erie, Pa.
114,137.—Dryer.—C. H. Hersey, Boston, Mass.
114,138.—Telegraph Pole.—Ira Hersey, New York city.
114,139.—Roofing.—D. Hitchcock and W. Gibbs, Syracuse, N. Y.
114,140.—Lamp Shade.—J. H. Hobbs, C. W. Brockemier, and W. Leighton, Jr., Wheeling, W. Va.
114,141.—Steam Trap.—J. W. Hodges, Baltimore, Md.
114,142.—Heater and Condenser.—B. Holly, Lockport, N. Y.
114,143.—Pocket Flask.—S. Hughes, Hudson, N. Y.
114,144.—Gas Cut-off.—W. Humphreys, Waterford, N. Y.
114,145.—Shoe Sole.—J. M. Hunter, New York city.
114,146.—Steam Generator.—W. H. Ivens, Trenton, N. J.
114,147.—Axle.—E. W. Ives, Hamden, Ct.
114,148.—Axle Box.—E. W. Ives, Hamden, Ct.
114,149.—Vehicle.—R. Jack, Des Moines, Iowa.
114,150.—Hay Rake.—O. S. Jarvis, Xenia, Ill.
114,151.—Puddling Furnaces.—J. A. Jones, R. Howson, and J. Gjers, Middlesborough-on-Tees, Eng.
114,152.—Latch.—A. D. Judd, New Haven, Ct.
114,153.—Milking Stool.—J. N. Knapp, Syracuse, N. Y.
114,154.—Water Wheel.—J. L. Kurtz, York, Pa.
114,155.—Shuttle.—Julius Kuttner, New York city.
114,156.—Exhausting Gas, etc.—R. Laidlaw and J. Thomson, Glasgow, G. B.
114,157.—Lubricator.—C. R. Laman, Painted Post, N. Y.
114,158.—Tweer.—F. Lawrence, Philadelphia, Pa.
114,159.—Band Cutter.—J. Lee, Jr., and J. Lee, Sr., Duquoin, Ill.
114,160.—Cooking Stove.—W. D. C. Lloyd, Louisville, Ky.
114,161.—Envelope.—P. Lockwood, Auburn, Ind.
114,162.—Balance Valve.—K. H. Loomis, New York city. Antedated April 19, 1871.
114,163.—Furnace.—P. W. Mackenzie, Blauveltville, N. Y.
114,164.—Pipe Mold.—T. Madeley, Rochester, N. Y.
114,165.—Harvester Rake.—J. P. Manny, Rockford, Ill.
114,166.—Harvester Rake.—J. P. Manny, Rockford, Ill.
114,167.—Shuttle.—E. W. Marble, Sutton, Mass.
114,168.—Horse Power.—D. G. Marden, Memphis, Tenn.
114,169.—Wheel Fellies.—D. J. Marston, Amesbury, Mass.
114,170.—Plow Handle.—E. G. Matthews, Oakham, Mass.
114,171.—Wood Bending.—E. G. Matthews, Oakham, Mass.
114,172.—Pavement.—F. E. Matthews, Chicago, Ill.
114,173.—Dumping Wagon.—S. D. and W. McCaleb, Louisville, Ky.
114,174.—Roofing.—D. W. McConnell and W. W. Pierce, Buffalo, N. Y.
114,175.—Extracting Metals.—W. P. McConnell, Washington, D. C.
114,176.—Water Elevator.—A. A. and R. P. McPheeters, Arbor Hill, Va.
114,177.—Gate.—J. L. Meredith, Bloomingsburg, Ind.
114,178.—Fence.—Levi Moore, Baraboo, Wis.
114,179.—Wrench.—F. B. Morse, Plantsville, Conn.
114,180.—Scroll Saw.—J. S. Moseley, Syracuse, N. Y.
114,181.—Stove-pipe Cleaner.—D. Murphy, Richmond, Va.
114,182.—Corn Harvester.—R. L. Nelson, Orange Court House, Va.
114,183.—Mortising Machine.—R. L. Nelson, Orange Court House, Va.
114,184.—Trace Buckle.—G. Oldham, Jr., Cuba, N. Y.
114,185.—Earth Auger.—T. Orchard, Sacramento, Cal.
114,186.—Photographer's Tank.—J. W. Osborne, Brooklyn, N. Y.
114,187.—Pile for Nut Blanks.—J. Ostrander, Manchester, Va.
114,188.—Pile for Nut Blanks.—J. Ostrander, Manchester, Va.
114,189.—Fence Post.—J. A. Otis, Watertown, N. Y.
114,190.—Wood Pavement.—H. E. Paine, Milwaukee, Wis.
114,191.—Electro-plating of Tubes.—D. D. Parmelee, New York city.
114,192.—Refining Sugar.—A. F. W. Partz, Oakland, Cal. Antedated April 22, 1871.
114,193.—Drill Cylinder.—C. S. Pattison, North Adams, Mass.
114,194.—Lubricator.—W. E. Phillips, Silver City, Idaho Territory.
114,195.—Trunk Fastening.—L. Ransom, Lansingburg, N. Y.
114,196.—Switch.—P. V. M. Raymond, Charles City, Iowa.
114,197.—Sewing Machine.—G. Rehfuss, Philadelphia, Pa.
114,198.—Advertising Device.—W. Reiff, Philadelphia, Pa.
114,199.—Folding Chair.—F. W. Richardson, New York city.
114,200.—Button Fastener.—A. M. Richmond, New York city.
114,201.—Trace Buckle.—W. G. Riley, Sullivan, Ind.
114,202.—Feed Water Steam Boilers.—Thomas Roberts, Baltimore, Md.
114,203.—Harvester.—Martin Rohrer, Polo, Ill.
114,204.—Wire Thread for Leather.—Chas. Rowland, Washington, D. C., and Nathan F. English, Hartland, Vt.
114,205.—Pole for Horse Cars.—A. G. Safford, Boston, Mass.
114,206.—Gas Regulator.—H. Shutte, Kansas City, Mo.
114,207.—Railway Switch.—Geo. H. Scougale, Carson City, Nevada.
114,208.—Cooking Stone.—J. Segondy and M. Ravolo, St. Louis, Mo.
114,209.—Window Shades.—J. Shorey and W. D. Butler, Lowell, Mass.
114,210.—Porcelain Knob Machine.—T. J. Sloan, Bronxville, N. Y.
114,211.—Water Wheel.—E. L. Small, Urbana, Ohio.
114,212.—Clevis.—J. B. Small and F. F. Holbrook, Boston, and G. Matthews, Oakham, Mass.
114,213.—Truck.—A. V. Smith, San Francisco, Cal.
114,214.—Buckle.—E. A. and D. L. Smith, Waterbury, Conn.
114,215.—Grist Mill and Huller.—J. W. Smith, Columbus, Ga.
114,216.—Boiler Alarm.—John Stanton, Philadelphia, Pa.
114,217.—Trunk Lock.—Jos. Stanton, Buffalo, N. Y.
114,218.—Veneer.—Benj. D. Stevens, Prairie du Chien, Wis.
114,219.—Fire Kindling.—J. W. Still, San Francisco, Cal.
114,220.—Plow.—W. H. Stone, Lebanon, Mich.
114,221.—Plow.—A. L. W. Stroud, Munford, Ala. Antedated April 19, 1871.
114,222.—Boiler.—Daniel Sullivan, Bangor, Me.
114,223.—Hair Dressing.—F. R. Taylor, Waverly, N. Y.
114,224.—Ash Sifter.—G. W. Taylor, Baltimore, Md.
114,225.—Bed Bottom.—A. E. Thayer, Philadelphia, Pa.
114,226.—Seed Drill.—J. H. Thomas, Springfield, Ohio.
114,227.—Grain Drill.—J. H. Thomas, Springfield, Ohio.
114,228.—Envelope.—J. S. Thompson, Philadelphia, Pa.
114,229.—Drill.—W. H. Thorne, Philadelphia, Pa.
114,230.—Breech-loading Firearm.—F. Tiesing and Chas. Gerner, New Haven, Conn.
114,231.—Clothes Wringer.—W. H. Towers, Boston, Mass.
114,232.—Seeder.—J. T. Trowbridge, Akron, Ohio.
114,233.—Fuse.—Richard Uren, Santa Cruz, Cal.
114,234.—Extract of Meat.—M. S. Valentine, Richmond, Va.
114,235.—Circular Saws.—D. W. Washburn, Brewer, Me.
114,236.—Bale Tie.—F. Watkins, Birmingham, England.
114,237.—Plow.—A. Weaber, Lebanon, Pa.
114,238.—Water Closet.—D. Wellington, Boston, Mass.
114,239.—Mail Bag.—M. V. B. White, Fort Edwards, N. Y.
114,240.—Balance Wheel.—F. W. Wild, Baltimore, Md.
114,241.—Horse Stall.—J. Wilkinson, Baltimore, Md.
114,242.—Dental Plates.—R. H. Winsborough, St. Louis, Mo.
114,243.—Reflector.—H. S. Wood and Jacob W. Morrison, Chicago, Ill.
114,244.—Harrow.—C. Wyckoff, Jr., Fairview, Ill.
114,245.—Condenser.—J. Yates and E. Deuell, Brooklyn, N. Y.
114,246.—Blackboard.—R. W. Young, Rising Sun, Ind.
114,247.—Hot Air Register.—Wm. Young, Easton, Pa.

REISSUES.

4,349.—Fluting Machine.—Henrietta H. Cole, New York city.—Patent No. 55,469, dated June 12, 1866.
4,350.—Piston Packing.—Orrin Collier, Sacramento, Cal.—Patent No. 98,232, dated December 28, 1869.
4,351.—Fall Leaf Extension Table.—Jacob Dourson, Columbus, Ohio.—Patent No. 87,829, dated March 16, 1869.
4,352.—Disinfectant or Carbolic Acid Soap.—C. J. Eames and C. A. Seeley, New York city.—Patent No. 65,186, dated May 28, 1867.
4,353.—Stanchion.—Walter C. Clifford, Jamestown, N. Y.—Patent No. 105,445, dated July 19, 1870.
4,354.—Lock Nut.—James H. Gridley, Washington, D. C.—Patent No. 62,483, dated February 26, 1867.
4,355.—Lightning Rod.—Lewis King, East Cleveland.—Patent No. 49,633, dated August 29, 1865.
4,356.—Pump Valve.—Wm. H. Pollard, Seneca Falls, N. Y.—Patent No. 73,038, dated January 7, 1868.
4,357.—Machine for Bending Wood.—Condit Prudden, Philadelphia, Pa.—Patent No. 54,012, dated April 17, 1866.
4,358.—Saddle or Sweat Cloth.—Robert Spencer, Newark, N. J.—Patent No. 41,944, dated March 15, 1864.

DESIGNS.

4,836.—Inkstand.—F. D. Alling, Rochester, N. Y.
4,837.—Lard Pail.—J. J. Brooke, New York city.
4,838.—Railway Car.—M. Buell and W. W. Lesley, New Castle, Del.
4,839.—Envelope Blank.—G. Cade, Long Branch, N. J.
4,840.—Mosquito Netting.—T. Carmichael, Newark, N. J.
4,841.—Show Case.—G. P. Farmer, Brooklyn, N. Y.
4,842.—Show Case.—G. P. Farmer, Brooklyn, N. Y.
4,843.—Cottage Front.—C. Graham, Elizabeth, N. J.
4,844.—Front of House.—C. Graham, Elizabeth, N. J.
4,845.—School Desk.—G. H. Grant, Richmond, Ind.
4,846.—Clock Front.—J. Moore, Jr., Brooklyn, N. Y.
4,847.—School Desk.—C. F. Palmer, Utica, N. Y.
4,848.—Saw Vise.—W. A. Perkins, Salem, Mass.
4,849.—Toy Engine.—E. P. Rider, New York city.
4,850.—Sash Weight.—W. H. Short, Brooklyn, N. Y.
4,851.—Gas Fitting.—F. E. Thomas, New York city.
4,852.—Faucet Holder.—Carl Tielenius, New York city.

TRADE MARKS.

227.—Stove Polish.—R. E. Cherrington, South Boston, Mass.
228.—Printers' Ink.—C. E. Johnson, Philadelphia, Pa.
228.—Pigment.—J. H. Nason, Boston, Mass.
230.—Cigars.—J. C. Smith & Son, Baltimore, Md.

EXTENSIONS.

Harvester.—E. D. Buckman, Philadelphia, Pa., and S. A. Sisson, of Queensburg, Vt., executors of S. S. Allen, deceased.—Letters patent No. 16,957, dated April 7, 1857.
Grinding Saws.—D. S. Nippes, Upper Merion township, Pa., administrator of Albert S. Nippes, deceased.—Letters Patent No. 17,110, dated April 21, 1857.
Machine for Splitting Wood.—Wm. L. Williams, New York city.—Letters Patent No. 17,061, dated April 14, 1857; reissue No. No. 2,132, dated December 19, 1865.
Securing the Doors of Hay Presses, etc.—C. Martratt, of Waterford, N. Y., Letters Patent No. 17,108, dated April 21, 1857.
Blind Fastening.—H. Vansands, Middletown, Conn.—Letters Patent No. 17,243, dated May 5, 1857; reissue No. 3,392, dated April 20, 1869.

DISCLAIMER.

Machine for Splitting Wood.—W. L. Williams, New York city.—Letters Patent No. 17,061, dated April 14, 1857; reissue No. 2,132, dated December 19, 1865. Disclaims fourth claim.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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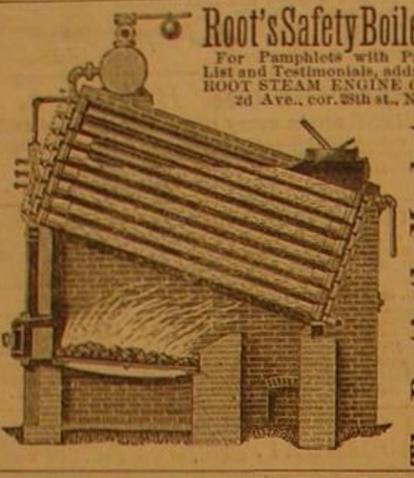

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Hannahs' Patent Metropolitan Railway.

The accompanying engraving is that of a system of elevated railways for New York, invented by J. M. Hannahs, of Chicago, Ill, and patented August 2, 1870.

The ends of the axles are intended to run so near the sides of the girders, that the wheels cannot get off the track, and the bottoms of the cars will only run from three to four inches from the track (see Fig. 4), so that the drop to the rail, in case of the breakage of an axle, would be slight; and the car, striking the rail, would slide along without noticeable concussion, careening, or damage.

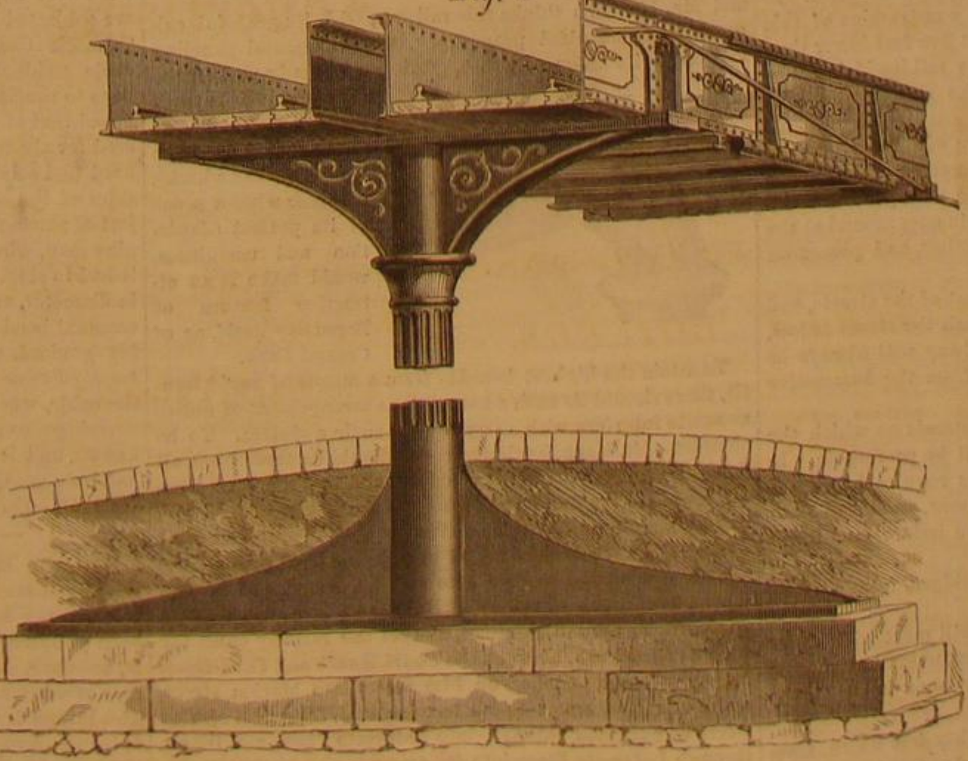
The inventor regards this feature, which he styles the "safety feature" of his plan, as so unquestionable and self-evident that it will secure general public confidence.

It is a double track railway, supported by single columns in the middle of the street, where the carriage ways are sufficiently wide; that is, in broad avenues, parks, squares, etc. Where streets are narrow, like Broadway, it is proposed to place the columns at the edge of the sidewalk, on each side of the carriage way, and to connect each series to the other by arch girders (Fig, 5). In either case the railway may extend over themiddle of the carriage way; or, if thought advisable, as it might be in some cases, single tracks may be supported by the columns on each side of the way.

The girders will be of iron or steel, of proper thickness, riveted up into the form shown, the rivets on the inner side being countersunk, so as to leave a smooth surface. The girders are connected across the bottom by cross-bars, on which is placed a strong, water tight oak floor.

On this floor, near the sides of the girders, are placed the T rails. The inside of the girders being smooth, there will be a complete, strong, and internally smooth inclosure, of sufficient hight of side wall to rise above the full diameter of the wheels, and above the lower framework and floors of locomotive and cars, only the lighter upper work of the cars rising above the sides.

Fig. 2



HANNAHS' PATENT METROPOLITAN RAILWAY

On the ends of the girders, there are strong head blocks (as shown in Fig. 2), riveted or bolted on, for the fourfold purpose of making substantial and solid bearings, for the ends of the girders, on the cross beams, and as braces to prevent them from spreading at the top. Being made with lugs, they serve to draw the girders together endwise, near the top surface, which is done by heavy steel bolts, which strengthen the girders. They also serve as towers, over which to place the truss rods or cables.

At intervals of six feet, are riveted to the outer sides of the girders, fins or braces, the feet of which are fastened to the projecting cross-bars, serving to give rigidity to the girders, and prevent their spreading.

The truss is not only an ordinary, independent one, acting as a strengthener and supporter for the girder within itself, as usual, but taking hold, as it does, upon the girders beyond for anchorage, it is as really a complete suspension cable, for any single length of the railway, as is the cable of a suspension bridge.

The girders being bolted rigidly together by the cross-bars, and each being strong of itself, and additionally strengthened by being drawn endwise to the girders beyond, by the steel bolt before mentioned, and upheld by the truss or cable, anchored as it is, provided that all are of suitable and proper proportions, and provided that the columns will bear it up, will, it is claimed, make a structure strong and enduring as it is possible to make of iron.

The columns are designed to be of cast iron, with bases reaching far out beyond the line of the weight of the superstructure; and each column, with base and upper cross beam, may be cast in one piece. The base of the column will rest upon a cut stone foundation, say four or five feet below the surface of the street.

It has been denied by some engineers that columns can be set so as to sustain such a railway; the inventor of the railway under consideration maintains that this is a mistake.

Such columns, as those which have failed in the West side railway in Greenwich street, in this city, set on crumbling brick foundations, will not do. His line of argument, in reference to these columns, is illustrated by the diagram, Fig. 3, and is as follows: If a stone pier were carried up from the stone foundation to the proper hight, fifteen feet broad at the base, and contracted toward the top, as shown by the lines, A, and a cast iron plate of sufficient thickness were placed upon the top, no one would doubt its capacity to support its share of such a superstructure. Now suppose that, instead of stone, the pier is of solid cast iron, placed on the same foundation; it would bear up the railway with any possible weight or speed of trains thereon. Such a pier, placed in the street, would be too much of an obstruction. But if thus set up to remain, the vast pyramid of iron might be reduced in size, provided the full size of the base and the top bearing, with sufficient brackets and thickness of each, were left intact. The question is, how much can its immense proportions be reduced and still retain the necessary strength?

A trifling reduction of the pier, as shown by the dotted lines, B, while the base and cross beams are not reduced, leaves it still, to all intents and purposes, a perfect pier. Then let the reduction go on, as at C, till it stands as a column, D, two feet in diameter, with base, shaft and cross beam unimpaired. It would then, it is maintained, be capable of bearing up, in perfect safety, this narrow track railway, with all the travel that could be crowded upon one or both tracks, as much as though it retained the original form indicated by the lines, A.

While columns may easily be cast entire, so exact that only drilling will be required, yet Mr. Hannahs thinks they can be made much lighter and cheaper with a base and cross beam of cast iron, and the shaft of wrought iron riveted up. In this case the base would be a plate with flanges or ribs to strengthen it, with a heavy ring or flange to which to bolt and rivet the wrought iron shaft. The cross beam can be bolted in a similar manner.

The arch girders will be riveted up, as shown, of wrought iron, and bolted to the heads of the columns prepared to receive them.

It is proposed to drive the cars with small locomotives of about the weight of a small fire engine. They will be very low, with only four wheels, and the wheels, cylinders, cranks, and pitmans will be entirely within the girders, and out of sight, so that horses will not be frightened. Dummies might be used, but their appearance is uncomely, and therefore objectionable.

The cars will be narrow, and will have only four wheels, with rear door for entrance and front door for egress, so that there may be no crowding or delay.

Trains will consist ordinarily of three cars, holding forty passengers each when necessary, though starting, as they easily may, every minute, there will be no necessity for thus crowding the cars. More cars can be added, and the trains start every minute, if necessary.

The engineer always stops at every station, so that he knows just when to shut off steam and put on brakes, but he starts only on signal. Being without obstruction, and having regular places to stop, high speed can be attained. It will be observed, also, that the peculiar construction of this railway brings the floor of the cars about five feet lower than the Greenwich street railway, while the rail itself is not so low. Fare will be paid on entering the station, as at the ferries.

At the ends of the railway, the curve will be around the engine and car house, so that the locomotives and cars can be switched off and on, as shall be desired, with greater facility than horses can be changed. The train goes around at the ends of the tracks, from one on to the other, and passes on without delay.

The cars will be entirely above the dust of the streets, and yet no dust or dirt from the cars can reach the street below, because the water-tight floor of the railway will always be damp, and so hold any ashes or dust from the locomotive from being blown about.

As before mentioned, there are many streets on which the single track, each side of the street, will be preferable. In this case, the track can, as circumstances require, be curved from the side to meet on the single columns, and also be carried from the single columns on to the before mentioned arches, at pleasure.

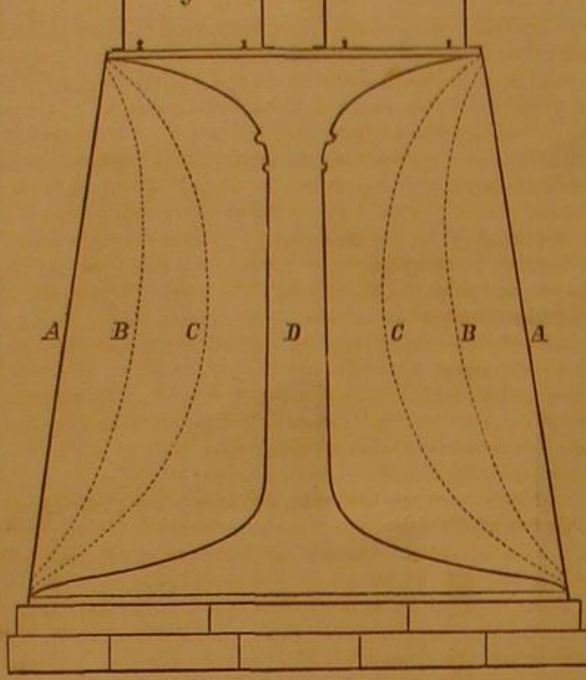
The cars will be reached by light bridges, from waiting rooms, at proper intervals.

Of course, a work of this magnitude will meet with objections; the principal of which will be obstruction to light and obstruction to carriage-way, from the columns being in the middle of the street.

Obstruction to light, in a street of eighty feet width, from a structure like this, being less than twelve feet in width, or of three feet in hight, at an altitude of fifteen feet, cannot, it is thought, be material; not nearly so much as an awning would produce.

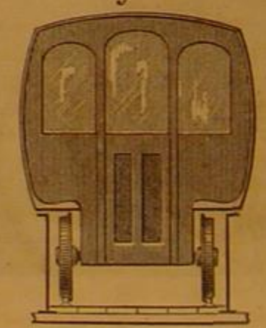
The matter of obstruction from the columns in the street requires some consideration. Of course business streets, as Broadway, or any street no wider than Broadway, will be spanned by the arch girder. The carriage way in all such streets would be left intact. But on reaching the broad avenues, which comprise the principal extent of the railway, and where the columns will be in the middle of the street, there will still be more room on either side of the single columns, than is contained in the whole width of the carriage ways of streets in the lower part of the city. The single line of columns, seventy feet apart, in such a street, even though thronged with travel, would not, it is thought, be a noticeable obstruction. In fact, there are streets in the lower

Fig. 3



part of the city, as, for instance, Bowery, Center, Broad, and other streets, where, Mr. Hannahs maintains, a single row of columns would be no obstruction. As can now be seen, the middle of Broad street is occupied as a carriage stand, without material inconvenience to travel. If columns were planted at intervals of seventy feet in that line of carriages, they would not add to the inconvenience. But, of course, no column should be placed at any intersection of streets. If, however, they prove a slight obstruction, it is thought so much should be conceded and borne with, considering the vast tide of travel that will come rushing down by that channel—a flood which, like that of the Nile, brings prosperity, to the whole city, and especially to the immediate route of the travel. It would be a tide additional to that which now maintains its inexorable ebb and flow in the great thoroughfares of the city.

Fig. 4



The ease with which the Greenwich trains run up and down a grade of 129 feet to the mile, has demonstrated the fact of its adaptedness to any grade in New York.

If the objection be raised that the railway will be an obstruction to view or sight, it is one which lies equally against shade trees and other street adornments, which really add to, instead of detracting from, the beauty of streets; and Mr. Hannahs thinks this railway, with its graceful columns and beautiful proportions, its ornamental paneling and finish, its unique coaches, gliding noiselessly past (for so smooth could the track be kept that he is confident that it would be less noisy than a hack), together with a sense of its perfect adaptation and usefulness, would make it an attractive feature of Broadway itself, or of Central Park.

Fig. 5

To attain the highest benefits from a means of rapid transit, there should be such a harmonious arrangement of routes as not to interfere with carrying out such a system. To be complet , Mr. Hannahs thinks there should be three lines, all meeting together at their extremities, and that the most eligible route for the first line is from the Battery, up Broadway, to 34th street, then up 6th avenue to and through Central Park. But as that route might be objected to at present, the next best would be to pass into and up Broad and Nassau streets to Spruce street; then let Elm street be opened through one block to Chambers street, and let the railway cross the corner of the Park, between the Court House and Tax Offices, into Elm street; thence up Elm street into Marion street, and up Marion street to its termination. Then let Marion street be extended through into Lafayette Place, and thence through Lafayette Place into 4th avenue; thence over Union Square into Broadway and 6th avenue, and through Central Park. This route is very near Broadway, being only two short blocks therefrom at any place, and most of the way but one. This route would also, Mr. Hannahs believes, open and bring into use a new and valuable thoroughfare between Chambers street and Astor Place, which is now valueless for travel or traffic.

This route is almost a straight line from the corner of Broad and Beaver streets to 4th avenue. It would not defeat the harmony of the system, as then another line could be located on each side of the central one. But this line may be carried on up 4th avenue from Lafayette Place, and another up 8th avenue, both meeting at their extremities. Even then there would be afforded, for a long time to come, the necessary facilities for rapid transit for New York and Westchester county.

With the system fully carried out, and the three lines established, the central one might make more frequent stops for the accommodation of city travel, that is, for Broadway and Fifth avenue, and adjacent parts, and for visitors to Central Park.

With the view of New York bay from the elevated position of the railway at the Battery, and the trip up Broadway, through Central Park, and beyond, an excursion on this railway would be unequalled for magnificence and variety.

Mr. Hannahs estimates that the entire structure may be constructed in one year, at a cost of $300,000 per mile on the broad avenues, and at a somewhat increased cost when two sets of columns with arch girders are required. On narrow streets, where the anchors are short, the cost will not be much greater than where single columns are employed. The parts all being made from drawings, can be constructed at different shops and brought together, so that the work might progress rapidly.

For descriptions, drawings, specifications, estimates, and plan of operating the road, address J. M. Hannahs, 37 Broadway, New York.

Precautions in Using Wire Rope.

In winding with round wire rope upon conical drums, it is important to make sure that the angle of inclination of the surface of the drum is not too great, as otherwise the coils of the rope are apt to slip off and cause serious accidents. Several fatal accidents have occurred in England from this cause. Mr. Wales, a government mining inspector (Great Britain), in his examination upon the cause of one of the accidents referred to, said:

"In his opinion, what most affected the proper and safe working of the spiral drum was the angle which the rope formed between the pulley over the shaft and certain portions of the drum. In the present case the angle was fifteen degrees, and in his opinion the accident was principally due to that fact, and not to any defect in the rope, which was broken by the jerk caused by the rope falling from the drum. In conclusion, he remarked that in erecting spiral drums, care should be taken to have the rope at as easy an angle as possible, and in no case ought it to exceed from ten to eleven degrees."

Professor Warrington Smyth, of the British Royal School of Mines, in one of his lectures directs attention to the precautions necessary in the use of conical drums. He mentions the case of a very serious accident a few years ago, by which the lives of a number of men were sacrificed, simply, he believes, in consequence of the cage having been wound up at too great a velocity, and then allowed to slacken too suddenly, the result being that the laps got loose, some parts slipped off, the rope went over the edge of the drum, and was snapped. Mr. Smyth then points out how this danger may be obviated by an ingenious contrivance of M. Lemielle, which consists of an endless rope passed down the shaft, and over a pulley at each extremity. The rope is thus kept constantly stretched out, and motion is communicated to it by a direct acting cylinder, which sets one of the pulleys in motion.

It is found to be very dangerous to allow wire ropes to wind over any inequality or projection, by which the wires are subjected to repeated bending back and forth. At the Cannock Chase Colliery, England, in 1867, the flat wire cable suddenly snapped, and precipitated eight men and boys to the bottom of the shaft, killing five. The inspector found that at the point of fracture, the cable had been covered for about eighteen inches with hemp, which had become hard and solid, and formed a bolster or projection on both sides of the cable, three fourths of an inch thick. The object of placing this hemp upon the cable was to show the engine man, when the cage was opposite a certain drift, where it had to stop. In passing to and fro over a pulley five feet in diameter, and under a drum of the same diameter, the constant bending broke off the wires. This effect was probably gradual, since it appeared on examination that only twenty-five or twenty-six wires, one seventh of the number in the cable, were whole when the cable finally parted. The covering also prevented the condition of the cable from being known, and it was believed that the breaking of the wires had been going on for three weeks or a month before the accident.—*Extracted from Blake's "Mining Machinery."*

Railway Bridge over the Ganges.—Notwithstanding the numerous railway lines, and the erection of many extensive railway bridges in India, the river Ganges has not yet been polluted by the shadow of the locomotive. That event is, however, close at hand, as a railway bridge is now in process of construction, which is to span the river at Cawnpore. The bridge is to be put up without the use of scaffolding. It is to be hoped that none of the girders will topple into the river, for in that case the Hindoos will be certain to ascribe it to the anger of their deity, and as a just punishment for invading the sanctity of the holy stream.

SOLUTIONS FOR SILVER PLATING.

[From Watt's Electro-Metallurgy.]

In making any of these solutions, perfectly fine silver must be employed; or, if it be desired to use standard or other impure silver, it will be better to purify the silver by first dissolving it in nitric acid; then add about one quart of cold water to the acid solution obtained from dissolving four ounces of silver. Now throw in a few pieces of sheet copper to precipitate the silver. In a few moments the silver will begin to deposit itself upon the copper, and by continuing the process for some time, and adding a gentle heat, the whole of the silver will eventually become precipitated in the form of minute crystals. When the pure silver is thus obtained, it is to be again dissolved in two parts water and one part nitric acid.

Solution 1: fine silver, 1 ounce; nitric acid, about 1 ounce; water, ½ ounce.

Put the silver carefully into a Florence flask, and then pour in the acid and water; place the flask on a sand bath for a few minutes, taking care not to apply too much heat; and, as soon as chemical action becomes violent, remove the flask to a cooler place, and allow the action to go on until it nearly ceases; when, if there be silver still undissolved, the flask may be again placed on the sand bath until the silver disappears. If, however, the acid employed has been weak, it may be necessary to add a little more. The red fumes, formed when chemical action is going on, disappear when the silver is dissolved, or when the acid has done its work. If a little black powder be visible at the bottom of the flask, it may be taken care of separately, as it is gold. I have frequently found gold in the silver purchased of a refiner; in some instances more than sufficient to pay the expense of the acid employed.

The nitrate of silver formed during the above operation should be carefully poured into a porcelain or Wedgwood capsule, and heated until a pellicle appears on the surface, when it may be placed aside to crystallize. The uncrystallized liquor should then be poured from the crystals into another capsule, and heat applied until it has evaporated sufficiently to crystallize. When this is done, the crystals of nitrate of silver are to be placed in a large jar or other suitable vessel, and about three pints of cold distilled water added, the whole being well stirred with a glass rod until the crystals are dissolved.

A quantity of carbonate of potassa is now to be dissolved in distilled water, and some of the solution added to the nitrate of silver, until no further precipitation takes place. It is advisable occasionally to put a little of the clear solution in a glass, or test tube, and to add a few drops of the solution of potassa, in order to ascertain whether all the silver is thrown down, or otherwise; as soon as the application of the alkaline solution produces no effect upon the solution of nitrate of silver, this operation is complete.

The supernatant liquor (that is, the fluid which remains above the precipitate) should next be carefully poured off the precipitated silver, and fresh water added; this is again allowed to settle, and the water poured off as before, which operation should be repeated several times in order to wash the precipitate thoroughly.

A quantity of cyanide of potassium is then to be dissolved in hot or cold water, and rather more than is sufficient to dissolve the precipitate added. In a few minutes the carbonate of silver will be dissolved by the cyanide, but in all probability there will be a trifling sediment at the bottom of the vessel, which may be separated from the solution by filtration, and preserved, as in all probability it will contain a little silver.

Sufficient water is now to be added to make one gallon of solution. Should the solution be found to work rather slowly at first, a little of the solution of cyanide may be added from time to time, as it is required: but it is preferable, in working a new solution, to have as small a proportion of cyanide as possible, otherwise the articles may strip, especially if they are composed of German silver.

When a silver solution has been worked for some length of time, it acquires organic matter, and is then capable of bearing, without injury, a larger proportion of cyanide.

It is necessary that the nitric acid employed for dissolving silver should be of good commercial quality, if not chemically pure, for if it contain hydrochloric acid (which is not an unfrequent adulteration), a portion of the silver dissolved will become precipitated in the form of a white flocculent powder (chloride of silver), and the success of the operation is thereby impaired.

Solution 2: To one ounce of silver, dissolved and crystallized as above directed, is to be added three pints of distilled water. The silver is to be precipitated from this by adding gradually a strong solution of cyanide of potassium. This must be done with caution, as an excess of cyanide will redissolve the precipitate. Should the operator, however, accidentally apply too much cyanide, a little nitrate of silver in solution may be added, the silver of which will be precipitated by the surplus cyanide. A portion of the solution should be placed in a wineglass occasionally, and a drop of cyanide added, until no further effect is produced by this substance.

As soon as the precipitate (which is white) has subsided, the clear solution is to be poured off, and fresh water added, this being done several times, as before, to wash the precipitate.

Three pounds of ferrocyanide of potassium (yellow prussiate of potassa) may now be dissolved in water, and added to the precipitate.

When the precipitate is dissolved, add sufficient water to make one gallon of solution, which should then be filtered before using. This solution is not very profitable to the electroplater, as it requires fresh silver to be added frequently, owing to the fact that the anode, or silver plate, is not acted upon by the ferrocyanide, therefore the solution soon becomes deprived of its silver. It may be used, however, for experimental purposes.

Solution 3: One ounce of fine silver, dissolved and treated as before, to which add three pints of distilled water. Precipitate the silver by adding a strong solution of common salt —an excess does no harm. A single drop of hydrochloric acid will show whether all the silver is thrown down or not. The white precipitate thus formed (which is chloride of silver) is to be washed as before.

A quantity of hyposulphite of soda is next dissolved in hot distilled water, and a sufficient quantity added to dissolve the precipitate. Water is then to be added to make one gallon. This solution is decomposed by light, and should therefore be kept covered up, or in a dark place. It is not much used by electroplaters.

Solution 4: One ounce of fine silver treated as before, and dissolved in three pints of distilled water. Precipitate with common salt, and wash, as above directed. Dissolve the precipitate with a strong solution of cyanide of potassium, taking care not to add much more than will dissolve the chloride of silver. Filter carefully, at least once through the same filtering paper, and once through clean filtering paper, and then add enough distilled water to make one gallon of solution.

The above solution is very useful when it is desired to plate an article delicately white, but the silver is liable to strip when the burnisher is applied to it. This solution, however, may be employed with less fear of the work stripping, if it be used weaker, with a small surface of anode and feeble battery power.

Under all circumstances this solution is more applicable to surfaces which only require to be scratch-brushed, or which are to be left dead. Chased figures, clock dials, cast metal work, etc., may be admirably plated with this solution.

Solution 5: One ounce of fine silver, as before, and the crystals dissolved in three pints of distilled water. Add strong solution of cyanide of potassium until no further precipitation takes place. If too much cyanide be added, it will re-dissolve the precipitate. Pour off the supernatant liquor and wash the silver as before. Now add strong solution of cyanide to dissolve the precipitate. Make one gallon with distilled water. The solution should have a moderate excess of cyanide, and it must be filtered before using.

Solution 6: A silver solution may be made by dissolving one ounce of silver as before. Dissolve the crystals in one pint of distilled water. Next be prepared with a large vessel full of lime water, made by adding recently slaked lime to an ample quantity of water, which, it must be remembered, dissolves but a very small percentage of lime. To the clear lime water is to be added the solution of nitrate of silver, which will be converted into a dark brown precipitate (oxide of silver.) When all the silver is thrown down, the clear liquor is to be poured off, and the precipitate washed as before. Now add strong cyanide of potassium solution to dissolve the oxide of silver, and make one gallon with distilled water.

This makes a very excellent solution, although it is somewhat troublesome to prepare.

Solution 7: Dissolve in one gallon of water one ounce and a quarter of cyanide of potassium, in a stoneware or glass vessel. Fill a porous cell with some of this solution, and place it in the larger vessel; the solution should be the same hight in both vessels. Then put a piece of sheet copper or iron, connected with the wire which proceeds from the zinc of the battery, into the porous cell. Place in the stone vessel a piece of stout sheet silver, which must be previously attached to the wire issuing from the copper of the battery. It is well to employ several cells alternated, for this purpose, when a large quantity of solution has to be prepared; that is to say, the zinc of one battery should be united by a wire with the copper of the next, and so on. In a few hours the solution in the larger vessel will have acquired sufficient silver, and the solution may be at once used. The porous cell is to be removed, and its contents may be thrown away.

In working this solution, at first it is necessary to expose a rather large surface of anode, and small quantities of cyanide must be added occasionally until the solution is in brisk working order.

This is one of the best solutions, when carefully prepared, and is less liable to strip than many others.

Solutions of silver may be prepared by precipitating the silver from the solution of nitrate with ammonia, soda, magnesia, etc., etc., but for all practical purposes the solutions 1, 4, 5, 6, and 7, may, if carefully prepared, be depended upon.

When it is desired that the articles should come out of the bath having a bright appearance, a little bisulphuret of carbon is added to the solution. This is best done in the following manner: Put an ounce of bisulphuret of carbon into a pint bottle containing a strong silver solution with cyanide in excess. The bottle should be repeatedly shaken, and the mixture is ready for use in a few days. A few drops of this solution may be poured into the plating bath occasionally, until the work appears sufficiently bright. The bisulphuret solution, however, must be added with care, for an excess is apt to spoil the solution. In plating surfaces which cannot easily be scratch-brushed, this brightening process is serviceable. The operator, however, must never add too much at a time.

In making up any of the foregoing solutions, the weights and measures employed are troy, or apothecaries' weight, and imperial measure.

Cultivation of the Fig, and its Preparation for Market.

The preparation of the fig for market is so simple that any family, having the trees, can succeed. It requires no sugar or syrup; as the fruit dries, it forms its own sugar. The greatest trouble is in gathering. If picked by hand, it will be found a tedious process. The best plan is to hold a sheet under the tree, then shake the tree hard enough to make the ripe fruit fall. Do not place the sheet upon the ground, as the ripe figs will burst open and be ruined for drying. Prepare a bath of strong ley that will swim an egg, have this near the boiling point. Put the figs in a basket, dip in the ley for two minutes, then dip in clear water. The reason for putting them in ley is to destroy the acrid gum in the skin, also, to change the color of the purple fig; let the fruit drip a short time, and it is ready for drying.

If dried in the open air, hurdles should be made with narrow slats, upon which to place the fruit. Keep in the sunshine. The second day you can flatten the figs by pressing them with the hand; the hurdles, with the fruit on them, must be placed under shelter at night, or when it rains. An objection to drying in the open air is, that a fly lays eggs in the fruit, and in a short time they become wormy. This can, however be obviated by heating them in an oven or stove, just hot enough to destroy the vitality of the egg, but not hot enough to candy the fruit. It requires a little practice to know when the fruit is dry; it should be soft enough to pack close in a box with moderate pressure; it keeps much better packed close, and is free from the attack of insects.

The boxes should contain from ten to fifteen pounds. Use oak, cypress, or gum, as pine will impart a turpentine taste to the fig.

The best and most expeditious plan is to erect a drying house, the size of which will depend upon the extent of the orchard. Where plank is scarce, a house can be built of logs, five feet by ten feet, and six feet high. Face both sides of the side logs, so as to leave a space of three inches between each; when the logs are put up, let these spaces begin two feet six inches from the bottom. Make an arched clay or brick flue through the house lengthwise, smoke-tight, with a chimney at the end outside; thick stove pipe can be used for a flue. Put slats across the ends and center of the house. Make frames half the width of the house, to fit the openings in the logs across the bottom of these frames or drawers and, make a lattice of palmetto stems; upon this place the figs and keep up a moderate fire; in twenty-four to thirty-six hours the fruit will be dry. Be careful not to have too great a heat, for it will darken the fig, give it a sirupy taste, and injure the market value. In building the house put a tight roof on, and daub all the cracks with clay.

Brain Weight.

An eminent German professor once assumed that, as a certain size and mass of brain is essential for the exercise of the mental faculties, therefore all the human race must be furnished with an equal amount of brains. This truly Teutonic theory has since however, been effectually dissipated. An elaborate paper was read not very long ago, before the Royal Society of England, in which the existing evidence as to the weight of brain among different nations was analyzed. The average brain weight for the English is stated to be 47·50 ounces; for the French 44·58; for the Germans, 42·83; but there are discrepancies in the results of different observers, some giving a greater average than this to the Germans. The Italians, Lapps, Swedes, Frisans and Dutch come into the category with the English. Among the Asiatic races, the Vedahs of Ceylon and the Hindoos give a mean of over 42·11 ounces. The skulls of Mussulmans afford a slightly increased average of brain weight over those of the Hindoos. Two skulls of male Khonds—one of the unquestioned aboriginal races of India—show a brain weight of only 37·87 ounces. The general average of the Asiatic table shows a diminution of more than two ounces when compared with Europeans. The general mean of African races is less than that of European races, although there are great differences; the Caffre rising high, and the Bushman sinking low in the scale. The average of the whole of the aboriginal American races reaches 44·73 ounces, which is 2·14 ounces less than that of the European races. The Australian races show a brain weight one ninth less than that of the general average of Europeans. The Malays and others of the Oceanic races, who migrated boldly, for commercial purposes, over the North and South Pacific Ocean, and occupy the islands show a tolerably high average of brain weight; and, on arriving at this section, we return in some measure to the large brain weight of Europeans.

Preservation of Honey.

As further information on the subject of the preservation of honey, and the prevention of its candying and turning white, we give the following directions, from Mrs. Sarah Kennedy, of White Hall, S. C.:

After the honey is passed from the comb, strain it through a sieve, so as to get out all the wax; gently boil it, and skim off the whitish foam which rises to the surface, and then the honey will become perfectly clear. The vessel for boiling should be earthen, brass, or tin. The honey should be put in jars when cool, and tightly covered.

To keep honey in the comb, select combs free from pollen, pack them edgewise in jars or cans, and pour in a sufficient quantity of the boiled and strained honey (as above) to cover the combs. The jars or cans should be tightly tied over with thick cloth or leather. The writer says that these processes have been in use for twenty years with unvarying success.

THE snail has 110 rows of teeth, with 111 on each row, or 12,210 teeth in all.

THE COCHINEAL INSECT AND ITS ALLIES.

Like the Aphides, the bark lice belong to the order of Hemipters or bugs—insects, we may remind the reader, which have a mouth adapted for piercing vegetable or animal tissues, and then sucking up their juices. In the characteristic hemipters, as this name, "half-winged," implies, the four wings are partly thickened, opaque, and coriaceous, and partly membraneous; but there is a subdivision of the order in which the wings have not the typical character, but are thin and translucent throughout their extent; and the members of this group are thence termed the homopterous (signifying "similarly winged") bugs. It is to this subdivision that the insects under consideration are assignable, and its characters may be familiarly observed—as we stated in our former paper on the Lantern fly (*Fulgora*)—in the common Harvest fly or Locust (*Cicada*). The families of the aphides, or plant lice, and coccidæ, or bark lice, are closely allied, but yet present us with some remarkable differences. The males of the coccids are minute insects, winged, it is true, but having only one pair of wings, the hinder pair being aborted and only represented by rudiments, reminding one of the similar condition of the wings in the Dipters or flies. In fact, so unlike are these males to the other members of this order, that they have been mistaken for dipterous parasites of the females and not for their lawful husbands. The mouth organs of the males, after they attain the mature stage, are but slightly developed, and they are consequently said to take little or no nourishment during the brief term of their perfect existence. The females are also remarkable for their "degraded" structural characters; they are wingless, and generally appear as little more than an animated scale, but they have a well developed beak, and use it for piercing the plant, whose juices they imbibe. The scale-like larvæ, when hatched from the eggs, crawl over the plants they frequent, living upon their sap and passing through the ordinary phases of insect growth. The adult female coccus is an ovoid-shaped creature, very convex above, as represented in the engraving accompanying our last paper. Soon after emerging from the pupa stage, she attaches herself by her beak, and frequently by an exudation from her body or else from the punctured plant, and proceeds to the reproduction of her kind. The convex and scale-like body is distended with eggs; these she finally lays underneath her, in such manner that they are almost entirely concealed from view; as they are discharged from the interior of the body, the latter collapses from beneath, the upper and lower walls thus coming together and forming a protected shell over the eggs. Most of the coccids also secrete, in greater or less quantities, a whitish feculent substance, amidst which the eggs are deposited, and which frequently, also, is developed as a covering to the larvæ and even of the adult insect. The collapsed female dies; and when the eggs hatch, the young readily escape from under the extraordinary protection, and make their way to their feeding grounds. According to Leuckart, these females, like those of the aphides, have carried the doctrine of "woman's rights" to the extent of dispensing considerably with husbands, whose services are only required at one period of the year. During the rest of the season, the multiplication of the family is carried on by virgin, or rather, as examination shows, by undeveloped females.

Insignificant and degraded in life type as these lowly bugs are, they are powerful for evil, and many a lover of plants has seen a favorite one become a wreck, pining and flowerless, and finally die altogether away, and yet has scarcely dared to attribute the ruin to the almost inanimate scales that swarmed upon it. Fitch regards the "oyster-shell bark louse" as the worst foe to the apple tree in this country, and no tree is able long to withstand the exhaustion produced by this insidious pest.

But while the aphides are unmitigated pests, the coccids, as some atonement for these injuries, contribute largely to the artificial requirements of our civilized condition, and the value of the substances they secrete appears almost fabulous when the insignificance of the authors is known.

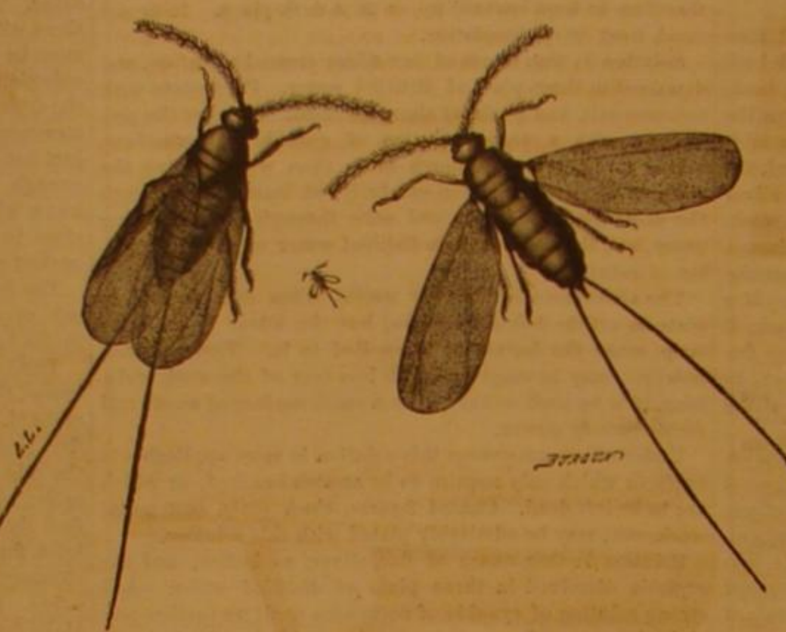
How important the culture of the cochineal insect is, in the countries in which it is carried on, may be judged from the fact that upwards of 2,500,000 lbs. of cochineal were imported into Great Britain in 1850, while 1,414,158 lbs., of the value of $927,946, were brought into this country in 1869. To meet this demand, we read of gardens of nopals (*opuntia*), the cactus upon which the *coccus cacti* feeds, in Mexico, containing from 50,000 to 60,000 plants; and this although, it is said, the largest part of the supply is obtained from the small gardens of poor proprietors. The *coccus cacti* was originally discovered in Mexico, but has since been introduced into other countries, notably into Java, Spain, and Algeria.

The Mexican cochineal has greatly superseded the use of the products of the European cocci, which formerly were used for obtaining similar dyes. These kermes dyes were known to the ancients even as far back as the days of Moses, and the *coccus polonicus* was collected in the middle ages as tribute from the rural serfs. But the uses of the coccids are not confined to the production of cochineal. The *coccus lacca*, a species of this family, feeding upon various trees in the vast countries of southern Asia, gives rise to the various products known as lacs and lac dyes. Stick-lack, from which seedlac and shellac are made and lac dye obtained, consists of the bodies and eggs of the bark lice, aggregated together upon twigs by a resinous substance, concerning which there appears to be doubt as to whether it is a secretion from the insect or an exudation from the wound made by the puncture of the bug.

The "vegetable wax" of China is another production of this family; and, according to Blanchard, a similar product may be profitably obtained from an European species of kermes, *C. ficus*.

Valuable as these important products are, it is a matter of speculation whether the net profit derived from them is equal, in a pecuniary point of view, to the damages others of the bark lice inflict upon us. In any case, it is a consolation to know that we can utilize, in some way, these devastators of Nature.

We have had occasion, in these papers, frequently to speak of the relative perfection of different insects, thereby implying their absolute imperfection; and this, and to speak of "degraded" forms of life, may seem to some minds to be an imputation on the "goodness" of the works of the Creator. The fact is, that these creatures, as we have hinted heretofore, are admirable in their perfection, if we look beyond the individual. The very lowness of the type of reproduction in the individual aphis may probably be its salvation as a race; and if the female coccids were not degraded as they are, they would possibly have long ago been exterminated, and we should have been without cochineal. As it is, they fill a place in Nature that would otherwise be vacant, and their very abundance proves how well they are adapted to the peculiar conditions under which they are placed; and this, though they may be utterly helpless by themselves, as are those aphides, of which Fitch tells us, which do not increase and multiply unless discovered and tended by a community of friendly ants!



THE MALE COCHINEAL INSECT GREATLY MAGNIFIED.

THE SEA-HORSE.

This remarkable fish is found near our south Atlantic coasts. It belongs to the singular order known as *Lophobranch*, or tuft-gilled, which differ from other fishes in the peculiar structure of the gill arches, by which the gills are arranged in little tufts on each side of the head, under the "cheek" bones or gill covers.

The male is really and literally father and mother to the progeny, as he is provided with a pouch or sack in which the eggs are deposited by the female; in which sack the eggs are fertilized, hatched, and the young reared, by the male.

We are indebted for our engraving to the *American Naturalist*, in which the Rev. Samuel Lockwood, who has carefully studied the habits of the sea-horse, gives us much interesting information.

The structure of the sea-horse's tail is unlike that of any other fish, being covered with an envelope, consisting of long scales—four-sided, and suggesting a small four-sided file—in faculty, prehensile, like that of a monkey, and of considerable length. In the act of excluding its young, it catches its tail around some object, such as a shell, and drawing its pouch downward against the object, pushes up the contents, forcing the young out of the opening at the top of the pouch. A dried specimen of a sea-horse sent to us recently by Mr. E. L. Caum, of Pennsylvania, measured five inches in length. Says Mr. Lockwood:

"The sea-horse, when taken fresh from his native home, though almost laughably grotesque, is a very pretty creature Its general color is ashen gray; at first glance, an exceedingly sober suit. But if examined more closely, it will be found thickly studded with tiny spangles of metallic silver. Add to this its rich armature of daintily carved plates, like a coat of mail, its body always pertly erect, and, bent forward, it looks like the steed of a knight-errant in quest of adventure; and those pretty golden, yet queer little eyes, chameleon-like, independent of each other, intently gaze two ways at once. Then, as to that dorsal fin, in oddity and beauty it has no compeer among its ichthyic rivals, so tastily fringed with a neat border of delicate yellow, precisely like the yellow tipping of the tail of the cedar-bird. In truth this dorsal fin is cruelly libeled in every engraving we have ever seen. In nature it is an exquisite fan, in form, size, and ornament, worthy the hand of Queen Mab. Thus our sea-horse, though anomalous in form and habit, has beauty united with its strange features, and grace with its eccentricity. In fine, as we look at his equine appearance, and think of his monkey faculty, and his opossum traits, and that queer blending of innocent oddity with patriarchal dignity, we have to accept the old fisherman's proverb: 'There is nothing on the land that is not in the sea.'"

Food from Algæ or Sea Mosses.

William S. Rand, Jr., of Brooklyn, N. Y., states in the specification of his recent patent, as above, that there are known to be over two thousand distinct species of algæ, and among them many contain the most valuable elements of vegetable nutrition. Some writers affirm that they contain nutritive elements sufficient to sustain all the demands of the human system. Hon. William H. Harvey, Professor of botany in the Royal College in Dublin, says "that algæ have been neglected as an article of food from want of proper commercial form, ignorance, and its invariable companion, prejudice."

The only serious objection to algæ as articles of food is their peculiar flavor. Growing, as they do, mostly in salt water, they contain lime, sulphur, salt, iodine, etc., which impart what may be properly called a sea flavor.

The object of this invention, then, is to expel, by a suitable process, the objectionable ingredients without decomposing or changing the nutritious and health-giving qualities, and put in such form as will be the cheapest and most convenient for commerce and the consumer.

The mode of preparing algæ (with the exception of the *chondrus crispus*) is to thoroughly clean the moss by suitable machinery or by hand; and, by washing it in a light alkali, to remove the salt and disagreeable sea taste, and, after desiccation, to disintegrate or grind it to a fine powder or farine.

Climatology of Bright's Disease.

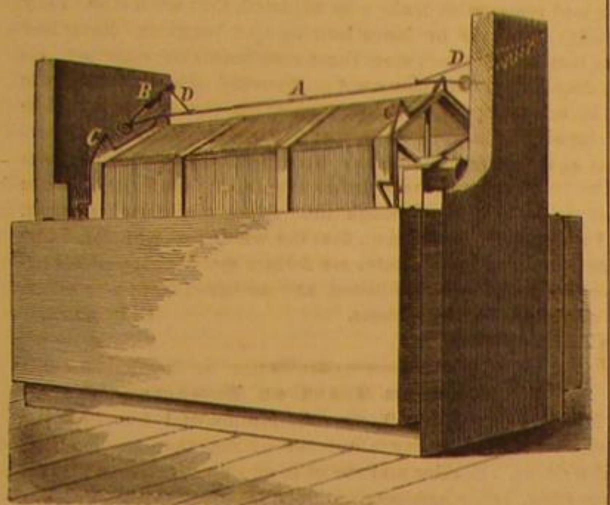
Gouverneur M. Smith, M. D., New York, does not doubt that climate is an element in the causation of Bright's disease. The inhabitants of the poles and the tropics are comparatively exempt from the disease, owing to the fact that the climates to which they are exposed are either uniformly cold or equably warm. The annual mean temperature of the city of New York and vicinity is 51° F., and therefore it is a location especially favoring the development of Bright's disease. It is consequently not surprising to hear that the malady is so frequently encountered. During the year 1867 the deaths in New York city numbered 23,441, of which number 425 were from Bright's disease. Rochester and Providence, with climates cooler than that of New York, have a considerably less mortality from Bright's disease. Dr. Smith believes that the liability to this disease is diminished where the vicissitudes of the weather are less abrupt than in this locality; in other words, that the climatic element of causation decreases both in more northern and more southern latitudes. The southern part of our union seems to present a place of refuge to one threatened with Bright's disease, or to one who has recovered from its more serious symptoms, and appears to offer a residence in which he is less exposed to excited irritation in parts of the kidneys which may be unaffected, or which may be but partially diseased. In following the isothermal line of 60° F., we find it commencing near the northern part of North Carolina, running through Chapel Hill and Raleigh, thence along the northern part of Georgia, Alabama, Mississippi, Arkansas, and Texas; thence crossing the continent and running northward on the Pacific coast, north of Sacramento, to about 40° of latitude. In conclusion, he says: "It behoves all, therefore, who reside in this metropolis during the winter months, to maintain a constantly uniform and normal temperature; an object which can only be attained by suitable diet, warm clothing, and a due attention to the warming of apartments."

The Iron-clads of the United States.

The iron-clad war vessels of the United States Navy now number fifty-one vessels of all classes. Most of these, we believe, are armed with smooth bore cast iron guns. The recent Prussian war has demonstrated, beyond all question, the superiority of cast steel breech-loading ordnance. A vessel armed with these might stand out of range of the heaviest guns of our iron-clads, and yet drive shot through them. The American Government is behind the age in respect to effective ordnance. It has not yet commenced the manufacture of steel breech-loaders.

MITCHELL & KESSINGER'S IMPROVED FLOUR BOLT.

In this improved flour bolt, a soft cotton cord, A, or a cord of other suitable flexible material, is extended lengthwise over the reel and fastened to coiled springs, B. On each end of the reel, or around the middle of the reel, are placed ratchet bands, C, over which the cord passes and straps down upon each section of the reel, one or more times, as it revolves. Auxiliary cords, D, are attached to the eyes of the springs, B, and are also attached to the principal cord, A, inside of the end ratchet bars, as shown.



This simple device can be attached to any reel at trifling cost, and, it is claimed, it secures important advantages, viz.: it keeps each section of the reel clear as it is presented to the rolling flour, and adds much to the capacity in bolting when the wheat is damp. It prevents beards and oat husks from sticking into the cloth to its injury, and preserves it from the ravages of moths. It is well known that the cleaner the cloth is kept, the less liable it is to be injured. The invention enables the miller to make the turn-out without difficulty, which, it is claimed, makes a large annual saving, and thus to satisfy his customers better.

The invention has been in use since December, 1868, and we have been shown letters from those using it, expressing in highest terms their satisfaction with the operation of the device. When grinding in damp weather, and when damp and musty wheat are ground, or when grinding new wheat before it has thoroughly dried, the work will, it is claimed, be done with greater ease and profit to the miller.

The principle of the operation of the device is that of whipping the cloth as with a bunch of broom straw. It does not jar the reel, but simply the cloth of each section, as it revolves. The ratchet bands serve to strengthen the reel, besides performing the office above described.

The invention was patented May 11, 1869, by Rufus S. Mitchell and Geo. Z. Kessinger. For further information regarding territorial or mill rights, address Mitchell & Kessinger, Monmouth, Warren Co., Ill.

Archimedean Screw and Centrifugal Pump.

At the meeting of the Institution of Civil Engineers (London) February 14, Mr. Vignoles, president, in the chair, the first paper read was "On the Archimedean Screw for Lifting Water," by Mr. Wilfred Airy. This communication was intended to supply information regarding the best form of the Archimedean screw, and its effect when laid at different angles of inclination to the horizon. After suggesting that the previous neglect of this subject was probably owing to the mathematical and practical difficulties attending the construction of screws in the ordinary way,—namely, with the threads at right angles to the surface of the core,—the author stated that he had adopted another principle of forming the spiral threads, which would simplify the work of construction and produce a more efficient machine. This was to make the spiral threads on the natural and developable system. If an annular piece of card or tin be wrapped upon a cylindrical core, having its edge retained in a shallow spiral groove on the surface of the core, it would naturally take up a fixed and determinate position, not at right angles to the surface of the core, but inclined to it, and inclined to it at an angle depending only upon the inclination of the spiral groove on the core. The core could only be constructed approximately by using a great number of small pieces. The developable threads also produced a more efficient machine than the threads of the usual form, as was shown by reference to tabular diagrams.

Experiments formed the basis of the investigation, and it was deduced from them:—

1. That the quicker the spiral, the flatter must the machine be laid to produce its best effect.

2. That screws of quick spiral angle, when laid at their best angle of inclination, delivered a far greater volume of water per revolution than those of slower spiral angle, when laid at their best angle of inclination.

In the most favorable case, the useful effect of the screw appeared at 88 per cent; and it was concluded that, after making allowance for certain small losses referred to, the useful effect of a well constructed screw should not be less than 85 per cent.

Reference was then made, by way of comparison, to other machihes commonly used for low lifts,—namely, suction pumps, centrifugal pumps, open Archimedean screws, scoop-wheels, chain pumps and Persian wheels; and the paper concluded by pointing out the various advantages of the Archimedean screw, more particularly as regards its durability, simplicity, and useful effect.

The second paper read was on "Centrifugal Pumps," by Mr. D. Thomson. The practical rules of construction were thus stated:

1. The arms of the fan were curved backwards, according to principles of construction which were explained by diagrams. The depth of the fan was one fourth of the diameter, and the central opening for the admission of the water was about nine sixteenths of the diameter. The space allowed in the case round the fan should be of ample dimensions.

2. The best duty was given when the speed of the periphery of the fan exceeded the velocity of a falling body, due to the height of the lift, by from 6 ft. to 8 ft. per second.

3. A fan 12 in. in diameter, and proportioned as described, would discharge 1,200 gallons of water per minute.

4. If the diameter of the fan were varied (the speed of the periphery and the lift remaining the same), the delivery of water was increased or diminished directly as the square of the diameter.

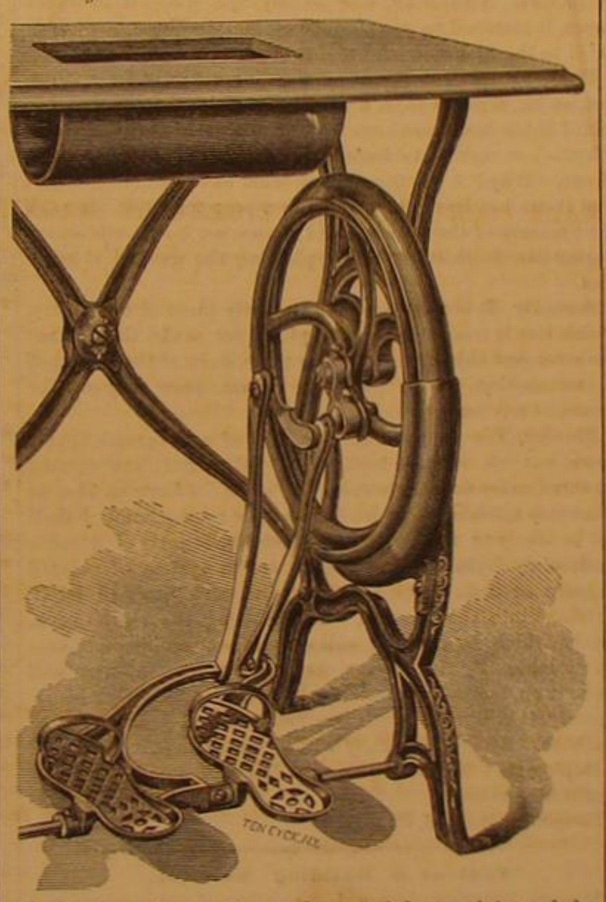
5. When a centrifugal pump, properly proportioned, was worked by a steam-engine, the duty that might be realised ranged from 55 per cent in the smaller sized pumps to 70 per cent in the larger machines, of the power shown by the indicator diagrams.

G. K. PROCTOR'S IMPROVED TREADLE MOTION.

This improvement is designed to render a double treadle motion, having no dead point, applicable not only to new sewing machines of all kinds, but to such as are already in use.

As will be seen, it is a double crank, of which our engraving shows only one form, but which is modified without change of principle, to adapt it to other methods of attachment.

Fig. 1



In the form shown, the attachment of the crank is made by set screws, to the hub of the wheel, and by a slot to the old crank wrist on the fly wheel. The two crank arms, A and B, Fig. 2, are set at right angles with each other, which obviates the possibility of both crank wrists being on the center at once, and allows the wheel to be started when in any position. The treadles act independently of each other, as will be understood without further explanation.

Fig. 2

On machines where the crank is formed on a shaft passing from end to end of the machine, instead of being attached directly to and forming part of the fly wheel, the double crank is attached by set screws.

In this way the inventor provides for the application to all machines of a double treadle motion, placing the machines entirely under control of the foot, leaving the hands free to work, making it easy to run the machine at high or low speeds, and giving more natural motion to the muscles, so that less fatigue is sustained by the operator. A stop motion, not shown, has also been provided, so that the machine cannot be started the wrong way. This can be used with or without the form of treadle movement illustrated.

Patented, March 7, 1871, through the Scientific American Patent Agency, by G. K. Proctor, whom address for rights or other information, 206 Essex street, Salem, Mass.

The Crystals found in Plants.

It has been proven by the microscopic examinations of distinguished naturalists, says the *American Journal of Microscopy*, that saline substances are spontaneously crystallized within the cells of plants, the crystals having been found ex-

Fig. 1.

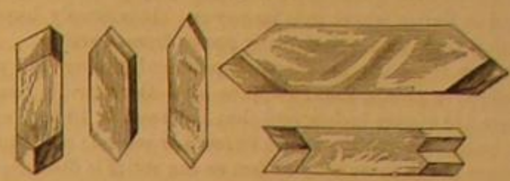
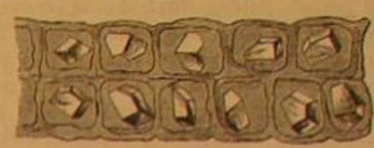


Fig. 2.



isting in infinite numbers throughout the bark, wood, and leaves of a great variety of trees and shrubs.

Prof. Bailey, of West Point, first called attention to this subject. He observed the crystals in the ashes of the hickory; afterwards he examined the bark previous to its being subjected to the action of fire.

When the bark of the hickory is illuminated by the rays of the sun, numerous glittering particles are seen. An examination proves them to be crystals, for when thin layers of bark or sections of wood are viewed by a microscope, the crystals are detected imbedded in their natural position.

They are, however, better seen by scraping the bark upon a plate of glass, upon moistening which with the breath, the crystals are made to adhere to the surface, while the woody particles are readily blown off. When placed under a microscope, the glittering atoms then appear as beautiful transparent crystals, having the forms shown in figure 1.

These crystals are identical in every particular with the polygonal bodies found in the ashes of hickory. Prof. Bailey examined the wood and bark of nearly every indigenous and foreign tree, and with the same result. Even in the densest woods, such as mahogany and lignum vitæ, the crystals may be found by scraping the wood into a watching glass filled with water, picking out the woody particles and then examining the residue. The crystals are likewise detached, in the minute particles that fall from worm-eaten wood, sawdust and in the finer particles of ground dye woods. This shows that even the finely ground medicinal barks, woods, etc., used by the pharmaceutist, may be examined successfully for the crystals peculiar to them.

It only remains for scientific men who desire to advance the interests of the profession of medicine, to examine all the medicinal vegetable substances, and ascertain the peculiar crystals belonging to each. Then, if these crystals are delineated and appended to our works on Medical Botany, Pharmacology, and even to Dispensatories, a great and practical advance in our knowledge of the purity of drugs would result.

When thin layers of the bark of the poplar are moistened, and examined by the microscope, the arrangement of crystals appears like an elegant piece of mosaic work, the crystals in the cells of the bark being either simple or compound, as shown in Fig. 2:

If we wish, for example, to satisfy ourselves whether a given specimen of pulverized Peruvian bark is adulterated or not, we first examine a thin layer of the perfect bark by the microscope, and ascertain the exact appearance of the crystals therein. Then we place some of the finely ground bark under the instrument, and see if the crystals, or all of them, have the same appearance. If the crystals in the pulverized bark be identical with those in the perfect specimen, we may decide the former to be genuine. If other crystals be found, the testimony is strongly in favor of adulteration.

This test, together with another which consists in the identification of the ultimate structure of the wood or bark, will enable us at all times to avoid imposition and the use of worthless drugs.

Licensing Druggists' Clerks.

A recent law, relative to the sale of drugs in New York city, is as follows:

The Mayor is directed to appoint, before the 1st of June, a board, consisting of one skilled pharmaceutist, one practical druggist, and two regular physicians, to hold office during the pleasure of the Mayor. These shall choose a practical druggist as secretary. The board shall examine and license all druggists, and clerks now employed, or hereafter to be employed, as clerks in drug stores. At the expiration of six months from the organization of the above board, any unlicensed person who shall make up a physician's prescription shall be deemed guilty of a misdemeanor, and shall be liable to a fine of not more than $500, or imprisonment not more than six months, or both. The salary of the members of the board shall be fixed by the Board of Supervisors, but shall not exceed $2,500 per annum.

Correspondence.

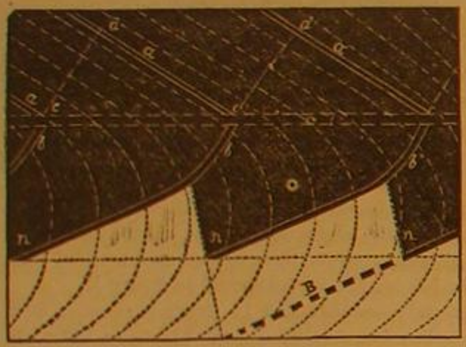
The Editors are not responsible for the opinions expressed by their Correspondents.

Filling the Issues of Turbines.

Messrs. Editors:—It is a well established fact that all good turbines possess the quality of working with filled issues; that is, the veins of water which they discharge are no less than the issues themselves; and it is plain that, if they are not filled, there can be no reaction, as there can be no pressure within a wheel which has the outlet so large that the entering water can escape without even touching all the surface of the issue or exit.

It is difficult to understand how port gate wheels can derive their power from anything but direct action of the water against the buckets, in the same way as the old undershot or flutter wheel gets its power. It is simply impossible that they should derive any power from reaction.

Reaction alone can be shown capable of giving 100 per cent effective power, thus: Suppose that the wheel's issues measure 144 square inches, and that the head is 10 feet, and the velocity through the issues 20 feet per second; now, since the issues are to move only as fast as the water is discharged (which simply means that the issues are to move, and not the water) 20 cubic feet per second will be discharged, and $20 \times 62\frac{1}{2} = 1{,}250$ pounds, falling 10 feet = 22·7-horse power. This is the entire power of the water discharged. The constant pressure on the line of issue is $144 \times 4{\cdot}33$ (the pressure per square inch) = 623·5 pounds moving 20 feet per second = 22·7-horse power as before; consequently the effect is equal to the power applied. This is very evident, and simple enough, but in carrying out this theory there are certain conditions to be complied with, to aid in explaining which, I give the following diagram of a turbine: *a a a* are the guides, and *b b b* the buckets; the lines, *c d* and *m n*, the guide and wheel issues respectively. The numerous broken curved lines show the direction of the water, as it



passes through the wheel, when it (the wheel) is in motion. Now, it will be observed that the four following conditions are essential: 1. A pressure on the plane of issue equal to that due the head. This is approximated by having the inlet larger than the outlet, and is also aided by complying with the third condition. 2. Making the plane or line of issue at right angles to the plane of the wheel's rotation. Thus the first furnishes the propelling force, and the second gives it the right direction. 3. There must be no retarding force, consequently the buckets must be so shaped as to enter and pass, through the column of water, from the guides, "endwise," or without obstructing the water or being obstructed or retarded thereby; thus allowing the water to pass in a solid column downwards, with the mere thickness of the buckets separating one vein from another. This is easily accomplished when the relative velocities of water and buckets are considered. Also, all that part of the outside of the buckets from *m* to *n* must not be touched by the water, or, at least, no pressure must be exerted against it. This is accomplished by making a rather short turn or angle at *m*, and drawing that part of the buckets above it, so as to require a slightly faster downward motion of the water to this point than after passing it. This bend also locates the plane of issue nearer the desired position, as it is thus made nearer at right angles to that of the wheel's rotation.

Thus far we have secured the propelling force, and avoided retarding forces; and it only remains to see that the water is discharged no faster than the issues move. This is the fourth condition, and one that has been the cause of a vast deal of trouble and disappointment. Yet it is accomplished by the very simple expedient of locating the relative position, or distance asunder, of the guide and wheel issues, as is required by the natural motion of the water in passing from one to the other.

The simple fact is: That as the water issues from the guides, it has a certain intensity of force in a direct forward line, but is also, from the instant of leaving the guide issue, opposed and deflected from that course towards the wheel issues, by virtue of the law, that fluids under pressure tend towards the issue or outlet. The resultant is a certain curve, of uniform and quite short radius, so much so that it has been found necessary to limit the distance apart of guide and wheel issues to about four inches, as it has been determined that, in this distance, the direction of the water will have been changed so much as to then be passing directly across the plane of the wheel's rotation, or parallel with that of the issues, which, it is obvious, must be the case in order to fulfil this condition.

I have thus briefly stated the requirements of a successful turbine, but I do not mean to be understood as saying that any of these conditions, except the last, can be exactly complied with; but they can be very closely approximated. For instance, it is scarcely possible that the pressure within the wheel, and consequently on the plane of issue, can equal that due the head, but it is very far from being equal to that due one half the head, as has been attempted to be proved by discharging water through two equal orifices, first from one vessel into another, and then into the open air. Such illustrations are not applicable to the turbine, inasmuch as the veins from the guides, being arrested and deflected as they are, would offer apparently an increased resistance rather than otherwise.

As to the direction of the propelling force, very little loss can arise therefrom; and as to retarding forces, the mere thickness of the buckets is about all the resistance. By far the most important point, is "filling the issues and yet discharging water no faster than they move," for without this, all the other conditions must certainly be violated.

I have shown in the diagram a deep and improper bucket, B, in which the issue is so far removed from the guide issues that the water has, as shown, commenced to move in a backward direction; consequently the issues would not be filled without discharging water faster than they moved, and consequently not at all, unless the area of guides were very much the largest.

It will be observed that the whole foundation of the principle which I have attempted to explain, rests upon the question: What time and distance traversed will be occupied in changing the direction of matter when acted upon in different directions (constantly or continuously) by forces), the direction and relative intensity of which is known? A particle of water moving in any direction cannot change that direction in "no time" and "no distance."

I have stated the distance which I find it to be, in the case of a turbine, and now leave the mathematical solution of this solution of this question to abler minds.

Boyd, Mo. J. B. Reyman.

The Coming Steam Plow.

Messrs. Editors:—After plowing all day, I took up the Scientific American, and as my eye glanced over the pages, it fastened on your notice of Mr. Greeley's book dedicated to the first man who will make a steam plow, etc.

First. The coming steam plow will not really be a plow, but, as Mr. Greeley says, a machine to pulverize the ground; and I think inventors have been mistaken in confining their attention so rigidly to improving simply an engine to draw plows. Why? A traction engine must have so much weight that it can but leave the ground in a poor condition through the pressure of the wheels, and I cannot see how a stationary engine can finish its work by plowing the ground it occupies.

Secondly. It is a very unwieldy, costly piece of machinery, which last is true of all steam plows yet made, though not the strongest objection. Yet the price, even if they worked to satisfaction, would place the steam plow beyond the means of any but a prince.

Thirdly. We do not want two feet of soil turned upside down, but we want it broken up, pulverized; the coming machine must do this to meet the want. I have an idea of what this machine must be, but as I am no mechanic, I shall not be likely to realize it. The principal parts of it are, a moderately light traction engine, and a system of pointed daggers or arms behind said engine, and operated by it, striking into the ground, and throwing the earth backwards, which, by reaction, will move the machine on to another stroke. By this means, the action of the machine will move it on, instead of drawing it back, as formerly; consequently, it will need much less traction, and less weight of machine. Being portable, it will be convenient.

Hoping that the coming steam plow will soon be on hand, I subscribe myself, A. W. Johnson.

Lower Providence, Pa.

Coal as a Building Material.

Messrs. Editors:—In a late number of your paper you have a very instructive article on artificial stone, known as *béton*, showing not only the way of making it, but the uses to which it has been and can be applied as a building material, with a well grounded opinion that it will be used as the best substitute for the ordinary stone for building purposes. You have not mentioned the modern or recent rival of both stone and *béton*, found in the admixture of coal dust, or small particles of coal, and silicate of soda (water glass), treated in the same way, or nearly so, as you have described the treatment of *béton*, to make it fit for building purposes. In it we have not only a building material equal to *béton*, but an excellent article of fuel, which burns without smoke or smell, and leaves neither clinker nor ash. In the neighborhood of the coal mines, where lumber is scarce, and bricks too costly, blocks or bricks of this coal dust, now worthless, could be made, and houses equally as strong and lasting as those built of stone or *béton* could be erected for a mere trifle. By another article in the same number, it appears that one half of the coal mined is waste or worthless, but this material could be made use of, far more cheaply than the *béton* you so favorably describe. W. J. Dermody.

Washington, D. C.

[If this building material will burn as stated, it would scarcely do for city building.—Eds.

Popular Errors Regarding the Watch.

Messrs. Editors:—I am very glad Mr. Alvin Lawrence and myself are not likely to have any controversy on the subject of "popular errors regarding the compensation balance." His own statement of facts in answer to my communication on that subject, leaves the matter just as I stated it to be. Unadjusted compensation balances, solid (uncut) or cut open, are good for nothing in compensating for variation by changes of temperature, or, as his friend quaintly expresses, "ar'n't worth shucks"; and Mr. L. naively confesses, that when he buys them unadjusted, he is obliged to cut them and adjust them in his testing apparatus. With the adjusted ones I find no fault, and Mr. Lawrence's certificate of adjustment, accompanying a watch, should be as much respected as any manufacturer's, for he can adjust a balance, undoubtedly.

What I complain of is t e flooding the market with unadjusted balances and imitations, that dishonest—no, I mean ignorant—dealers palm off on the credulous public, to the serious detriment of those who desire honorable and honest treatment.

Mr. L. says he has found watches, guaranteed by responsible and respectable makers as adjusted, that are not so. Very likely; but does he know how many "bunglers" have had the handling of them since these certificates were given? So he may have found many not professedly adjusted that were so by accident; for expansion balances that are designed to be capable of adjustment are at first constructed as near perfect as it is possible to make them; and many such happen to be just right without further attention; but those that are just wrong must go through the "freeze and thaw" process.

I must say in conclusion, that the whole tenor of Mr. Lawrence's answer corroborates my former statement, that all expansion balances not adjusted are useless, except as a snare to catch ignorant customers. R. Cowles.

Cleveland, Ohio.

A Voice from Texas on Temperance.

Messrs. Editors:—Your valuable journal has had for many years, in this city, a number of constant readers and subscribers. Besides matters of most important scientific information, other subjects, no less interesting, are found in every issue.

That advertisement of "A Friend to Humanity," relative to the extirpation of a fruitful source of evil, crime, and general demoralization—the parent of 90 per cent of all the trouble in the civilized world, to wit, the legalizing of a retail traffic in intoxicating liquors—has attracted attention. The invention of a practical plan—call it machine or engine—to accomplish the desired result, would overshadow, in real value, all the inventions, ever illustrated in your publications, put together.

How would this do for the specifications of a plan? namely: Educate the girls to a horror and detestation of, and never-ending opposition to, the liquor traffic and habitual use of intoxicating drinks. Let this principle be inculcated in every public and private school, and at the lap of every mother in the land. Good results would, although slow, be effective and permanent. Humanity.

San Antonio, Texas.

Effect of Cold upon Iron and Steel.

Messrs. Editors:—In relation to articles with the above heading, before the experimenter establishes as a fact that cold cannot cause tires on wheels to break, allow me to say that that will never do!

I admit that iron will endure as much (if not more) steady pressure, without breaking or bending, when frozen as it will when in moderate temperature, but it will not stand a sudden shock as well, for this very simple reason, namely: Iron will break when forced to stretch more, or quicker, than its capacity (bending a bar of iron is evidently stretching one side of it, and pressing the other side closer) and it must be just as true that the more frozen iron is, the less it is capable of expanding, and of expanding quickly, as it is indisputable that, the warmer it is, the more and the quicker it can be made to expand. Who can deny that Fact?

A Suggestion Regarding Lamps.

Messrs. Editors:—I noticed in a recent number of the Scientific American, two or three communications on the subject of the explosion of lamps, and the shortness of the tube was noticed as one cause. I have been using for some time a "student lamp" burner on a common glass lamp. As the burner is over two inches long, there is no danger of the flame running down into the lamp; and the wick itself does not have to be moved, except when it is trimmed. As the flame is circular, it gives a much stronger light than the common flat flames. F. P. Mann.

Princeton, N. J.

Seed Drill.

Messrs. Editors:—I noticed, in the Scientific American, April 1, 1871, that an Englishman claims to have invented a seed drill that will drop a given or desired number of seeds, at such distances as are required. If he has, he has conferred a great boon on his countrymen, as well as a fortune on himself. And, in fact, the greatest objection to raising root crops in this country is the labor of thinning, and the expense attending it. Why can't an American invent one? In view of the coming cultivation of the sugar beet, and the great increase of root crops consequent to such an invention, there is a fortune in it to the inventor, who will, moreover, be a public benefactor. C. R. M.

Johnson Town P. O., Va.

A New City Railway has lately been opened in Brooklyn, N. Y., five miles in length, from Fulton Ferry to Greenwood. Each car carries fourteen passengers, and is constructed in the most approved manner. The driver acts as conductor, the fares being deposited in a patent cash box; the car door is opened and closed by the driver, by means of cords.

The Boston *Post* is authority for the report that the New Jersey watering places are rapidly filling up with mosquitoes, and never before were they so thoroughly organized and confident of success.

New Zealand Flax (Phormium Tenax.)

The plant grows, says Mr. A. M. Southworth, in the *Rural South Carolinian*, in almost every variety of soil, from the rich mud and clay along the banks and at the mouths of rivers and lagoons, in the soil of the valleys and plains, on the tops and sides of many of the hills, and all along the seashore close to high water mark, among clean white sand. I think that the soil along the banks of our Southern rivers is admirably adapted for its growth, and that it would flourish among the low lands and islands along the coast.

It grows in bunches, two leaves starting first; and when about a foot high, they are about an inch wide, double, and one clasping the other; these spread apart and two more come up inside, and so they keep increasing and side shoots starting, and get to be a large bunch from four to six feet across, with leaves from six to nine feet long and even longer.

There is a quantity of gum in the leaves, and some free gum in the fold of the two halves toward the bottom. This gum is now used in England to make "safety envelopes," as no steaming or soaking will open them. There is a large quantity of honey in the blossoms. The stalks are very light and pithy, and are used by the natives to make their canoes more buoyant, by binding bundles along the sides.

These stalks, split or chopped fine, if used in stuffing the furniture of vessels and steamers, would make each piece a life buoy. The leaves, cut green from the bush and split to the proper size, serve a great variety of purposes, as strings and small ropes; they are woven into sacks and baskets, nets and mats; the latter are stronger and more durable than those brought from China. A few pieces of a leaf steeped in hot water will raise yeast like hops; and it has been suggested, by Dr. Hector, that the latter principle in the leaf can be applied to the manufacture of beer.

The people of New Zealand have long been aware of the plant growing wild so abundantly around them, but it is only within the last few years that machinery has been invented to work it to advantage. The principle in the several machines used is the same. The leaves are cut green and fed to the dresser, which consists of two rollers, one smooth and one grooved. These are about two inches in diameter, and feed the leaves to the beater, a cast iron cylinder a foot in diameter and six inches across, with steel bars half-square, set diagonally across its surface. This drum revolves very rapidly and the bars strike the leaf and knock the fleshy substance from it and leave the fibers hanging below. This is washed and bleached and then scutched, when it brings in the English market from two hundred to three hundred dollars per ton. It is estimated that an acre of good flax land will yield from twelve to fifteen tons of green leaves and two tons of dressed fiber. There is no particular season in which it must be harvested, but in New Zealand the mills run the year round. In England, there is machinery which still further improves the value of the fiber. I have seen ropes made from it aboard several American vessels, and the captains expressed a very high opinion of it, and wished to see it introduced into the United States. Capt. Friend, of the Barkentine Adele, of San Francisco, informed me he had some canvas made from it, which he obtained in Melbourne, Aus. Once successfully growing in the country, and with American enterprise and ingenuity bearing upon the manufacture, I think there is no plant that will so add to the wealth and prosperity of the country.

Vision of 1900.

Can any one realize the exceedingly probable fact that in 1900—only twenty-nine years from now—the population of the United States will number 75,000,000 of, we trust, free and independent citizens? Yet, says the *Evening Mail*, Mr. Samuel F. Ruggles proves that this will be the case, without making allowance for annexations, North and South, that will certainly come about, Mr. Sumner and all others to the contrary notwithstanding. He shows the reasons for his prophecy in figures, and although the old saw that "figures won't lie" is the most unveracious of proverbs, Mr. Ruggles' figures have acquired a reputation of their own, and a good one at that. For the past thirty or forty years, he has been figuring about our internal and domestic commerce; and although he has often been accused of romancing in figures, the facts have always sustained his predictions. When, therefore, the ablest, most experienced and most trust worthy statistician now living, tells us that we shall have a population of 75,000,000 in 1900, the younger part of the present generation may as well consider what awaits them in their maturity and old age.

Seventy-five millions of people in the United States implies the settlement of the entire South and West by as dense a population as that of Massachusetts; the reclamation of the arid wastes of the great Plains by irrigation; the development of states as strong as Ohio, Indiana and Illinois along the Rocky mountains; the settlement of the Utah Basin by four or five millions of agricultural and pastoral people; the development of a tier of agricultural states along our northern border, from Lake Superior to the Pacific, as populous and prosperous as Missouri and Minnesota; the growth of of the Pacific states into commonwealths as rich and populous as New York and Pennsylvania. It means that New York will cover the whole of Manhattan Island with a population of at least two millions, to say nothing of the outlying suburbs in New Jersey and across the East River; that Chicago and St. Louis will each become as large cities in fact, as they are now in their own estimation, and that San Francisco will have half a million of inhabitants. The national debt will have become a tradition, and it will be difficult to understand how it was ever hard to raise three or four hundred millions a year by taxation. Such are the glowing visions which are excited by the prosaic and careful figures of Mr. Ruggles. If any of our readers are unduly "Bearish" in their tendencies and inclined to get the blues over our future, we advise them to indulge in the line of speculation suggested by his striking statistics, and carry our predictions more into details.

Facts in the Natural History of the Honey Bee.

There are three classes of bees in a hive, the Worker Queen and Drone.

Queens are raised by peculiar food and treatment from eggs that would otherwise produce workers.

The worker is an undeveloped female. Workers in the the absence of a queen sometimes lay eggs. These invariably produce drones.

The queen lives from two to five years. The worker lives two or three months in the working season, and from six to eight during the season of rest.

The queen is perfected in fifteen or sixteen days from the egg, the worker in twenty to twenty-one, and the drone in twenty four.

The queen usually commences laying from seven to twelve days after leaving the cell, and is capable of laying from two to three thousand eggs in a day.

The impregnation of the queen always takes place outside the hive, on the wing, and generally the fourth or fifth day after leaving the cell. Excepting in rare cases, one impregnation answers for life. The drone she has mated with dies immediately.

The eggs of an unimpregnated queen produce nothing but drones; and it is generally conceded that impregnation does not affect her progeny; consequently, the male progeny of a pure Italian queen is pure, without regard to the drone she has mated with.

The queen and worker are provided with stings; but while the latter will use it upon any provocation, the former will only use it upon her own rank. The drones have no stings.

One queen, as a rule, is all that is tolerated in a hive; but previous to throwing off "after swarms," two or more queens are permitted in the same hive for a short time; but the extra ones are soon disposed of. In case of superseding a queen, the old one is preserved until the new one is fitted to take her place. Queens have a deadly hatred for each other and will destroy, if permitted, all queen larvæ or cells in the hive, and will fight each other until there is but one living one left.

A frightened bee, or one filled with honey, is not disposed to sting.

A good swarm contains about twenty thousand bees.

A strong or medium hive, with a good laying queen, is never seriously troubled with the moth worm; but a hive without a queen or the means of raising one is sure to be taken by th m.

Bees recognize each other by their scent.

The first one or two weeks of the young bee's life is spent inside the hive, as nurse or wax worker.

The range of a bee's flight for food is generally within two or three miles; much greater range is of but little benefit to them.

Manufacture of Pig Iron in Europe.

The process of improvement in the iron manufacture is rapid and unceasing. New sources for supplies of ore are being diligently sought out, and new processes for cheapening the conversion of the ore into metal, or for improving the quality of the iron are being diligently prosecuted. Already iron ores of superior quality are being brought from Bilboa, in the north of Spain, and from Marabello, near Gibraltar; and during the last month, letters from the north of Ireland announce the energetic prosecution of iron mining in that district, primarily for sale to iron manufacturers in England, but with the intention of eventually erecting blast furnaces on the spot; for, although the coal will require to be imported to work such furnaces, yet, seeing that it requires two tuns of the best ore, to make one tun of iron, and only one tun of coal, it is believed that it will be found more profitable to import the coal than to export the ore. This announced intention corroborates the view already put forth, that the iron manufacture is in a state of transition, which suggests and implies grave issues. For if the coal be henceforth brought to the ore, instead of the ore to the coal, the locality of the manufacture will be changed in many cases, and existing works must in some instances be shut up.

In the north of Ireland there are extensive deposits of iron ores, extending along the shore from Carrickfergus to the Giant's Causeway, and some of these ores are hematites containing 55 per cent of iron. Upwards of 80,000 tuns of ore were shipped to England and Wales during the past year. But this is only a small beginning, and the trade will, no doubt, rapidly expand. In other parts of Ireland there are ferruginous deposits which may be found of still greater eligibility; and in Somersetshire and other parts of the south of England valuable ores are being worked, some of which produce speigeleisen, which is added to the decarbonized pig for the production of Bessemer steel. The existing process for puddling iron is expensive and laborious, and many projects have been propounded for superseding it. But it is the only method yet known whereby phosphorus and sulphur can be removed from the iron, and therefore the only method in use for decarbonizing the pig yielded by the large class of ores contaminated with those substances.

Sherman's method of purifying the iron by the introduction of a small dose of iodine, and Henderson's, by introducing powdered fluor spar, mixed with oxide of iron, as a floor to the puddling furnace, have been favorably spoken of; but their success cannot be said to be assured. By Heaton's plan of making wrought iron from pig, a certain quantity of nitrate of soda was introduced into a vessel, and was covered over with a perforated iron plate. Molten iron was then poured into the vessel, and in a short time the oxygen, expelled from the salt by the heat, boiled up through the metal and decarbonized it, reducing it to the condition of a pasty mass, which was afterwards rolled. Mr. Menelaus, of Dowlais, used a rotating puddling furnace, which, however, did not in all respects answer his expectation; and not one of the plans for superseding puddling has yet been sufficiently successful to come into general use. Nevertheless there appears little reason to doubt that that this great desideratum will be reached in a little time. Just, however, in the proportion in which the operations of the iron manufacture are abbreviated and cheapened by the employment of more compendious methods, and by reducing the present waste of heat, will the relations of the existing ironworks be affected, as the selection of localities which yield cheap coals will cease to be the most prominent necessity of the manufacture. On the whole, it appears probable that the iron trade will shift its localities, as the copper trade has already done; and it will migrate to situations in which cheap and good ores are found, or to seaports which, with cheap coal, combines the advantage of cheap freight for ores from other places.

The iron trade of South Wales has already received a severe shake by the rise of a competing industry in the north of England. Its copper trade, once so profitable, is almost extinct; and it will require great care and circumspection on the part of mineral owners and manufacturers to prevent the iron trade from following a similar course.

Meanwhile the race of improvements in pig iron suggests but one course, and that an imperative one, to consumers, namely, that they must not localize, but extend their demand all over the producing world, and test by practical experience and pecuniary confirmation which qualities of iron suit them best. The demand for pigs for America never was larger than at this moment, and as they can be laid down in New York and Boston at $25 to $26 gold per tun of 2,240 pounds (all costs and duty paid), that demand is likely to continue.—*Alex. S. Macrae.*

Base Ball.

Some idea of the popularity of this excellent out-door amusement, may be gathered from the following report of the manufacture of base balls and bats, which we find in the New York *Times:*

No less than sixteen kinds of balls are in use, from the regulation ball to the children's or fancy ball, and prices vary from $18 to 85 cents a dozen. Some half dozen regular manufactories of base balls alone, exist in this city, the largest producing just now seventy five dozen balls per diem. The town of Natick, however, in Massachusetts, is the greatest ball manufactory perhaps in the world, many hundreds of people being employed in producing these articles, and it is not uncommon for houses in this line of business to order thence 6,000 balls at a time. Their manufacture entails nothing of very special interest, the inside being of wound rubber, and the wrapping of woolen yarn, save that the winding of the yarn around the ball is principally done by men. One would suppose from the nicely shaped spheres women make when winding up worsted, they would be most adapted to this kind of work, but it seems to require a certain amount of physical strength which the weaker sex is not endowed with. The cover of horse hide is put on entirely by women, who use a saddler's needle and saddler's thread. Dark, the famous English ball maker, is an artist in his way, and, according to the best authorities, employs thirty five workmen all the year round, and uses up one and a half tons of worsted, and covers them with the hides of 500 cows and oxen. The method of securing the cover to the English ball with the triple seam, is superior to the American method. This plan is said to have made the fortune of its inventor, a certain John Small.

The total number of balls made and sold in New York is immense, one manufacturer alone having supplied 162,000 balls last year. Perhaps the United States will bat to pieces half a million of balls this season. Bats form an important business alone. They run through a dozen different varieties. It sounds somewhat preposterous to think of mills running all the year round, turning out bats. As more bats are used than balls, one can form some idea of the enormous quantity of material consumed. Orders for all base ball implements are just now at their hight, and the supply is barely up to the demand.

Improvement in Preserving Wood.

A recent patent to Nathan H. Thomas, of New Orleans, La. He says:

My method is the simple process of saturating the wood in resin oil, warm or cold, or at any required temperature, according to the circumstances. In the event of the wood being of moderate dimensions—thin board, for instance—I apply the oil cold; and for wood of large dimensions I apply the oil hot, in either of the above cases, by immersing the wood in the oil, or by applying the same to the wood with a brush, or in any convenient manner whatever, so that the wood may be thoroughly saturated with the oil.

Claim: The application of resin oil, hot or cold, for the preservation of wood from decay, and from destruction by worms and insects, substantially as described.

[It is proper for us to state that the preservation of wood by boiling the same in resin, under a pressure, is the subject of a prior patent, granted some three years ago to another party, and that it is an effective method of preservation.—EDS.

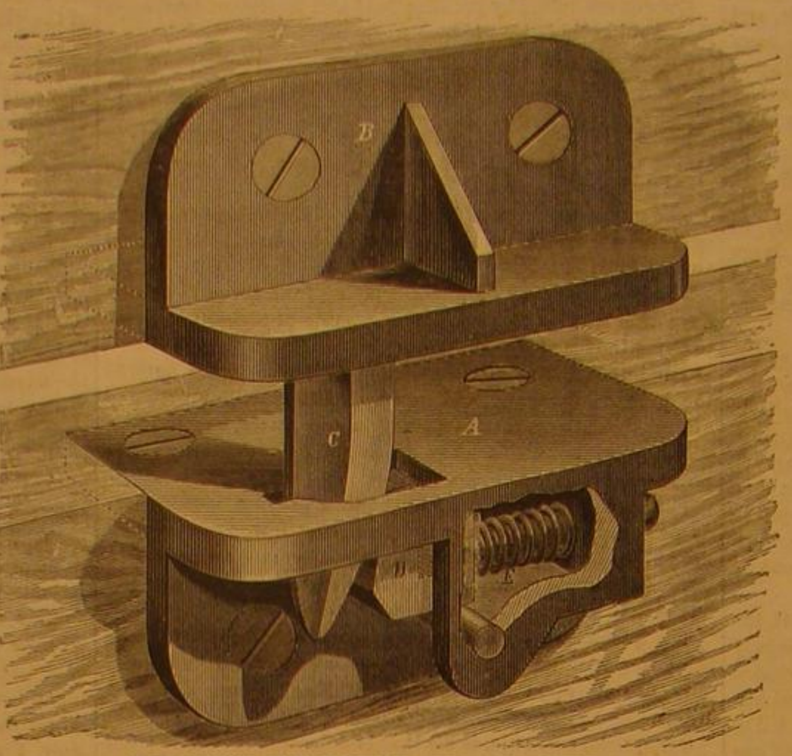
Improved Flask Guide.

All practical molders are aware of the difficulties in making castings as true as the pattern, on account of the looseness of the guide pins of their flasks, as they are ordinarily met with in foundries. If made tight, they stick or bind, and are apt to jar the sand out; and, if loose enough to work with freedom, then it is difficult to avoid lop-sided castings, because the cope cannot generally be replaced in the exact position it occupied before removal for the withdrawal of the pattern.

The accurate replacing of the cope is secured by the improved flask guide herewith illustrated; and as two sides of the pin are straight, except at the point, the cope must ascend or descend vertically, while a spring bolt, pressing against the taper side of the pin, keeps it forced against the straight sides. It is claimed that this arrangement secures a perfect guide, free from any liability to stick, and always working freely and accurately.

The construction and operation of this device will be more fully understood on reference to the engraving, in which A represents the part of the device attached to the lower part of the flask; B, that attached to the upper part of the flask; C, the guide pin, triangular in form, with one side tapering, as shown; D, a spring-bolt bearing against the pin; and E, the spring that exerts the pressure. The guides are made from right and left patterns.

The improvement was patented through the Scientific American Patent Agency, April 5, 1870, by Thos. S. Brown, of Poughkeepsie, N.Y., whom address for further information.



BROWN'S IMPROVED FLASK GUIDE.

Left-Handedness.

Various attempts have been made to account satisfactorily for the use of the left in preference to the right hand in those in whom this peculiarity exists, but, according to the *Lancet*, without success. Dr. Pye-Smith takes up the question, and, disposing of the theories that left-handedness is to be accounted for by transposition of the viscera, as asserted by Von Baer and others, or by an abnormal origin of the primary branches of the aorta, proceeds to argue that right-handedness arose from modes of fighting adopted, from being found to be followed by the least serious consequences. "If a hundred of our fighting ambidexterous ancestors made the step in civilization of inventing a shield, we may suppose that half would carry it on the right arm, and fight with the left; the other half on the left, and fight with the right. The latter would certainly, in the long run, escape mortal wounds better than the former, and thus a race of men who fought with the right hand, would gradually be developed by a process of natural selection." Of course the habit once acquired, of using the right hand more than the left, would be hereditarily transmitted from parent to child.

Frings' New Process for Preparing and Mashing Grain in Distilling.

Mr. Charles H. Frings, of Centreton, Mo., has invented an improvement in preparing and mashing grain, of which the following is a description, derived from his specification:

In this process the grain is first pulverized, or if of a horny consistency, like rice and certain kinds of corn, first steeped in an alkaline solution, containing for every bushel of grain one to one and a quarter ounce of caustic soda, or an equivalent quantity of caustic potash, and water enough to cover the grain.

After having been steeped for several hours, the horny parts will be sufficiently loose, and the grain may, after having been superficially dried, be pulverized. Grain less horny is first pulverized, and is then, in a suitable sieve or apparatus, separated from the larger (horny) parts. These are then separately moistened with an alkaline solution, like that used for the horny grain, and pulverized, after a few hours, when sufficiently dry.

To extract the proteine from the grain, the latter is steeped in another alkaline solution, which contains for every bushel of grain one to one and a quarter ounce of caustic soda, or its equivalent amount of caustic potash, and for every bushel of rice or corn about fifteen, for other grain about twenty, gallons of water.

The grain is stirred in this solution for about fifteen minutes, and then allowed to settle until about five gallons of the liquid above the sediment can be drawn for every bushel of grain. This proteine extract is reserved for fermentation.

To prevent alkaline reaction, which in the mash promotes a disadvantageous formation of lactic acid, the inventor adds to the sediment muriatic acid, in such proportion that the mash will, after addition of proteine extract, show a sour reaction. This aids in completing the disclosure of starch before saccharization, and promotes, in conjunction with the said alkaline bases, the effectivity of the diastase during saccharization, and the action of the proteine during fermentation. It also improves the quality of the alcohol, prevents the formation of acetic acid, and increases, by forming salts, in its combination with the soda or potash, the value of the slop or swill as fodder.

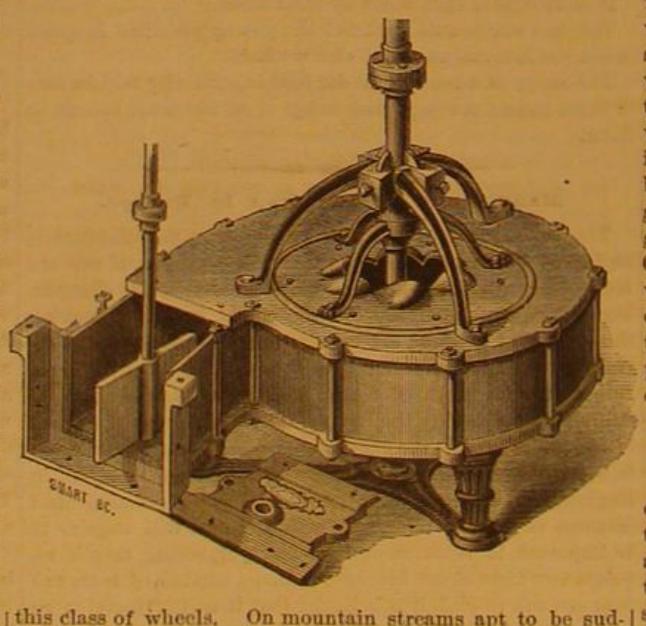
From five to six ounces of muriatic acid for every bushel of grain, diluted in three times its bulk of water, are, while the sediment is being stirred, added to the same. The mixture, after standing about fifteen minutes, is brought to the mash tub. The tub should contain sufficient hot water so that, after the addition of the grain, thirty gallons will be occupied by each bushel.

For rice and corn, the water in the tub should be about 212°, for other grain about 180° Fah. Immediately after the application of the sediment to the tub, which causes a considerable reduction of temperature, one bushel of malt is added to every one hundred bushels of unmalted grain, for the liquefaction of "paste" first formed. The temperature is then gradually raised, for rice and corn to 200°, for other grain to 170° Fah., retained for ten or fifteen minutes, then quickly reduced to about 145°, and the malt required for saccharization is added, whereof five bushels for every one hundred bushels of unmalted grain are required. The temperature is now, for about one hour, kept at 142° to 145°, after which time the process of saccharization is completed.

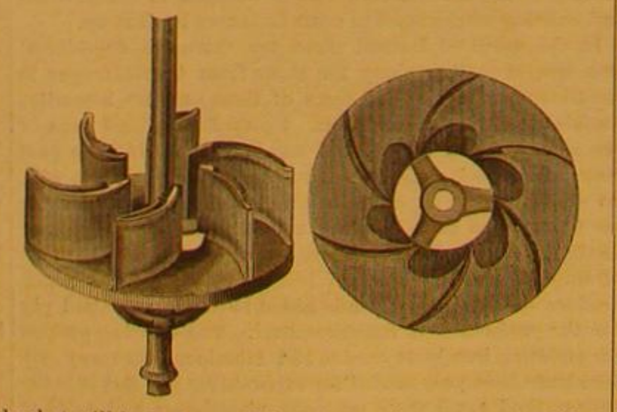
The proteine extract taken from the grain is added to the mash when the same has been cooled to about 120°. Fermentation is finally effected, after further cooling, by the customary addition of yeast, and is completed in about thirty-six or forty hours.

IMPROVED TURBINE WATER WHEEL.

It has long been recognized as desirable to so construct turbines that the buckets and gate might be easily accessible. For many reasons such construction adds to the usefulness of



this class of wheels. On mountain streams apt to be suddenly flooded by heavy rains, more or less rubbish, like stones, sticks, and gravel, will be carried down, and it is scarcely possible to avoid its occasional entrance to the wheel. When stones thus enter the wheel, should they wedge between the buckets and the case, either the wheel will be stopped or the



bucket will be broken. When the sections are cast solid to the disk of the wheel, as in the old method of making scroll turbines, the buckets cannot ordinarily be polished or finished, and consequently, by their friction in the water, absorb a notable percentage of power over those made with polished buckets. If a bucket be broken, it becomes necessary to remove an entire section, and supply its place with a new one, causing delay and expense, especially when the wheel is at a long distance from the factory. The gate cannot be removed without disconnecting the scroll from the flume, and setting the entire wheel out of its usual place.

These difficulties are removed in the construction of the wheel illustrated herewith, and another advantage is gained, namely, the power to adjust the gate so as to compensate for wear, and prevent leakage and other inconveniences attending such wear.

Another object is secured, namely, the continued reaction of the water after it has left the buckets, so as to extract as much as possible its available dynamic power before its discharge from the wheel.

These desiderata are secured by making the buckets separate and movable, so that they may be polished for the purpose of lessening friction, or removed without taking the wheel apart; and providing a flange or bead upon each bucket, made in sections or continuous the whole length of the edge of the bucket, the flange fitting into a corresponding groove in the disks of the wheel, and secured by a screw bolt passing through the disks into the flange or the edge of the bucket.

The upper portion of the mouth of the scroll is made so that it can be removed, as shown in the engraving, which gives ready access to the gate, permitting the latter to be re- moved or adjusted without disconnecting the wheel from the flume The gate is also provided with adjustable strips or bars placed on the inside by which compensation for wear is secured and leakage prevented.

The wheel is made without a hub, and the upper and lower disks have formed upon them half domes, as many on each disk as the number of buckets in the wheel. The domes are of the shape shown in the engraving, and their bases receive the water as it leaves the buckets, and by their directing power compel it to react upon the buckets for a longer time than would be the case were they dispensed with.

These improvements were patented April 18, 1871, by Elisha P. H. Capron, of Hudson, New York. For further information address the Capron Water Wheel Company, Lock Box 138, Hudson, N. Y.

Testing for Gold with Iodine and Bromine.

W. Skey, in the *Chemical News*, gives a method for detecting small quantities of gold by the use of iodine and bromine. Two grammes of roasted quartz sand, which contained 2 ounces gold to the tun, was shaken up with an equal volume of a tincture of iodine, and after the sand had settled to the bottom, and the liquid above was clear, a piece of Swedish filter paper was immersed in it, and afterwards burned. The ash was not white, but purple, and the coloring matter was quickly extracted by bromine. One gramme of the same gold-bearing quartz was taken and thoroughly mixed with other rock, so that the gold did not exceed 2 dwts. per tun, and left for two hours with constant stirring, in contact with the iodine tincture. A strip of filter paper was then immersed five times in the liquid and tried each time, then burned and treated with bromine as before, when traces of gold were made evident. Hematite ore was mixed with gold quartz in such proportions that the gold did not exceed 0·5 dwt. to the tun, and yet it was easily detected in this way. By the amalgamation method it is scarcely possible to detect gold, even when 100 grammes are put into test, where the amount does not exceed 2 dwts. to the tun. Mr. Skey's process, being easy of execution, offers many advantages over the old way of testing for gold.

Passivity of Iron, and Electrolysis.

L. Schönn states that, when a piece of iron is tightly fastened to a piece of charcoal, care being taken to make the contact between the charcoal and well polished iron as perfect as possible, and also to immerse both these substances simultaneously into nitric acid, the iron is not dissolved; but as soon as either the metal or the charcoal is touched, under the surface of the acid, with a strongly electropositive metal (for instance, zinc), the iron becomes at once active again, and is dissolved in the acid with a copious evolution of gas. When some very dilute hydrochloric acid, so weak that it hardly acts upon zinc, is poured into a platinum basin, and a piece of zinc placed in that liquid in metallic contact with the platinum, a copious evolution of hydrogen takes place at once, precisely on the spot where the zinc, platinum, and acid are in contact. If, instead of the very weak acid, an aqueous solution of corrosive sublimate be taken, and the experiment repeated, metallic mercury is separated at the point of contact between the zinc, platinum and the solution. The author finally states that, from a series of experiments made by him, he has found that all desired electrochemical actions can be called forth at pleasure by simply placing either two different metals, or charcoal and metals, in contact with a fluid.

REV. WILLIAM SPEER, D. D. (*China and the United States*) says it is amusing to witness the eagerness of the Chinese when, once in many years, a slight snow falls in the winter, to gather it into bottles, in which they suppose its precious virtues will be preserved after it melts, and be an efficacious remedy for fevers.

THE secrets of Nature are the secrets of God, and man should inquire into them with reverence and without boldness.

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NEW YORK, SATURDAY, MAY 13, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

THE ERIE CANAL.

When, in 1816, DeWitt Clinton presented his celebrated memorial, with one hundred thousand names appended, to the New York Legislature, asking for an act authorizing the construction of the Erie Canal, it is doubtful whether he foresaw the storm of opposition his proposition would raise; and when, at last, by his untiring energy, he secured an appropriation of $5,752,738, and saw the first shovelful of earth raised, at Rome, on the succeeding 4th of July, it is probable that he realized still less the brilliant future of that—at the time—stupendous project. Still less did he foresee that scarcely would the work be completed ere a new system of transportation and traffic, exceeding in rapidity anything the world had ever dreamed of, would spring up, and, stretching its "steel-shod grooves" parallel with this world-famous canal, rival the latter in carrying power for freights, and totally extinguish its passenger traffic.

Many are still living who have been huddled in the closely crowded cabins of the old-time packets, whose sharp prows no longer cut the waters of the Erie Canal. And some have, perchance, had the experience of a trip in a lazy line-boat from Albany to Buffalo.

The writer well recollects such an experience, and can call to mind the table supplied with steaks of fresh pork, flanked with boiled potatoes, tea and coffee, bread and butter, and apple sauce, which formed the standard dinner; the cabin which, the tables being removed, was crowded with sleeping berths, the males being separated from the females by a rude curtain, and mingling their snores in anything but harmonious concert; the long drawn cry of "Lock red—d—a—a!" easily heard half a mile away, in the still night air; the shrill cries and screams of impudent boy drivers, receiving castigation at the hands of irate captains; the startling crash of pike poles, thrown down upon deck immediately over the heads of the passengers, causing those in the up per berths to jump up, half awake, and bump their heads against the deck timbers; the curious sensation of sinking down unfathomable depths, in going through locks; the early rising in the moist, foggy air; the ablutions, performed in ways and by means indescribable, or, in many cases, left unperformed; the rush to breakfast; the broiling through the long summer day on the deck, the monotony only varied by occasional cries of "Bridge—Low Bridge" from the "steersman," and the general scramble and ducking of heads which followed, or by stale stories and feeble jokes, from the more humorous of the passengers, or perhaps by, what was then frequent, a fight between boatmen. These were the charms of travel over the Erie Canal, "but all these charms are fled."

The writer well recollects standing in the village of Canastota, filled with wonder at his first sight of a locomotive and train, coming on at a speed of perhaps fifteen miles an hour, over the Central Railroad, and it was not long after that the waters of the Erie practically ceased to carry passengers. From that time, destined to be only an artery for the circulation of freight, it has been sought to improve its carrying capacity. All these movements have been opposed by the railroad interest, yet the people at large have seen too clearly how much the prosperity of the State has depended, and still depends, upon this great work, to allow the defeat of such measures. Its capacity has been greatly increased by enlargement of its cross section and its locks; and many attempts have been made to give it still greater carrying power, by the substitution of steam for horse and mule power in the propulsion of boats, culminating in the bill we published last week, offering a prize of $100,000 for the best system of propulsion.

This prize will have the effect of bringing to bear upon the problem a vast deal of inventive talent, and if fairly awarded, will be quite as likely to be secured by some ingenious farmer's boy in the backwoods, as by a skilled engineer, versed in the mysteries of steam engineering. For it must be remembered that the solution of this problem does not depend upon any novel construction of steam engines, but upon means not hitherto employed for applying the power of motors to the propulsion of these boats, under the conditions specified in the law, or upon some radical modification in means already used, but as yet found defective. It is a new path that must be struck out, in which old devices will be of little use, except as elements of new combinations; and, we venture to say, there are many undeveloped Watts and Ericssons, who to-day are masters only of few tools and rude appliances, huddled together in their fathers' horsesheds, who would be even more likely to hit upon something new, than men whose minds have become accustomed to run in grooves, and who recognize, in the screw and paddle wheel, the only practical means of steam propulsion.

The effect of the prize will be, however, broader than was intended by the framers of the bill. Those who attempt the solution of the problem will stumble upon many inventions capable of useful application to other purposes. The construction of the canal banks and locks may even undergo material change, ere the anticipated system of propulsion can be applied. It may even prove that in such a modification, of the construction of the canal, lies the solution of the entire question. But these are things that time only can develop.

In our next issue we propose to resume this subject, perhaps giving more particulars, historical and statistical, of the origin and progress of the canal, and following with some account of patents issued on means of canal boat propulsion in the United States.

We shall also be glad to receive contributions from our correspondents upon this, now more than ever, important subject.

PIPES FOR DOMESTIC WATER SERVICE.

There is nothing about which we receive more numerous inquiries than water pipes. Most people are getting suspicious of lead for this purpose, it having been shown that this metal often contaminates the potable waters conveyed through pipes made of it. For a time, quite a popular impression prevailed that in zinced, or, as commonly called, galvanized iron pipes, the cheap and safe water conduit for for domestic purposes had been found. This is still maintained by some, and it is with a view to throw additional light upon the subject that the present article is written.

There is no doubt, as we have shown in previous articles, that iron pipes, thoroughly coated with zinc, and conveying perfectly pure water, will not contaminate the water to any appreciable or hurtful degree. Waters containing acids or free alkalies will, however, speedily become charged with the oxide or salts of zinc, to a greater or less extent, depending upon the character of the water. In some cases, where there does not appear to be a notable amount of alkalies, acids, or salts, the solutions of which dissolve or combine with zinc oxide, there is still rapid attack upon the metal. We have a specimen of such a pipe that is nearly filled with a deposit of metallic origin, resembling mixed metallic zinc and red oxide of iron. An analysis of this deposit would be interesting. Pure water acts more powerfully upon lead than upon zinc. While the oxide of lead is readily soluble in water free from carbonic acid, it is converted into a comparatively insoluble, or difficultly soluble, carbonate, whenever it is exposed to water containing carbonic acid. In experiments made by the Government commissions appointed to examine into the chemical quality of the water supply of London, the extraordinary effect produced by a small quantity of carbonic acid in the way described was most particularly noted. Pure distilled water placed in contact with lead became highly poisonous, while that containing three per cent of its volume of carbonic acid remained safe. They decided that sufficient carbonic acid is usually found in well, river, and spring waters, to render lead pipes a safe means for conducting them.

Notwithstanding this, they admit that, from causes little understood, water will at times act with unusual energy upon lead; and we have no doubt that imperfectly understood conditions will often render it powerfully energetic in its action upon zinc coated iron pipes. The specimen of this kind of pipe, above referred to, which has almost become stopped by its deposit of mixed oxide, metallic granules, and salts, would seem to indicate this, as the water which flowed through it has always been regarded as being of ordinary purity for drinking and culinary purposes.

A prominent leader in the Shaker family at New Lebanon, N. Y., assures us that they have not succeeded in the use of zinc coated pipes; and regarding lead with disfavor, they are meditating a return to the old pump log service, once so much used in this country.

We are cognizant of another example, in a town near Boston, Mass., where a new house was piped with galvanized iron pipes. Sickness soon overtook the family, one of its young members died, and a *post mortem* examination revealed the presence of salts of zinc in the stomach and other organs. Death was directly attributed to the use of these pipes.

Mr. Robert Rawlinson testified, before the commission referred to, that galvanizing iron pipes is a delusion. He said: "If the pipes are laid in subsoils which will act upon iron, the galvanizing affords no protection against that action, and there are soils which will rapidly eat away either iron or lead. If you examine a galvanized iron pipe under a microscope, you will find that it is not an even coating; it is freckled, and there are interstices, oxidation sets up, and then the galvanizing is blistered off; it does not improve, and, even so far as it does cover it, I doubt very much whether it preserves it; it is not stronger in its texture, and it certainly does not last longer; that is my experience."

Mr. Thomas Duncan, engineer of the Liverpool Water Works, stated that "the effect of soft water upon iron pipes was to produce an infinite number of small tubercles; those have grown up, and they project, in many instances, for about three quarters of an inch, reducing the diameter of the pipe between point and point, one and a half inches, thereby increasing the friction. They form an infinite number of little eddies, and it is not only the space they occupy in the pipe, but, from my observation, I believe the effects extend much further into the interior of the pipe, and disturb the current."

A method has been recently patented for coating pipes internally by silver electroplating therein. Water containing sulphur would, of course, in time convert such a coating into the sulphide of silver; but this, being insoluble in water, would protect the pipes as well as the metallic silver. Should the water contain any alkaline hyposulphites, and also free chloride, the silver may be gradually converted into a chloride, which, being dissolved by ammonia, would, after a time, result in the denudation of the lead. Of course, the time required for this action, if it should take place, can only be determined by experiment; but in such waters as contain traces of the substances named, such action would seem likely to result ultimately. It is known that silver exposed to an atmosphere containing chlorine will gradually blacken from the formation of chloride; and it is probable that this would occur, to some extent, in water pipes coated with silver. The cost of the metal will stand in the way of using a very thick coating; and, therefore, any chemical action will be more apt to interfere with the economical application of silver to this purpose.

In Boston the lined copper pipes are coming into vogue, and are pronounced perfectly safe in all respects. The copper is tinned before being made into tubes, and the interior of the pipe is again tinned when made up. The expense of these pipes is about the same as lead pipes of equal strength.

THE BLOWPIPE AS AN AID TO THE DRILL IN OPENING SAFES.

The blowpipe, in an attack upon a *well constructed* safe, is a powerful auxiliary to the drill, but it cannot be used alone with success.

Some experiments with most skillfully constructed apparatus, performed at the Herring safe manufactory, in this city, which we witnessed last week, show that the temper may be drawn, in time, from a steel plate an inch thick, by the use of the blowpipe, so that the plate may be drilled. It may also be burned quite through when operated upon singly; but it is difficult to do this with iron plates, which burn less easily, and also conduct heat away from the point against which the flame is directed, as rapidly as the steel. Spiegeleisen burns with even less facility than ordinary iron. The flame directed against the corner of a fragment of speigeleisen fused it, but, after continued action, only produced a comparatively small amount of the oxide of iron, which coated the bead formed. The fused metal, on cooling, was as hard as before. This material, in fact, depends for its hardness upon its natural composition, and not upon any process of tempering, so that mere melting does not change its character.

It would, however, require apparatus not available to burglars to melt a hole in the center of a speigleisen plate. It follows, therefore, that while iron plates and steel plates may be successively penetrated by the use of the blowpipe, as practically capable of use in the hands of burglars, the speigeleisen plate, which practically resists drilling, defeats the use of the instrument as an adjunct to the drill.

We have recently held a conversation with Mr. John Dickinson, of 65 Nassau street, New York, manufacturer of carbon points for drills, etc., who assures us that these points will not drill speigeleisen, except by the use of appliances for obtaining speed, which cannot be used by burglars, and that to drill it at all would be a work of so much time as to prevent its adoption for safe-breaking.

The rate at which, by the ultimate use of the blowpipe and drill, a hard steel plate can be penetrated, is, we are told by Mr. Farrell, about one inch per hour; the drawing of the temper in advance of the drill occupying about two fifths as much time as the drilling. It is found that the alternate use of these instruments enables more rapid progress to be made, than when it is attempted to draw the temper entirely through the plate at a single operation.

IMPORTANT DECISION BY THE COMMISSIONER OF PATENTS.

On the 8th of July, 1870, amendments to the patent laws went into operation, providing, among other things, for the issue of patents for trademarks. Commissioner of Patents Fisher, with his customary promptness, at once established rules to facilitate the new issues; and decided, overruling the Primary Examiner, that any trademark, whether consisting of mere words or accompanied by a device, might be the subject of a patent. Under this ruling, a number of applications were filed and patents granted; soon after which, Commissioner Fisher resigned. No sooner was his back turned than the Primary Examiner began to nullify the new practice, by rejecting those applications for trademarks that consisted of words, only granting those that were accompanied by a figure or device. The acting Commissioner declined to interfere, and left the matter for settlement by the incoming Commissioner, Gen. M. D. Leggett.

The new Commissioner has just rendered his decision, and, we are gratified to be able to state, he gives to the law a broad and liberal interpretation, fully sustaining the ruling of his predecessor.

Commissioner Leggett decides that patents may be granted for trademarks of all kinds, consisting of one or more words, either with or without other devices. But the mere name of a firm or corporation cannot be patented, unless accompanied by some other word, device, or "mark." The document is clear, concise, and interesting. We publish it in full, on another page.

This decision is very timely and judicious. So long as manufacturers are assured that they may hold, as their own property, and derive benefit from, the particular marks that they place upon goods, they will take pains to improve the productions; and the patented trademark will become a certificate of genuineness and excellence.

We are glad that the narrow views of the Primary Examiner have been overruled in this instance, as in so many others during the past twenty years. The difficulty with such superannuated officers is that they are fussy, adhesive to past traditions, and unable to accommodate themselves to the progress of the age; and, as Patent Office examiners, they create delay and difficulty in the transaction of business, by unnecessary or whimsical rejections of legitimate claims. The usefulness of the Patent Office ought not to be thus obstructed. We trust that the new Commissioner, like a new broom, will sweep clean, and remove all the cobwebs that stand in the way of an enlightened, liberal, and vigorous administration of the Department.

We have been asked what is the especial value of trademark patents, in view of the fact that the State courts are ready to afford protection against infringers? We reply that a United States patent for a trademark is valid in all the States and territories; and a decision made in any one United States court is respected in all the States. The trouble and expense of separate infringement trials in each State is thus avoided. A trademark patent costs in all only thirty-five dollars; whereas a single suit for infringement in a State court often costs five hundred dollars; and the decision of one State court is not binding in another State. Moreover, the possession of a regularly issued patent for a trademark is a preventive as well as a protection against infringers. Few persons will venture to begin an infringement in open defiance of a known patent. The advantages of trademark patents are obvious.

By the terms of the new law, patents may now be had for business stamps or trademarks of all sorts, no matter how long they have heretofore been used. The proceedings are quite easy and simple. We shall be happy to communicate with any of our readers who desire further information upon the subject.

HEALTH IN OLD AGE.

William Cullen Bryant, the poet, and editor of the New *Evening Post*, is now almost seventy-six years of age, but he is as active and vigorous as most men of fifty. He is the impersonation of good health, the result of long-continued habits of good living. His stalwart form and flowing beard of gray often attract our attention as we see him passing our office window, on his way down town, after a brisk morning walk of three miles.

Mr. Bryant has lately permitted the publication of a familiar personal letter, in which he makes known his general manner of living. From this it appears that he is very frugal in diet, and very generous in the matter of bodily exercise. He rises early, and at once engages in exercise for an hour, in his room, with light dumb bells, the bar, a chair, etc. Then a bath, then breakfast, taking no tea or coffee, no meat, but simply hominy and milk, oatmeal, wheaten grits, cakes, baked apples, or other fruits. After breakfast, study for a while, then a long walk. An early dinner, taking a little meat. Supper the simplest, fruit, bread and butter. No study, no thinking, no writing of any sort in the evening. Early to bed. No toddy or stimulants of any sort. Mr. Bryant's faculties are all in good order. His mental vigor is remarkable. Not the least wonderful fact in his history is, that from early childhood his intellectual powers have been constantly worked. As a youth he was precocious. Before he was ten years old, he was a poetical contributor to the papers; and at fourteen, his first volume of poems was published. After a college education, he studied law, and became quite distinguished in Connecticut. For the last forty-five years he has been connected with the *Evening Post*, which is one of the best daily papers in the world. His literary productions rank among the very highest.

INVENTIONS MADE BY WORKMEN.—WHO OWNS THEM?

The rights of employer and employé, in respect to ownership of inventions developed during the term of service of the workman, although settled, years ago, by the ruling of United States Courts, in various cases, has been lately revived in the Supreme Court in this city, on the appeal in the case of Lawrence *vs.* Good.

The latter was a foreman in the rope factory of the plaintiff, and, while so employed, made an improvement and obtained a patent, for converting hemp into slivers. The patent was said to be worth at least fifty thousand dollars.

The plaintiff alleged the existence of an agreement, by which he was to furnish means for introducing the invention, and, in consideration thereof, was to be entitled to one half of the patent when issued. This suit was brought to compel the defendant to assign the above share of the patent; and the plaintiff also contended that, even in the absence of an agreement, he was entitled to the benefits of the invention, the same having been made while the defendant was in his employ as a workman, the improvement being also in the line of such employ.

The Court decided, first, that the existence of the contract was not proven. Second, that, while the plaintiff had a legal right to the services of the defendant in the line of his employment, he had no legal right to the results of defendant's intellectual labors, outside his ordinary duties; and that this invention was clearly outside of such duties.

This decision is in accordance with the rulings in previous cases, in which the following, among other points, have been established:

1. The employer is entitled to the patent if he directs a workman, generally, what kind of an improvement to make; the employer has the right to avail himself of the ingenuity and mechanical skill of the workman to perfect the invention, or put it in practical form; and the employer has also the right, under the circumstances named, to include in his patent such additions or improvements as the ingenuity or skill of the workman may have developed or suggested.

2. On the other hand, the employer has no claim upon any independent invention made by his workman, although such invention may relate to the special business or trade in which he is engaged; the sole right to the patent for such independent invention belongs to the workman.

Complaint is made by employers, that some workmen are so mean as to make use of time, materials, and shop conveniences, belonging to the employer, for the purpose of testing inventions, without so much as a thank-you for the facilities thus surreptitiously obtained. This is neither right nor honorable; but it is not any meaner than for an employer to bring a suit, as in the foregoing case, and attempt to deprive a man of a patent simply because he is his workman.

SCIENTIFIC INTELLIGENCE.

PREPARATION OF PURE BENZOLE.

Professor Hofmann recommends, for the purpose of procuring perfectly pure benzole, its exposure to a freezing mixture and then pressing it out. The frozen cake is put into a brass cylinder, 8 to 10 centimeters wide, and 40 to 50 centimeters deep, into which is fitted an iron plunger, pierced with numerous holes. It is better to freeze the benzole in the press. After squeezing out the liquid, the melted benzole will be found to be of unusual purity.

ADAPTATION OF UNGROUND GRAIN FOR FOOD.

At the meeting of the Academy of Sciences, of Paris, held on the 26th of September last, a discussion occurred on the application of unground grain for purposes of food. The subject was at that time one of vital importance to the Parisians.

M. Grimauld reported that, during the siege of Venice by the Austrians, the following process had been pursued. The grain was first softened in water, and rubbed to free it from the hulls, and was then boiled with vegetables, and seasoned. It produced an agreeable food, and must have been nourishing, as it was composed of a mixture of gluten and starch, and was the exclusive article of diet, of fourteen persons for two months.

Dumas remarked that the entire kernel could be eaten, and it was complete in itself; by grinding and bolting, much nourishing substance was removed and lost. It was not a matter of indifference that, of the 11,000,000 pounds of grain on hand at the commencement of the siege, only 7,700,000 pounds should be counted as food. The Romans in the first century were in the habit of roasting the kernels, grinding, and making the meal into a paste; and they regarded the baking of bread as wasteful.

The Arabs at the present time eat grain that has been hulled and boiled with steam. It is generally assumed that four parts of grain will yield three parts of flour; this is a waste of one fourth that ought to be saved. In England, brown bread, containing all the constituents of the grain, is regarded as a luxury, and is baked as often as twice a week.

Payen called attention to the fact that, according to Grimauld's proposition, 25 to 30 per cent of the nourishing properties of the grain was saved, which was ordinarily lost in the bolting; and the resulting paste afforded a more nourishing, healthier, and cheaper food, as the gluten contained certain nitrogenous substances in greater quantity than the other constituents of the grain, which were easily assimilated and were good for the digestion. Even the indigestible part of grain played a part in the digestion, as was abundantly proved in the English brown bread made from unbolted flour. The problem to make bread from the entire grain has been solved by Sezille, who slightly moistens the kernels, then rubs off the hulls, by which only a loss of 5 per cent is incurred; then he soaks for seven or eight hours in tepid water, until it can be easily crushed between the fingers, by which it takes up 50 to 60 per cent water; he then converts into paste between rollers, and bakes into bread after fermentation. Payen had eaten such bread, and pronounced it excellent.

HEALTHY SOIL AND WATER.

According to Chevreul, a soil is not adapted to the sprouting and growth of plants, unless the seeds and the spongioles of the roots can obtain access to the oxygen of the atmosphere. Substances absorbing oxygen, such as sulphide of iron, and sulphide of calcium, are therefore prejudicial to vegetation, while draining is beneficial.

Animals can only live in water that contains oxygen, and hence whatever removes this element from the water, destroys it for the lower animals. Fish improve stagnant water, by devouring organic substances, and vegetables produce the same effect by taking up organic matter, and giving off oxygen in the sunlight. Flowing water is, therefore, more wholesome than stagnant. Soil is injured by oil that condenses in gas-pipes, and by dead vegetation. It is necessary to the health of a house that it be exposed to air on two sides, and that light can penetrate to the interior, and that the air of all apartments can be frequently renewed.

GLYCERIN SOAP.

In the manufacture of soap, since time immemorial, all the glycerin has been thrown away, but in later years the healing and antiseptic properties of the glycerin have rendered its combination with the fats and oils very desirable, hence we hear a good deal about glycerin soaps. Unfortunately, most of the soaps of this name contain little or no glycerin.

Fashion and the ignorance of the public demand a transparent soap, and this quality is incompatible with a considerable per centage of glycerin. Transparent soaps owe their clear property to the addition of alcohol, and glycerin produces an opposite effect.

Glycerin soaps ought to contain 25 to 30 per cent of that agent to be really valuable, but rarely show more than three or four per cent. It would be more candid if soap manufacturers would undeceive the public on this point, and make a true glycerin soap at a price that would afford them an adequate profit. A glycerin soap, with some ammonia, would be a truly valuable article for wounds and bites of insects, but its value ought not to be destroyed by attempts at fancy coloring or transparency.

ON A METHOD OF DETERMINING THE PERCENTAGE OF WATER MECHANICALLY SUSPENDED IN STEAM DELIVERED FROM BOILERS WHICH PRIME.

A Paper read before the Society of Practical Engineering, April 26, 1871, by Leicester Allen, Associate Editor of the SCIENTIFIC AMERICAN.

The second annual report of the Inspector of Boilers of the city of Philadelphia, states that out of fifty-six men who presented themselves during the year 1870, for inspection and license as engineers and boiler tenders, only four were considered first class. Out of thirty-nine who sought examination for a renewal of their licenses, only nine were first class. A large proportion were only third class. I am not aware what the standard of classification, adopted in Philadelphia, is, but it is probably none too rigid. It is, probably, also fair to suppose that those who sought examination were better than the average of those employed to take charge of boilers; since there is, in that city, no penalty imposed for the employment of unlicensed engineers or boiler tenders. I deem it, therefore, extremely probable that the four receiving first-class certificates, out of the fifty-six examined, represent even a larger proportion of thoroughly qualified men, than would be shown if a general system of examination and license were legally enforced.

In view of the general incompetence of those placed in charge of boilers, not only in Philadelphia, but throughout the country, the use of boilers, not only safe with good care and treatment, but safe even under neglect, has been gradually growing in favor, notwithstanding most of the boilers, justly regarded as being incapable of exploding disastrously, do not compete, in point of economy, with others, which, unskilfully attended, are liable at any moment to explode with destructive violence.

The year 1870 has a most appalling record of death and destruction from boiler explosions, and it is time that the question of safety *versus* economy, in the use of boilers, should be definitely settled. The first step toward settling this question is the accurate determination of the real ratio of economy in boilers admittedly safe, under all circumstances, to those admittedly unsafe, except when used with the best skill and fullest knowledge.

The safe boilers are those known as "*sectional*," in which very great strength in proportion to rupturing strain is attainable, and which—even if, under enormous pressure, they explode—cannot explode as a whole, but can only burst some minute portion of their structure. These boilers could, some of them, make a fair showing of evaporative power, in proportion to consumption of fuel, without forcing; but in trials made to ascertain their steam producing capacity, their exhibitors are apt to force them until they prime, and thus the amount of water passed through them becomes no index of their economical value as steam generators. These boilers also present such an enormous heating surface, in proportion to the water they carry, that, in practical use, they may be caused to prime by slight overfiring; and, with the ordinary care they get, it is little to be wondered at, that it is an exception to find one of them delivering dry steam.

Any boiler has a limit of steam generation, beyond which it cannot be pushed without priming; and, on the other hand, any boiler has a limit of steam producing capacity, below which it will deliver perfectly dry steam. The amount of dry steam per pound of fuel actually burned, that boilers will produce, from water at 212° Fah., is the accepted standard of comparison as to their working economy. Experiments made by myself have, however, shown that in very few cases, where boilers are thus tested, absolutely dry steam is delivered; the amount of water contained in the steam being in one case, which I now call to mind, certainly not less than forty per cent of the entire weight of mixed steam and water issuing from the boiler. This was, of course, an extreme case, in which the boiler was specially contrived, it would seem, to prime as much as possible. The evaporative power claimed for it by its sanguine inventor, was thirteen pounds of water per pound of coal consumed. All the way from this extreme, up to absolutely dry steam, you may find boilers working, if you will look for them. Boilers priming to the extent named, or even much less than that, are really unfit for service to supply engines with steam; and, I need not say, are scarcely ever used for that purpose. But boilers often prime to a much greater extent than is suspected, in the absence of means to detect the exact amount of water mechanically carried over.

A common method of testing the quality of steam is to pass the hand through the jet of steam escaping; a method so rude, that it is really a disgrace to the science, which has taught us, that, with steam as a motor everything may be reduced to mathematical certainty. I have known the estimate made by good judges to be ten per cent from the truth, in making this test. The appearance and feeling of steam, differ with the hygrometric condition of the atmosphere into which it rushes. On a clear bright day, steam appears different from the same quality educted on a moist, foggy, and obscure day.

The method I have employed for testing the quality of steam, and the instrument devised for the purpose, is based upon the fact that steam at 212° always contains 1,178 heat units per pound, and water at 212°, 212 units of heat per pound. It follows that, knowing the amount of heat issuing from a boiler in a pound of mixed steam and water, the proportions of water and steam, in the pound, can be easily determined. For if x be used to represent the water in pounds, and y the steam in pounds, a the quantity of mixed water and steam educted, in pounds, and b the total number of units of heat carried out in the mixed water and steam, we may form the equations

$$x+y=a$$
$$212x+1178y=b$$

from which we find the value of x to be $x=\frac{1178a-b}{966}$; or, to drop algebraic language, the amount of water contained in a given amount of mixed steam and water, will be, in pounds, 1,178 times the weight of mixed steam and water, minus the number of units of heat it contains, divided by 966, the number of units of heat required to convert a pound of water at 212° Fah. into steam at the same temperature.

To determine the amount of heat carried out by the mixed steam and water, I devised the following apparatus. A scale beam with a platform, and a thickly felted water chamber at one end, and a counterpoise at the other, has upon it a sliding weight, indicating pounds and half pounds. The walls of the water chamber are made of thin tinned sheet copper; there being two shells, between which, felting, an inch and one half thick, is placed. A felted cover is also provided, through which is inserted a standard thermometer, having a large bulb and easily read in fifths of degrees. A finely perforated coiled copper pipe rests upon the inner floor, and passes out at the lower part of the side wall of the chamber. This is the steam induction pipe. The bottom of the chamber is obtusely funnel shaped; and, from the lower part of the funnel, is led out an escape pipe. Both pipes are provided with cocks. A small funnel in the cover, also provided with a cock, completes the apparatus.

To use it, five pounds of water are placed in the chamber, through the funnel in the cover. The water is then raised to 80° Fah. by allowing a jet of steam—conveyed through a felted pipe—to enter through the coiled induction pipe. The surplus water thus added is drawn off through the escape pipe at the bottom of the chamber, leaving in the chamber five pounds of water at 80°, containing 400 units of heat. The sliding weight is then set along into the five and one half pound notch, and the steam to be tested is then allowed to flow in till the scale beam balances. Then the influx of steam is stopped, the thermometer is read, and the experiment is complete.

Suppose, now, the resulting thermometrical reading to be 180°. We then have 900 units of heat in the chamber, not counting in the amount absorbed by the thin copper lining—a very small amount indeed, and only noticeable theoretically; the general result is scarcely affected by its neglect. It follows that the amount of heat conveyed into the chamber in the pound of mixed steam and water is 960—400=560 heat units. Substituting this value for b in the above formula, we have (the value of a now being ½) $\frac{1178-560}{966\times 2}$ which, reduced to hundredths, gives $31\frac{908}{1932}$ per cent of water.

This instrument, for want of a better term, I have called the "steam hygrometer."

The standard quantity of water in the chamber, five pounds, the standard temperature, 80°, and the standard quantity of steam admitted in the experiment, one half pound, are chosen merely as matters of convenience. It is evident that, for any system of standards, the percentages for different resulting temperatures, between the minimum and maximum limits inclusive, may be computed and tabulated, so that, in testing boilers, no calculation need be made; the percentage for any resulting temperature being taken at once from the table.

REFUSE AND WASTE.

There are no such things as waste products in Nature's laboratory, but in man's workshop there are plenty of them. In fact, we make little use of the gifts that are bestowed upon us, a vast majority of them being wasted on account of our ignorance of their value.

If there be anything that characterizes the present age, it is the revolution that has taken place in this respect. We live in the era of saving, and many are the objects now turned to good account which formerly were thrown away. But, notwithstanding the boasted progress of this century, we cast away far too many substances under the names of refuse and waste.

In the cutting, sawing, and paring of cork wood, there is an accumulation of light material, which is used for packing, filling life preservers, and manufacture of mattresses. This refuse, if burned, would produce a smoke that might prove of value in preserving meat and fish; if distilled, it would yield peculiar products; and, if chemically treated, would furnish corkic acid, the properties of which are not well understood. The charred cork has long been used for its fine black color, and it is possible that, for disinfecting and filtering purposes, it is capable of application. Here is quite a field of research for any one who has the knowledge and leisure.

What becomes of the buttermilk, after the fatty matter is separated from it? We know that it is extensively fed to the pigs, and not a few people eat and drink it. It has peculiar chemical properties, and is said to work up into cements. Could we not, also, by blowing air through the milk, as well as agitating it, add to the yield of butter, and otherwise modify the character of the sour curd? The fermentation of the buttermilk is not understood by our farmers, nor do they pay much attention to other possible uses of this refuse. As there are enormous quantities of milk used in butter making, it would be well to look into this matter.

So, too, in the cheese industry; in Europe they save the whey to convert it into milk sugar, and this article of sugar can be fermented, and used for many purposes. In homeopathy it already plays an important part.

The root plants growing wild all over our country ought to be examined and experimented upon by agriculturists. We have abundant encouragement in favor of such a course, in the history of the tobacco, potato, sugar beet, peppermint, spearmint, wintergreen, and a host of other natural products that, by judicious culture, have been raised from the rank of weeds to a first class position among profitable crops. The sugar beet especially is worthy of note; it was originally an unsightly plant growing wild in Southern Europe. By culture it has been improved and changed in character, and now yields nearly one third of the total sugar crop of the world, and represents an industry worth some hundreds of millions of dollars. As the Government of the United States has set aside large tracts of land to endow agricultural colleges, it is not asking too much for some of these institutions to cause experiments to be made upon what are now called weeds. Many of these wild plants contain alkaloids, sugar, tannic acid, and fiber for paper, and could, by culture, be converted into valuable products. The example of the Massachusetts Agricultural College in this direction is well worthy of imitation.

Sawdust, which was formerly thrown away, is now converted to many useful purposes. The manufacture of oxalic and formic acids from it, is extensively prosecuted in England, and is the source of wealth to all who are engaged in the business; but that is not the only invention that has been sought out with this unpromising material. The hard boxwood sawdust makes an excellent polish for jewelry, and mahogany sawdust is good for smoking fish. Westphalia hams owe their admirable flavor to the wood used in preparing them. Sawdust from the birch cleanses furs; that of sandal wood, cedar, butternut, and black walnut, affords volatile oils that find favor as perfumes or to destroy insects. They have a way in France of compressing sawdust into molds suitable for use as artificial wood; and it could also be distilled for the production of creosote, acetic acid, and wood gas. Some of it could be used for paper, but in general the fiber is too short. A new industry has arisen in converting the sawdust into gun cotton for the use of photographers, and in the manufacture of a coarse blasting powder. It will thus be seen that sawdust is hardly any longer to be considered a waste product, but it is a great help in many industries.

Vulcanized rubber was long an object of study and experiment, to see what uses could be made of the waste; after the sulphur had been added, it was thought that it could not be worked over, and in this event, the price was likely to remain at a high quotation for many years. Fortunately, the difficulty yielded to the stubborn will of our manufacturers who do not like to throw anything away, and a process was, discovered by which the old rubber could be mixed with the fresh in certain proportions, and thus changed to a useful article. Ivory dust and shavings have found favor in the manufacture of steel plates, and as an article of food. Iron filings, tin scraps, refuse from galvanized iron, furnace slags, photographer's slops, chimney soot, dead oil, rags, galls, bones, fat, brine, oil from wool, coal dust, cotton seed, sponge, sea weed, leather scraps, and a host of other things that were useless in former times, are now economized to a considerable extent.

There is a waste in large cities for which there is really no necessity, and that is of the sewage. A vast amount of valuable phosphate goes to feed the fish off the banks of Newfoundland; and if we had the monopoly of the fish, there would be some recompense; as the case now stands, we have the consolation of knowing that we feed the fish for other people to catch: and then as a sort of compensation, we send to the islands of the Pacific for guano with which to enrich our lands. There is enough compost annually thrown away to increase the value of our crops many million of dollars. The vastness of this waste has probably deterred our engineers from attempting to grapple with it, but that is no reason why the loss should go on forever.

We have thus presented some considerations on the topic of refuse and waste, which may awaken inquiry in the minds of inventors, and lead to practical results.

MAGGOTS IN THE EAR.—Dr. C. Robertson of Albany, N. Y. at a meeting of the Albany County Medical Society, spoke of the case of a lady, who, while on a picnic, heard a fly buzzing about her ears, but did not think of the circumstance again until after the lapse of a few days, when she felt some irritation in one ear. A physician removed some parasites with aural forceps, which had penetrated beyond the membrana tympani. Sweet oil was poured into the ear, and retained for awhile; shortly, a maggot came to the surface, apparently in search of breath; this gave relief for ten minutes. More were observed, which were extracted with the forceps. The after-treatment consisted in syringing the ear with warm water. The opening in the tympanum closed, and her hearing became perfect.

No person should allow a tooth to be extracted till every possible means have been tried to save it.

NATURE—"the garment of God, by which thou seest Him."—GOETHE.

THE man who possesses good health is always rich.

IMPORTANT DECISION OF THE COMMISSIONER OF PATENTS—TRADE MARK PATENTS.

In the matter of the application of Porter Blanchard's Sons, for the Registering of a trade mark for churns.—The applicants seek to have registered as a trade mark the words, "The Blanchard Churn," to be stencilled on the churn they manufacture and sell.

The examiner refused the application, and gave as a reason for the refusal, "the label of applicant is not sufficient to entitle it to registry as a trade mark; the words should be accompanied by some sign or mark to distinguish the same from the mere words alone, to the use of which latter, other possible parties of the name in like business might have an equal right."

Section 79 of the Act, approved July 8, 1870, in the second clause provides that "the Commissioner of Patents shall not receive and record any proposed trade mark which is not, and cannot, become a lawful trade mark, or which is merely the name of a person, firm, or corporation only, unaccompanied by a mark sufficient to distinguish it from the same name when used by other persons," etc.

The question, what constitutes a lawful trade mark, is left by the statute just where the common law leaves it, with the single limitation, that it shall not be the mere name of a person, firm, or corporation, unaccompanied by a mark sufficient to distinguish it from the same name when used by other persons.

The only thing about this limitation that is at all ambiguous, is the meaning of the word "mark." The examiner seems to understand by this word some device, figure, or emblem, something other than mere words. In this interpretation of the word "mark," I am clearly of the opinion that the examiner is wrong.

Every man in the United States who is engaged in trade or manufacturing, is entitled to the registry of a trade mark if he chooses to adopt one; and to require each person to invent a device or symbol differing from all others in the same trade, would be to require an impossibility, and Congress certainly never thought of attaching such a meaning to the word "mark." This word had obtained a technical meaning before the act of July 8, 1870. The term "trade mark" was in very general use, and by such use, and by the constructions and rulings of courts, was made to include, not only devices and emblems and symbols, but single words, and all manner of combinations of words, without devices. Congress took this word "mark," with the meaning it had obtained in the compound word "trade mark," and introduced it into the statute.

Previous to the passage of this law, the courts had not been uniform in their decisions as to the mere names of persons, firms, or corporations being legal trade marks, and the statute settled this question by saying that the mere name of a person, firm, or corporation only, unaccompanied by some other "mark," that is, some other word, or words, or letter, or figure, or sign, or symbol, or device—in short, something in addition to the mere name only—should not be registered as a trade mark.

I am clearly of the opinion that any word or any combination of words, with the single exception named, that would constitute a trade mark under the common law, may be registered as such under the statute of July 8, 1870. The expression, "The Blanchard Churn," certainly is not the mere name of a person only, but the name is accompanied by the marks "The" and "Churn," hence it is not excluded by the limiting clause of the statute. The only question then is, as to whether it is a legal trade mark at common law.

In the case of The Amoskeag Manufacturing Company, 2 Sand, S. C. R., 599, the Court says: "Every manufacturer and every merchant for whom goods are manufactured, has an unquestionable right to distinguish the goods that he manufactures or sells, by a peculiar mark or device, in order that they may be known as his, in the market for which he intends them, that he may thus secure the profits, that their superior repute as *his*, may be the means of gaining.

"The principle is well settled that a manufacturer may, by priority of appropriation of names, letters, marks, or symbols of any kind to distinguish his manufactures, acquire a property therein as a trade mark." Stokes *vs.* Landgraff, 17 Barb. 608.

"A manufacturer of goods who, in order to designate his own manufacture, has adopted names, marks, or labels, which are peculiar, and not before used, is entitled to be protected in a court of equity in their use." Williams *vs.* Johnson, 2 Bosworth 6.

"Though the mark has no other meaning than to distinguish their manufacture from others, if the party has given it out as his mark, and by it the article has acquired reputation and sale, he is entitled to protection in it."—*Ibid* 6.

"Any contrivance, design, device, name, or symbol which points out the true source and origin of the goods to which it is applied, or which designates the dealer's place of business, may be employed as a trade mark, and the right to its exclusive use will be protected by the Courts." Filley *vs.* Fassett *et al.* Supreme Court of Missouri. Vol. 8, "U. S. Am. Law Reg.," 402.

"The books are full of authority establishing the proposition that any device, name, symbol, or other thing may be employed as a trade mark which is adapted to accomplish the object proposed by it; that is, to point out the true source and origin of the goods to which said mark is applied."—*Ibid.*

These quotations state the broad doctrine on the subject of trade marks as held by the courts.

The following are a few among many trade marks that have been sustained by the Courts, and that would not be excluded by the limiting clause of the law of July 8, 1870, namely: "Cocaine," as the name of hair oil, Burnett *vs.* Phalon, 9 Bosworth, 192; "303" as a mark for pens, Gillott *vs.* Esterbrook, 47 Barb. 545; "Sykes' Patent" as a mark for shot bolts, Sykes *vs.* Sykes, 3 Barn G. Cress, 542; "Bell's Life" as the name of a newspaper, Clement *vs.* Maddick, 22 Law Rep. 428; "H. H. 6," as a work on plows, Remsen *vs.* Bental, 3 Law of U. S., 161; "Roger Williams Long Cloth," Burrows *vs.* Knight, 6 R. I. 434; "Anatolia" as a brand for liquorice, McAndrews *vs.* Bassett, 10 Jurat, N. S. 550; "Revere House" as the name of a hotel, Marsh *vs.* Billings, 7 Cush. 322; "Burgess' Essence of Anchovies," Burgess *vs.* Burgess, 17 Eng. Law and Eq. R., 257; Morrison's Universal Medicines," Morrison *vs.* Salmon, 2 Man and Gran, 385.

It is proper here to remark that most of the trade marks here referred to were used in connection with the names of the persons claiming them, or with their place of business, or both, and sometimes in connection with other words.

There seems, then, to be no more restriction against the choice of words, combinations of words or names (other than the mere name of a person, firm or corporation only), for a trade mark, than of symbols or devices. The only limitation at common law in the selection of words or devices for trade marks is, that they be so far original, as, when known in the market, to distinguish the goods of one merchant or manufacturer from those of another, and that they be not generic in their use, nor description of quality nor calculated to deceive the public as to their true origin or ownership.

The object of a trade mark is to point out the origin and ownership of the article offered for sale, and the more clearly the words or devices selected do this, the less objection there should be to their selection and registration and trade marks, so they avoid the limitations named.

The combination of the three words, "The Blanchard Churn," seems to possess the necessary characteristics of a trade mark, and is not excluded by the limitations. The decision of the examiner is therefore reversed.

(Signed) M. D. LEGGETT, Commissioner.

April 24, 1871.

Business and Personal.

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

Answers to Correspondents.

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

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

D. D., of Ind.—Put in flues 8 inches in diameter behind the bridge wall of your furnace. The size of the perforations should be about one half inch, but there should be plenty of them. Provide them with first class dampers, and arch over your mud drum. It is a too common practice not to have dampers in furnace doors, but to keep steam from getting too high by opening the furnace door. Such practice is a disgrace to engineering. Your ideas in reference to setting boilers and cleaning them are right; stick to them.

J. B., Jr.—An extension bridge of ordinary width and construction requires the aid of machinery in laying up the cables, but one may be made by stretching single wires by hand over a stream a quarter of a mile in width, if only enough wires are used, and all are made to receive their share of the weight to be supported.

TANNING SHEEP SKINS WITH THE WOOL ON.—Take one part of alum and two of saltpeter; pulverize and mix well together; then sprinkle the powder on the flesh side of the skin, and lay two flesh sides together, having the wool side out. Then fold up the skins as tight as you can, and hang or lay them in a dry place. As soon as they are dry (which will be in two or three days), take them down and scrape them with a blunt knife till they are supple, and rub them over the edge of a board, if necessary, to make them soft. Other skins, which you wish to cure with the fur on, may be treated in the same manner.—H. A. C., of N. Y.

TURNING CURVED PLUNGER.—In regard to "turning curved plunger," I would state for the benefit of S. G. S. (whose inquiry is given in your issue of 15th ult.), that the flange plate can be cut nearly off with safety, after the body of the plunger is finished, by using an acute angular-pointed turning tool. By proper care the body of the plunger can be finished over the reduced part, the flange plate being cut away, or reduced on each side. The plunger can then be separated from the plate by scoring with a square-nosed tool, on each side of plate, about one-sixteenth inch from the body; and the slight projection, or fin edge, can be removed with a file and scraper. If desired, a carrier can be used, that will allow the entire body of the plunger to be turned. I enclose sketch of the device; it consists of a flange plate and center shaft, the plate being furnished with bosses that are drilled and tapped for set bolts, that support and retain in position the plunger to be turned. One of the bolts has its end squared, to enter a similar shaped hole cast in end of plunger, a jamb nut on the bolt preventing its turning. The set bolt in the other boss, upon being screwed up, secures the plunger in position in the carrier. The turning tool can be fed through from each side, by working the lathe, by hand, the thickness of the flange plate of the plunger carrier.—W. P. P., of Pa.

LEAKY FAUCETS.—Let C. H. K. take pulverized grindstone (procured at any place where a stone is being turned up to true) and use it with water. File off the plug of the faucet (in diameter) above the seat or shell, so there shall be no shoulder to prevent the plug going to its seat after it has been cleaned off.—C. H. J.

CUTTING THE TEETH OF SMALL WHEELS IN A LATHE.—Let B. B. L. turn a rod or cylinder of the material, to the diameter he wishes his wheels to be, and as long as he likes. Keep it on the centers where turned. Allow it no play in the driving connection with the face plates. Have the dial plate on the lathe spindle, attached to the face plate or otherwise. Make a tool the exact size and shape, inversely, of the space between the teeth. Make the tool to use in the chisel stock (or tool stand of the lathe) as a planing or grooving tool; flute the cylinder around, space by space, to the depth proper for the length of the teeth. Then with a thin cutting-off tool, cut off the wheels the thickness wanted, after which they may be chucked and bored, as required. Internal gears are cut in the same way. Keep the chuck where bored until cut. He had better procure a small gear cutter to attach to his lathe. They may be procured at reasonable rates, of many of the tool makers of the Eastern states. I have one of my own arrangement and make, with which, with one row of one hundred holes, I can get quite a goodly number of divisions, from one up to ten ten thousand.—C. H. J., of N. Y.

H. L. C., of Mich.—When air is taken under water, its bulk, submitted to the pressure of the water, is reduced more than is that of the water by the same pressure. Its relative buoyancy is therefore lessened as it is sunk deeper. At a depth of 33 feet, it would only be about half as buoyant as just beneath the surface; at 99 feet only about one fourth, and so on. At a depth at which it would receive a pressure of 814 atmospheres, it would become as dense as water, provided Mariotte's law of the relative volumes and pressures, held good for such high pressures; but it has been shown that it does not apply exactly, as pressures increase.

PLATING ON IRON OR STEEL.—If your inquirer will follow the directions below, he will have no trouble in plating on iron or steel. Take two quarts rain water, dissolve two pounds cyanide of potassium, and filter. This solution is only for steel or iron. In order to plate steel or iron, dip it into pure sulphuric acid for one minute, then clean with pumice stone and brush; rinse, and hang in cyanide solution of potassium for three minutes, or until it becomes white; then hang in silver solution until plated heavy enough.—C. E. B., of Ill.

H. W. C., of Vt.—You are right in supposing the principal difficulty in the direct application of steam to the raising of water, without the intervention of pistons, is the condensation and consequent loss of power. Attempts to avoid this have been made in various ways, such as lining the pump cylinder with non-conducting material, the introduction of flexible non-conducting diaphragms, to separate steam and water, etc. Were it not for this loss, the most economical application of steam to raising water, would be directly upon the water surface in the cylinder, provided we were confined to the use of steam non-expansively; but to use steam expansively necessitates the use of a cylinder and piston, or their equivalent, as it is obvious that steam pressing directly upon water, even if it would not condense, could never expand below the pressure of the water. With the use of a steam cylinder and piston, and a smaller piston in the pump, we can expand the steam to any limit desired.

D. C. A., of N. H., asks "what is considered, by scientific men, to be the strictly true definition of the word "machinery?" In other words, what is a machine? Is a planer, or lathe, or drill (for either iron or wood) a machine, or simply a tool? The question is of importance to mechanics here, from the fact that machinery is taxable, while tools are exempt." The courts, or other authorities, in whom the power to regulate the working of the tax law is vested, must decide what is the distinction between the terms "tools" and "machines" within the meaning of the law. Scientifically speaking, any instrument, if only a simple lever, by which power is applied to the performance of work, is a machine.

T. P. M., of N. J.—The scales of pyrometers are marked either in degrees centigrade or Fahrenheit, to which they are reduced by immersing the instrument in boiling mercury, and noting the degree of expansion (contraction, in Wedgewood's pyrometer), and dividing the rest of the scale proportionally. The Wedgewood pyrometer is very inaccurate; Daniell's is the best of the older instruments, while the new one of Siemens, not long since described in these columns, is probably better than either.

W. B., of Mass.—Glucose and starch sugar are the same thing. It is made by the action of dilute sulphuric acid upon starch. For particulars of the process, we refer you to Miller's "Organic Chemistry," Dr. Ure's "Dictionary of Art and Manufactures," etc. The constituents of glucose are 72 parts carbon, 14 parts hydrogen, and 12 parts oxygen, by weight.

IMITATION OF EBONY.—If E. E. B. will take a solution of sulphate of iron, and wash the wood with it two or three times; let it dry, and apply two or three coats of a strong decoction of logwood; wipe the wood when dry, with a sponge and water, and then polish with oil; he will have a very good imitation of ebony.—W. A. P.

NEW BOOKS AND PUBLICATIONS.

PART II. of "The Dictionary of Words and Phrases Used in Commerce," has come to hand, and gives increased evidence of the ultimate value of the work. Several items, among which is one on carpets, another on camel's hair, etc., will be found in our issue this week. They illustrate the real character of the work better than we can describe it in a notice like the present. The editor is Mr. Thomas McElrath, and the publishers are N. Tibbals & Son, 37 Park Row, New York.

AMERICAN HORTICULTURAL ANNUAL. Orange Judd & Co., 245 Broadway, New York. Price, 50 cents.

This is a valuable hand-book for gardeners and horticulturists, full of well executed engravings of new varieties of fruits, flowers, and vegetables with practical hints on growing them.

Recent American and Foreign Patents.

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

TELEGRAPH SOUNDERS, RELAYS, ETC.—This invention consists in arranging, in an open rectangular wooden box, the usual coils and magnets, having between them and parallel to them, a straight, solid or hollow cylindrical bar, hung on two pivoted arms, which extend from shafts, having their bearings attached to the side of the wooden case. Both arms being of the same length, the bar which they carry, will, in any position, be parallel to the line it occupies in any other position. At right angles to this bar, is attached to it, the armature, which in its motions must, therefore, also move in parallel lines, and strike the magnets square on their faces. The ends of the bar which carries the armature, strike upon sounding pivots, and the arrangement enables the instrument to give a very clear and distinct sound. The bar is operated by springs which pull against each other in such a way that when no current is passing about the magnets, the armature is held at the proper distance from the poles. In the vertical position of the apparatus the weight of armature and bar are made to aid in imparting force to the blows upon the sounding points, but the instrument may be used in any position. This instrument has been patented by Hugh Swinton Legare Bryan, of Cedar Rapids, Iowa.

DIVIDING WHEELS OF WEFT THREAD KNITTING MACHINES.—This is an improvement upon the dividing wheels of the weft thread knitting machine or loom, patented July 19, 1870, by William H. Abel, and which our readers have noticed recently in this journal. The invention is to increase the capacity of such looms to weave or knit a variety of patterns. To this end, the teeth of the dividing wheel are made radially adjustable, so as to throw out of line one or more needles, as may be desired, at intervals to form stripes, etc. The invention has been patented by Horace Woodman, of Saco, Me.

WASHING MACHINE.—James M. Noble, of Delhi, Iowa.—This machine consists of a cylindrical rocking suds-box, with a funnel-shaped opening in the top, the ends of the funnel forming flanges for arresting the motion of the suds. It also has a perforated false bottom, through which, when the cylinder is rocked, the suds rush backward and forward, to act forcibly upon the goods to be cleansed.

WIRE FENCES.—This is an improvement in fences, invented and patented by Zebedee Nicholson, of Haddenfield, N. J. The fence is formed of a series of straight strands of wire, between which other strands of wire are made to assume a curvilinear zigzag course, crossing each other at points lying in vertical lines, over which intersections are placed "stiffeners," or plates of iron riveted together. The "stiffeners" occupy a position midway between the wooden posts which support the fence. This makes an apparently strong and secure, as well as a neat looking fence.

MILLSTONE DRESSING MACHINE.—Samuel East, Memphis, Mich.—This invention relates to a millstone dressing machine, which operates a common mill pick for cracking, facing, and furrowing, in which the pick is supported on a handle in such a manner that it can be moved laterally to any desired point, said frame being made to slide, by means of a screw, so that it can be moved forward or backward, for the purpose of setting the pick in position to make fresh "cracks" in the "land" of the stone.

LIFE PRESERVING TRUNK.—Lawrence Rebstock, Hollidaysburgh, Pa.—This invention relates to a trunk, so constructed that it may be converted at pleasure into a boat, and thus serve as a life preserver in cases of shipwreck.

BREECH LOADING CANNON.—The construction of the barrel is that of longitudinal bars, hooped by iron bands shrunk on, a collar over all carrying the trunnions. The barrel is hung in a U-shaped frame, and is provided with a grooved breech block, actuated by a lever in such a way, that when the lever is swung down, the breech end of the barrel is raised above the block, so that the charge or cartridge can be inserted, and vice versa. The inventor and patentee is H. J. Allen, of Arkadelphia, Ark.

COAL SCUTTLE.—James C. Parrish, Petersburg, Va.—This invention relates to that class of coal scuttles that are provided with a sifter within the scuttle, situated above and parallel with the bottom, and the invention consists in the peculiar connection or combination of a handle with the door or hinged cover for the outlet of the ash pit.

WASHING MACHINE.—John Hilger Doll, of Etna, Ill.—This consists of a rubbing board, having a similar surface to that of ordinary rubbing boards, but placed so that the rubber surface is uppermost, and in a horizontal position. Upon the rubbing board are brought to bear a series of rubbing rollers, attached to a swinging frame, pivoted at some distance above it. The whole is fitted into a suitable tub or receptacle.

BABY TENDER.—This consists of a cloth seat, with an open dress, which is designed to be hooked or buttoned about the waist of the child, and is attached to a hoop a little distance above by means of cords or chains, the hoop being in turn attached by cords or chains to a swivel at the end of a rod, which is attached to a coiled spring, the whole being suspended from a hook in the ceiling. The cloth seat is passed through between the legs of the child, and hooked to the waist of the loose dress. This arrangement gives great freedom of movement to the limbs of the child, and holds it in a comfortable position. This is the invention of Alexander H. Carson, of Newport, R. I., and Andrew Brown, of Troy, N. Y.

DOUBLE CHURN DASHER.—William F. Jones, of Easton, Kansas.—The lower end of the vertical dasher shaft is pivoted to the bottom of the churn. A transverse pin or round passes through the shaft, to the ends of which are attached curved wings of peculiar form, and within these wings are two other blades or wings, which force the milk or cream upward and outward, while the outer ones force it downward and inward. The several parts are all detachable, so that they can be thoroughly cleaned.

FURNITURE CASTER.—Augustus G. Stevens, of Manchester, N. H., has invented a furniture caster, in which the outer surface of the socket is notched or serrated, so that when driven into the wood the notches will hold the socket fast by the expansion of the wood into them. The screws driven into the ends of the furniture legs frequently get loose; the notches are intended to hold the socket without the screws, should the latter get loose. The stirrup and socket are held together by a hook which engages with a collar on the bottom of the socket.

ADJUSTABLE SCAFFOLD BENCH.—An improvement in scaffoldings made by James Pettit, of Rochester, Indiana, consists in making bench pieces, braces, and legs, movable independently, so that adjustments in length and hight may be made either simultaneously or separately as may be desired. To this end he uses slotted legs and slotted sliding pieces at the top, which allow the pieces to be slipped in either direction; and adjustable braces to hold them in place, the scaffolding being self supporting.

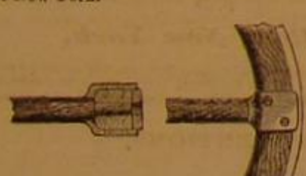
WAGON BRAKE.—In this invention, the brake beam is hinged to the reach of the wagon, and connected with the draft bar, so that, whenever the team ceases to pull, the brakes are brought into instant and forcible contact with the wheels, the weight of the brake bringing it down against the face of the wheel. The connection between the double tree and the hinged brake is effected by rods and links. Patented by R. C. Shockley, of Fayette, Wis.

NEWSPAPER ADDRESSING MACHINE.—Patrick O'Connor, of Youngstown, Ohio.—The principle of this machine is that of stencil plate printing. An endless stencil plate belt is moved around rollers, the impression being given by a hammer, as the plates of which the belt is composed pass over the upper roller. Instead of an endless belt, the inventor uses, when desired, a ribbon belt, winding upon one roller, as it unwinds from another.

DUMB BELLS.—Ellis Ballou, of Zanesville, Ohio.—The essential feature of this invention is the protection of the hand by placing the handle within a cavity of a shell formed between the balls or spheroids of the bell.

VALVES AND STEAM CHESTS.—The chief feature of this invention is the employment of a conical steam valve, flattened on two sides, within a steam chest that has four parts, two of which admit steam to the cylinder, and the other two of which are respectively the inlet and outlet. The parts are all equal distances apart, so that the proper connections of the parts with each other are established either by oscillating or by rotating the valve, in the latter case acting as a cut-off. The improvement is the invention of Peter N. Woods, of Fairfield, Iowa.

RECOLORING FABRICS.—After the fabric to be recolored has been properly dusted and freed from grease marks and stains, by the usual means employed for the purpose, it has applied to it a hot solution of aniline color, dissolved in alcohol and diluted with boiling water, in the proportion of one part dry color to ten parts alcohol, and as much water as may be required to obtain the desired tint, or shade. While the fabric is still damp from this application, the inventor applies, by another sponge, a suitable mordant, such as bromide of potassium, or other equivalent, the surplus mordant being finally removed by sponging with cold water. This process is the invention of John Murray Wallace, of New York city, assignor to Bernhard Weber, also of New York.



CARRIAGE WHEELS.—The invention of James Y. Silton, of Due West, S. C., is illustrated by the accompanying diagram. It consists in making the spokes of carriage wheels with clamps for the felly and tire, as shown, and metal sockets for the spokes, each being cast in one piece, and one being used for each spoke. The engraving shows an elevation, and also a section through the device, which will give a clear idea of the invention.

MACHINE FOR MAKING SKEWERS.—This is the invention of Chauncey Andrews, of Patterson, N.J. By its use skewers are split out, smoothed off, and pointed conveniently and rapidly. The parts of the machine cannot be intelligibly described without drawings.

BRICK LIFTER.—In certain kinds of brick machines, where the clay is pushed by a piston through a nozzle upon a table or set of rollers, to be subsequently cut into blocks by wires or cords, the rapid removal of the blocks or unburnt bricks is difficult. It is the design of this implement, invented by K. Julius Hugg, of Cincinnati, Ohio, to facilitate this operation. It consists of two parallel wooden board jaws, with arms pivoted together, after the manner of tongs, to which another set of bars are pivoted, so as to form lazy tongs, the upper ends of the latter bars being attached to the hoisting rope by a ring, which passes through suitable sheaves. This enables the block of clay to be rapidly removed to a truck, so as not to interfere with the action of the machine.

CHURN.—Henri Schuldtdrees, of Brookville, Ind.—This invention consists in an arrangement for the bearing of a horizontal beater shaft, to be raised as the butter begins to form for gathering it, and also for supporting the shaft at an elevated position.

VAPORIZING VOLATILE HYDROCARBONS.—This invention provides an apparatus for vaporizing volatile hydrocarbon oils, in such a way that only a small quantity of the oil may be in the gas house at a time, and which prevents the escape of the vapor into the gas house. The main body of the oil is kept outside the gas house, and is led in, through a pipe, to be vaporized in a coil heated by a hot water bath. A cold water condenser also surrounds the pipe, just previous to its reaching the vaporizer, which condenses any vapor that might seek to return through the pipe, and thus prevents its escape into the room. The oil is thus vaporized in small quantities as it flows into the gas house. The inventor is John Butler, of New York city.

PISTON PACKING.—Philip Estes, Leavenworth, Kansas.—This invention relates to piston-heads provided with expansible packing rings, and it consists in the means employed for forcing said packing ring outward, whenever it may be necessary, in order to the preservation of a steam-tight joint between the piston and cylinder.

PENDULUM LEVEL AND CLINOMETER.—This invention has for its object the adaptation of a stand pendulum pointer and scale (such as are used for ascertaining the deviations of the earth's surface, of the surfaces of other objects, from a horizontal line) to use as a plumb for determining the lines of objects standing vertically, or nearly so, and of overhead walls and ceilings. It has for its distinctive feature a scale arranged relatively to the hight and stretch of the forked measuring legs of the stand, so that measurements in right lines vertically, of the inclinations of the surface may be indicated on the curve which the index describes. It was invented by Rev. William Johnson, of Edisto Island, S. C.

HINGES FOR TABLE LEAVES.—The invention of Philip Hires, of Columbus, Ky., has for its object an improved hinge for table leaves, etc., which shall render the knuckle in table leaf joints unnecessary, while the hinge will be out of sight, and will hold the leaf firmly.

APPLICATIONS FOR EXTENSION OF PATENTS.

METALLIC BRIDGES FOR PIANOFORTES.—G. Henry Hulskamp, New York city, has petitioned for an extension of the above patent. Day of hearing, July 5, 1871.

SAWING MILL.—William M. Ferry, Grand Haven, Mich., has petitioned for an extension of the above patent. Day of hearing, July 5, 1871.

ARTIFICIAL LEGS.—Robert H. Nicholas, Chicago, Ill., and Douglas Bly, of Rochester, N.Y., have petitioned for an extension of the above patent. Day of hearing, July 12, 1871.

COMPOUND CAPSTAN FOR SHIPS.—Charles Perley, New York city, has petitioned for an extension of the above patent. Day of hearing, July 19, 1871.

CARRIAGE PROPS.—Chauncey Thomas, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, Sept. 6, 1871.

BOBBINS FOR ROVING AND SLUBBING.—Isaac Hayden, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, July 19, 1871.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Queries.

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

1.—CEMENT.—How can I make a cheap waterproof cement for roofs, and to be used about chimneys, and other crevices?—H. A. C.

2.—CREOSOTING BOAT BOTTOMS.—I noticed in your issue of the 1st inst. that creosote oil is mentioned as a preventive for the sea worm. What would be the cost of same per gallon, and could it be successfully applied to old boats just hauled out, whose bottoms are thoroughly soaked with salt water? Or should the wood be in a comparatively dry state, before using the oil? A preventive of this kind is very much needed in the bays here, as we have a large number of small vessels which have to be hauled out frequently and repainted with verdigris, etc., to preserve the timber from the worms.—J. E. M.

3.—HONING RAZOR.—In honing my razor, I always get a rough wiry edge. What is the reason? If any one will tell me how to do this, so that I can at last get a good, smooth, satisfactory shave, they will confer a favor upon—P. R.

4.—STAMPS FOR PRINTING CARDS.—How are the elastic hand stamps for printing cards made?—C. F. M.

5.—ASPHALTE WALKS.—What is the experience of Southerners in the use of asphalte walks? How does heat affect them, and how do they compare in point of cost with other walks?—N.

6.—SMOKED BRICK WALLS.—How can wood smoke stains be removed from a new brick wall?—D. P. S.

7.—MENDING CAST IRON PATTERNS.—How can a broken piece of cast iron be so mended that a founder may use it for a pattern in molding a new piece?—J. G. G.

8.—STRENGTH OF BEAMS.—I would suggest to those having so much controversy about the strength of beams, that a beam will support its own weight inversely as the square of its length. For, as you double the length (which is its breaking leverage) you double the load. But for a uniform load, supposing the beam to weigh nothing of itself, the strength decreases as the length increases. If I am not right, will some one tell why?—W. G. B.

9.—DRAFT OF VEHICLES.—If a wheel be rolled over a plain of mud, of uniform consistency, and so loaded that it sinks a part of its diameter into the mud, should the line of traction be horizontal or inclined upwards? Suppose a block weighing 100 pounds rests on a level surface, and requires a force of 100 pounds exerted horizontally to move it: can it be moved more easily by pulling in any other direction? If so, what angle does the line of traction make with the base, and what is the force necessary to move the block?

10.—GEARING SLIDE REST.—I am an amateur turner, and I want to gear my slide rest to my lathe mandrel, to cut small screws. I don't know very much about gear wheels, and would like to ask one or two questions in regard to them. What would be the best number of teeth, to the inch of the diametrical pitch, for a lathe like mine, which is small (10 inch swing) and light? Would 16 teeth to the inch of the diameter of the pitch circle be too small or too large? If so, what would be a good number? Sixteen teeth to one inch of the diameter of the pitch circle would give, on a wheel of 3 inches in diameter of pitch circle, 48 teeth on the pitch circle, would it not? And would a wheel so small as 1¼ inches, with 20 teeth, work well with one of 2½ inches with 40 teeth? In giving the size of the wheels, I mean the diameter of the pitch circle. I have made all the calculations as to the size of the wheels I want but do not know how to get at the number of teeth to the inch that will work nicely on so small a lathe as mine?—G. J. Van D.

11.—ELECTRIC LIGHT.—What is the most economical way to produce the electric light? The direct way, by a Grove battery, or by a revolving magnet, or by Rhumkorff's coil? Has an estimate been made as to the cost of its production, compared with that of any other illuminator? What would be the cost of apparatus, and are there persons in New York who sell the proper apparatus? This subject has been discussed by several scientific men and subscribers to your valuable paper, and all are anxious to hear what light can be thrown upon the subject.—L. K., M. D.

12.—CHEAP BATTERY.—In your issue of March 11, 1871, there were directions to make a cheap galvanic battery. I undertook, in company with a friend, to construct one of these, and although we followed the instructions to the letter, as we thought, yet the result was an ignominious failure. It did not generate one particle of electricity, not even so much as is produced in the humble experiment of a silver coin and piece of zinc placed on the tongue. We first procured a glazed earthen bowl, holding about a gallon; inside this was fitted a cylinder of sheet zinc; within this cylinder we placed an unglazed earthen flower pot, medium size, the hole stopped with shoemaker's wax, and inside this again was a cylinder made from the bottom of an old copper wash boiler. Then, dissolving nearly half a pound of sulphate of copper in water, we poured it into the flowerpot containing the copper, filling it full, and also filled the outer earthen pot with a strong solution of salt and water. Having attached copper wires to both zinc and copper, we now naturally expected the machine to work, but never a bit of it. Up to this writing, it has stood as complacently innocuous as a barrel of slop. Is anything wrong with our apparatus? We have modified, altered, improved and experimented, all to no purpose. So let A. G. please inform us where the difficulty is, or we shall be confirmed in the opinion, gradually gaining ground in our minds, that his directions are a fraud, or at least of no use to novices like—F. R. S.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING MAY 2, 1871.

Reported Officially for the Scientific American.

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114,248.—WEIGHING SCALES.—D. D. Allen, Adams, Mass.
114,249.—MILLSTONE.—J. A. Althouse, New Harmony, Ind.
114,250.—WASHING MACHINE.—A. Assmann, Rahway, N. J.
114,251.—GRAIN SEPARATOR.—S. K. Ayres, Dellton, Wis.
114,252.—STALK CUTTER.—Josiah Babcock, John F. Stilson, and James C. Leidy, Galesburg, Ill.
114,253.—SASH HOLDER.—W. Bacheller, West Newbury, Ms.
114,254.—SEWING MACHINE.—N. and R. S. Barnum, Chicago, Ill.
114,255.—BOILER FEEDER.—Robert Berryman, Hartford, Ct., and R. N. Pratt, Philadelphia, Pa.
114,256.—FIRE EXTINGUISHER.—C. Blake, Boston, Mass.
114,257.—STEAM TRAP.—J. H. Blessing, Albany, N. Y.
114,258.—THILL COUPLING.—G. I. Bradley, Boston, Mass
114,259.—FIREARM.—Heinrich Buchner, New York city.
114,260.—STOVE.—E. Bussey and A. Hamlin, Troy, N. Y.
114,261.—INFANT'S SHOE.—W. M. Carpenter, Rowley, Mass.
114,262.—INKSTAND.—C. C. Catlin, Cleveland, Ohio.
114,263.—CHEESE HOOP.—Azer Chandler, Rome, N. Y.
114,264.—MEDICAL COMPOUND.—A. R. Clapp, Boston, Mass.
114,265.—NEEDLE SHARPENER.—C. P. Clark, Lock Haven, Pa.
114,266.—HOE.—Isaac Cook and J. T. Bever, Haynesville, Mo.
114,267.—METER.—T. Kent, Old Kent Road, and J. Watson Victoria Chambers, Westminster, London, Eng.
114,268.—PRINTING PRESS.—C. B. Cottrell, Westerly, R. I.
114,269.—WHIFFLETREE.—H. Crocker, Jr., Montrose, Pa.
114,270.—STENCH TRAP.—Thomas Dark, Buffalo, N. Y.
114,271.—COTTON PRESS.—Henry J. Davis, Wetumpka, Ala. Antedated April 26, 1871.
114,272.—GAS REGULATOR.—Otis Dean, Richmond, Va.
114,273.—PRINTERS' CASE.—A. T. De Puy, New York city.
114,274.—MULE.—John Dodd, Oldham, England.
114,275.—GAS PURIFIER.—E. Duffee, Haverhill, Mass.
114,276.—TUCK MARKER.—G. L. Du Laney, New York city.
114,277.—IRON AND STEEL.—Z. S. Durfee, New York city.
114,278.—EVAPORATOR.—S. P. Dyer, Ankney Town, Ohio.
114,279.—PIPE SHELF.—J. P. Elliott, Bridgeport, Conn.
114,280.—GRATE BARS.—W. H. Farris, Cairo, Ill.
114,281.—NIPPLE SHIELD.—S. C. Foster, New York city.
114,282.—INVALID CHAIR.—G. T. Fowler, East Somerville, Ms.
114,283.—HYDRANT.—J. P. Gallagher, St. Louis Mo.
114,284.—PUMP.—J. P. Gallagher, St. Louis, Mo.
114,285.—PRINTING PRESS.—M. Gally, Rochester, N. Y.
114,286.—BOOK BINDING.—John Glass, Greenpoint, N. Y.
114,287.—RUBBER.—John Greacen, Jr., New York city.
114,288.—SPINNING MULE.—P. W. Greenwood, Landenburg, Pa
114,289.—SLATE FRAME.—W. W. Hamilton, Flushing, N. Y.
114,290.—GRATE.—C. R. Harvey and J. H. Foote, New York
114,291.—DRAFT.—B. A. Haycock, Richmond, Iowa.
114,292.—CRIB.—W. T. Hazard, Randolph, Mass.
114,293.—OIL.—S. A. Hill and C. F. Thumm, Oil City, Pa.
114,294.—SEWING MACHINE.—J. A. and H. A. House, Bridgeport, Conn.
114,295.—APPARATUS FOR EVAPORATING LIQUIDS.—J. Howarth, Salem, Mass.
114,296.—ENGINE GOVERNOR.—R. K. Huntoon, Boston, Mass.
114,297.—PUNCHING MACHINE.—W. H. Ivens and William E. Brooke, Trenton, N. J.
114,298.—LUBRICATOR.—James Ives, Mt. Carmel, Conn.
114,299.—CAST STEEL.—P. E. Jay, J. A. Rafter, Montreal, Can.
114,300.—STEAM ENGINE.—Asa Johnson, Brooklyn, N. Y.
114,301.—PAPER PULP.—M. L. Keen, Jersey City, N. J.
114,302.—LAMP.—H. Kelley and W. H. Locke, Boston, Mass.
114,303.—GRINDER.—F. J. Kimball, Philadelphia, Pa.
114,304.—DRYER.—F. J. Kimball, Philadelphia, Pa.
114,305.—WASHING MACHINE.—J. M. Kimball, Woodstock, Ill.
114,306.—CHURN.—J. J. Kimball, Naperville, Ill.
114,307.—WEFT FORK.—J. H. Knowles, Lawrence, Mass.
114,308.—STALK CUTTER.—M. K. Lewis, J. Munger, Malcom, Iowa.
114,309.—WINDMILL.—G. Mabie and T. C. Little, Dixon, Ill.
114,310.—BELT SHIPPER.—H. Macon, Providence, R. I.
114,311.—CUTTING METAL.—J. R. Maitlank, Little Rock, Ark
114,312.—COAL BOX.—John Mallin, Chicago, Ill.
114,313.—THRASHING MACHINE.—M. H. Mansfield, Ashland, O
114,314.—BIT STOCK.—Charles Manson, Boston, Mass.
114,315.—CORPSE PRESERVER.—M. R. Margerum, Trenton, N. J
114,316.—CARBURETER.—L. Marks, San Francisco, Cal.
114,317.—LUBRICATOR.—C. Mather, Steubenville, Ohio.
114,318.—HAME.—Asa McCracken, South Byron, N. C.
114,319.—EXTENSION TABLE.—F. Menzer, Flint, Mich.
114,321.—BARREL MACHINE.—Wm. R. and E. Middleton, Cleveland, Ohio.
114,322.—SHINGLE MACHINE.—U. D. Mihills, Fond Du Lac, Wis.
114,323.—MATCH SAFE.—J. Musgrove, Newark, N. J.
114,324.—HUB CAP.—G. H. Nevins, Liverpool, Cal.
114,325.—ROOFING.—E. P. Newton, Clintonville, Pa.
114,326.—MILLSTONE GUIDE.—J. North, New York city.
114,327.—HAT.—J. Northrop and J. F. Emmons, Bridgeport, Ct
114,328.—LIFTING LOCOMOTIVES.—G. T. Nutter, Jersey City, N. J.
114,329.—GAS BURNERS.—R. Nutting, Randolph, Vt.
114,330.—COFFEE ROASTER.—A. Olst, Cambridgeport, Mass
114,331.—CORN SHELLER.—C. M. O'Hara, Cincinnati, Ohio.
114,332.—NEEDLES.—C. H. Palmer, New York city.

114,333.—Tackle Block.—I. E. Palmer, Hackensack, N.J.
114,334.—Plow.—W. F. Parker, Troy, Ala.
114,335.—Coal Scuttle.—J. C. Parrish, Petersburg, Va.
114,336.—Stove.—J. S. Peckham, Utica, N. Y.
114,337.—Play Pipe.—E. L. Perry, New York city.
114,338.—Valve.—George Pierce, Boston, Mass.
114,339.—Hydraulic Apparatus.—P. E. Powers, Genoa, Nev.
114,340.—Shoes.—W. F. Prusha, E. L. Wales, Marlborough, Mass.
114,341.—Polisher.—P. F. Randolph, Jerseyville, Ill.
114,342.—Chimney.—W. Richards, London, England.
114,343.—Trap.—J. H. Richardson, Westport, Mo.
114,344.—Slide Valve.—A. K. Rider, New York.
114,345.—Clothes Line.—J. Ripley, Cincinnati, Ohio.
114,346.—Saw Guide.—A. Rittenhouse, Smithville, Ohio.
114,347.—Plumber's Water Boiler.—A. R. Robb, Brooklyn.
114,348.—Pipe Wrench.—E. H. Robbins, Pittsfield, Mass.
114,349.—Car Heater.—H. R. Robbins, Baltimore, Md.
114,350.—Paper Cutter.—T. C. Robinson, Boston, Mass.
114,351.—Dust Pan.—Thomas F. Rooney, Chicago, Ill.
114,352.—Tobacco.—A. S. Rosenbaum, New York city.
114,353.—Car Coupling.—S. S. Sartwell, Camden, N. Y.
114,354.—Polish.—H. A. and R. G. Sawyer, Milwaukee, Wis.
114,355.—Mats.—C. S. Schenck, New York city.
114,356.—Iron Furnaces.—E. G. Scovil, St. John, Canada.
114,357.—Sled Knee.—C. Shaw, Milledgeville, Pa.
114,358.—Gas Machine.—W. A. Simonds, Boston, Mass.
114,359.—Stave.—Wm. Sisson, Fulton, N. Y.
114,360.—Canister.—W. H. Smith, Portland, Conn.
114,361.—Oil Tank.—H. F. and G. S. Snyder, Williamsport, and A. Snyder, Freeport, Pa.
114,362.—Sprinkler.—J. I. Spear, San Francisco, Cal.
114,363.—Bridge.—C. B. Sreeves, Atchison, Kan.
114,364.—Hub.—H. W. Stow, New Haven, Conn.
114,365.—Scaffold Bracket.—J. W. Tallmadge, Plainville, Conn.
114,366.—Bib.—Adaline L. Thomson, Hudson city, N. Y.
114,367.—Dish Washer.—H. B. Todd, Plymouth, Conn.
114,368.—Hay Rake.—R. M. Treat, Morris, Conn.
114,369.—Traction Engine.—C. W. Tremain, Chicago, Ill.
114,370.—Lunch Box.—D. Troxell, Newark, N. J.
114,371.—Mold for Belting.—S. W. Tyler, Troy, N. Y.
114,372.—Watches.—A. Wadsworth, Newark, N. J.
114,373.—Leather Fabric.—E. Waite, Franklin, Mass.
114,374.—Firearms.—D. B. Wesson, Springfield, Mass.
114,375.—Salve.—W. Wheelock, Boston, Mass.
114,376.—Tilting Chair.—E. R. White, Milford, Mass.
114,377.—Roll.—E. Wight, Philadelphia, Pa.
114,378.—Combined Square.—M. M. Wilson, Elwood, N. J.
114,379.—Door Spring.—L R. Witherell, Galesburg, Ill.
114,380.—Washing Machine.—J. A. Wood, Chemung, Ill.
114,381.—Wind Wheel.—Horace Woodruff, Sandwich, Ill.
114,382.—Canal Boats.—G. G. Wyland and T. M. Rathmell, Williamsport, Pa.
114,383.—Bolt Cutter.—W. E. Yeager, Lawrence, Kansas.
114,384.—Grain Drill.—J. P. Zeller, South Bend, Ind.
114,385.—Shearing Metal.—W. J. Adams, Grand Rapids, Mich.
114,386.—Padlock.—W. H. Akins, Ithaca, and H. E. Abell, Brooklyn, N. Y.
114,387.—Binder.—W. Allebaugh and J. M. Cuffell, Norristown, Pa.
114,388.—Knife.—J. W. Androvatt and T. W. Joline, Tottenville, N. Y.
114,389.—Lamp.—W. W. Batchelder, Boston, Mass.
114,390.—Corn Planter.—Harry Baughman, Sandusky, O.
114,391.—Hay Fork.—Charles Bean, Pawtucket, R. I.
114,392.—Stable Fixture.—S. S. Bent, Port Chester, N. Y.
114,393.—Soap.—J. T. and P. S. Bever, Lathrop, Ill.
114,394.—Grain Drill.—J. R. Bird, Brooklyn, N. Y.
114,395.—Ditching Machine.—I. Boas, New Orleans, La.
114,396.—Preparing Beefsteak.—A. M. Bond, Concord, N.H.
114,397.—Knitted Fabric.—Henry Boot, Philadelphia, Pa.
114,398.—Roller Skate.—P. R. Borein, San Leandro, Cal.
114,399.—Hoist.—P. J. Borger, Cincinnati, Ohio.
114,400.—Fibrous Plants.—A. Bouchard, New Orleans, La.
114,401.—Bridge.—T C. Boutet, Baris, France.
114,402.—Shaft Coupling.—S. Broadbent, Scranton, Pa.
114,403.—Pump.—A. P. Brown, New York city.
114,404.—Pocketbook.—Jefferson Brown, Jr., New York city.
114,405.—White Lead.—T. H. Burridge, St. Louis, Mo.
114,406.—Burglar Alarm.—J. G. Butler, Glen's Falls, N. Y.
114,407.—Corpse Preserver.—J. T. Carpenter, Downington, Pa.
114,408.—Reaper.—G. H. Clark, Cleveland, Ohio.
114,409.—Railway Frog.—J. W. Close, Buffalo. N. Y.
114,410.—Billiard Cushion.—H. W. Collender, New York city.
114,411.—Meter.—Thomas Cook, New York city.
114,412.—Window Blind.—A. Cooper, Twickenham, Eng.
114,413.—Nail Machine.—H. D. Cowles and G. Stacy, Montreal, Canada.
114,414.—Bridge Gate.—E. R. Coyne, Chicago, Ill.
114,415.—Water Meter.—J. W. Cremin, New York city.
114,416.—Fanning Mill.—L. M. Crosby, Ashtabula, Ohio.
114,417.—Raisin Seeder.—W. Curtis, Jr., Wolcottville, Ct.
114,418.—Toilet Case.—F. E. Dapron, Davenport, Iowa.
114,419.—Water Meter.—J. F. de Navarro, New York city.
114,420.—Liquid Meter.—J. F. de Navarro, New York city, and H. C. Sergeant, Newark, N. J.
114,421.—Fire Escape.—William De Pew, Paris, Canada.
114,422.—Cupola Furnace.—J. Dougherty, Philadelphia, Pa.
114,423.—Mixing Machine.—Robert Duff, New York city.
114,424.—Sewing Machine.—G. L. Dulaney, New York city.
114,425.—Dressing Millstones.—S. East, Memphis, Mich.
114,426.—Saw Mill.—M. J. and T. J. Egery, Bangor, Me.
114,427.—Piston Packing.—Philip Estes, Leavenworth, Kan.
114,428.—Division Plate for Stoves.—S. C. Ewing, Hill's Ferry, Cal.
114,429.—Steam Engine.—H. Fontaine, Paris, France.
114,430.—Gun Carriage.—J. G. Foster, Boston, Mass.
114,431.—Wash Boiler.—J. H. Garner, Pontiac, Ill.
114,432.—Lantern.—N. Gear, Newark, Ohio.
114,433.—Rail Joint.—W. F. Grassler, Muncy, Pa.
114,434.—Earth Closet.—W. H. Grove, Philadelphia, Pa.
114,435.—Sewing Machine Stand.—W. H. Grove, Philadelphia, Pa.
114,436.—Support for Window Sashes.—C. Ham, New York city.
114,437.—Boiler Furnace.—C. J. Harris, Bloomington, Ill.
114,438.—Candle.—Charles Havard, New York city.
114,439.—Bedstead.—J. F. Hollister, Plano, Ill.
114,440.—Steam Heater.—A. L. Ide, Springfield, Ill.
114,441.—Harvester Rake.—B. Illingworth, Le Roy, Minn.
114,442.—Bobbin Winder.—T. M. Jenks, New York city.
114,443.—Shingle Machine.—Joseph Jimo, Vergennes, Vt.
114,444.—Baking Pan.—Amos Jones, Lebanon, N. H.
114,445.—Sash Holder.—G. N. Kendall, Wooster, Ohio.
114,446.—Awl.—Thomas Kenney, Lynn, Mass.
114,447.—Electro Mold.—S. P. Knight, Brooklyn, N. Y.
114,448.—Wagon Tongue Support.—J. Krehbiel, Williamsville, N. Y.
114,449.—Fire Bricks.—B. Kreischer, New York city.
114,450.—Safety Can.—W. H. Lawrence, Williamsburg, N.Y.
114,451.—Match Hook.—Jos. D. Leach, Penobscot, Me.
114,452.—Securing Wheels to Axles.—George Granville Lobdell, Wilmington, Del.
114,453.—Stove Damper.—Ernest Lohsand, La Porte, Ind.
114,454.—Securing Dental Fillings.—C.H.Mack, Portland, Oregon.
114,455.—Spindle Step Box.—L. Maish, Minneapolis, Minn.
114,456.—Fruit Box.—Joshua H. Marvil, Laurel, Del.
114,457.—Wash Boiler.—D. McCleary, Allegheny City, Pa.
114,458.—Wheel.—R. W. McClelland, Springfield, Ill.
114,459.—Sail Hank.—Wm. E. Meyer, New York city.
114,460.—Elevator.—Charles E. Moore, Boston, Mass.
114,461.—Buckle.—John H. Morris, Paxton, Ill.
114,462.—Washer and Wringer.—J. H. Murray, Kirkwood, N. Y.
114,463.—Grain Separator.—W. A. Myers, York, Pa.
114,464.—Washing Fluid.—E. H. Neill, San Francisco, Cal.
114,465.—Puddling Furnace.—J. Neville, Brooklyn, N. Y.
114,466.—Sleigh Heater.—Alfred Norton, Kokomo, Ind.
114,467.—Nozzle Stopper.—J. H. Noyes, Abington, Mass.
114,468.—Rolling Paste.—C. A. Oehl, New York city.
114,469.—Chill Castings.—James Oliver, South Bend, Ind.
114,470.—Enameling Boot Heels.—C. H. Orcutt, Leominster, Mass.
114,471.—Lantern.—John Orphy, Buffalo, N. Y.
114,472.—Plow and Marker.—O. M. Pond, Independence, Iowa.
114,473.—Lubricator.—J. M. Porter, Frostburg, Md.
114,474.—Nut Lock.—P. F. Randolph, Jerseyville, Ill.
114,475.—Life Preserving Trunk.—L. Rebstock, Hollidaysburg, Pa.
114,476.—Bending Machine.—G J. Riblet, Bootheville, W.Va.
114,477.—Hair Crimping Device.—F. C. Richardson, New York city.
114,478.—Churn Dasher.—Julius M. See, Griffin, Ga.
114,479.—Bridge.—Jacob Seebold, Kantz, Pa.
114,480.—Liquid Meter.—H. C. Sergeant, Newark, N. J.
114,481.—Bottom for Metal Ware.—H. W. Shepard, Mannsville, N. Y.
114,482.—Atomizing Liquid.—A. M. Shurtleff, Boston, Mass.
114,483.—Cultivator.—M. P. Simpson, Rosemond, Ill.
114,484.—Stovepipe Thimble.—H. G. Smith, Meriden, Ct.
114,485.—Trunk.—Joseph Stanton, Buffalo, N. Y.
114,486.—Ore Concentrator.—W. C. Stiles, Nevada City, Cal.
114,487.—Snap Hook.—O. O. Storle, North Cape, Wis.
114,488.—Saddletree Mold.—J. Straus, St. Louis, Mo.
114,489.—Blower and Rotary Engine.—H. P. Tenant, Germantown, Ind.
114,490.—Fabric for Cuffs.—H. H. Thayer and W. H. Hart, Jr., Philadelphia, Pa.
114,491.—Automatic Fan.—B. D. Thompson, New York city.
114,492.—Clarifying Coffee.—C. L. Tucker, Chicago, Ill.
114,493.—Harvester.—B. G. Turner, Fremont, Neb.
114,494.—Curtain Fixture.—E. Turner, Wolcottville, Conn.
114,495.—Ice Machine.—A. Vaass and F. Littmann, Halle, Prussia.
114,496.—Hay Elevator.—J. M. Van Demark and Moses Barlow, Phelps, N. Y.
114,497.—Draught Regulator for Stoves.—W. W. Waddell, Hillsborough, Ohio.
114,498.—Rolling Hoe Blanks.—H. Waters, Boston, Mass.
114,499.—Kiln.—G. A. Wedekind and H. Dueberg, Baltimore, Md.
114,500.—Grain Separator.—H. L. Whitman, St. Louis, Mo.
114,501.—Lawn Mower.—A. W. D. Williams, London, Eng.
114,502.—Soda Water.—J. B. Wood, Richmond, Va.
114,503.—Steam Boiler.—F. A. Woodson, Selma, Ala.
114,504.—Paper File.—S. W. Young, Providence, R. I.
114,505.—Wrench.—A. C. Coes, Worcester, Mass.
114,506.—Steam Pumping Engine.—L. J. Knowles, Worcester, Mass.
114,507.—Steam Pump.—L. J. Knowles, Worcester, Mass.
114,508.—Fertilizer.—H. A. Hogel, New York city.
114,509.—Meat Saw.—P. J. Hogan and A. Sowden, Cincinnati, Ohio.

REISSUES.

4,359.—Stove Lid and Damper.—Wm. Doyle, Albany, N.Y. Patent No. 89,861, dated May 11, 1869.
4,360.—Preserving Wood Railroad Ties, etc.—B. S. Foreman, Morrison, Ill. Patent No. 43,197, dated June 21, 1864; reissue No. 1,951, dated May 9, 1865.
4,361.—Oil Cup.—J. P. Haines, New York city. Patent No. 92,820, dated July 20, 1869.
4,362.—Sad and Fluting Iron.—F. Myers, New York city. Patent No. 112,482, dated March 7, 1871.
4,363.—Printing Cloth.—Alfred Paraf, New York city. Patent No. 95,040, dated Sept. 21, 1869.
4,364.—Concrete Pavement.—J. J. Schillinger, New York city. Patent No. 105,599, dated July 19, 1870.
4,365.—Metal Corner Piece.—E. A. Stratton and C. M. Stratton, Greenfield, Mass. Patent No. 100,463, dated March 1, 1870.
4,366.—Distilling Petroleum, etc.—A. H. Tait and J. W. Avis, New York city. Patent No. 53,359, dated March 20, 1866.
4,367.—Distilling Petroleum, etc.—A. H. Tait and J. W. Avis, New York city. Patent No. 63,115, dated March 19, 1867.
4,368.—Cattle Car.—The National Cattle Car Co., Salem, O. Patent No. 29,409, dated July 31, 1860.
4,369.—Package for Lard.—Chas. L. Tucker, Chicago, Ill. Patent No. 66,368, dated July 2, 1867; reissues Nos. 3,037 and 3,038, dated July 14, 1868.

DESIGNS.

4,853.—Bracket.—J. H. Bellamy, Charlestown, Mass.
4,854.—Front of a Catch-All.—J. H. Bellamy, Charlestown, Mass.
4,855.—Gate Hinge.—Chas. B. Clark, Buffalo, N.Y.
4,856.—Bottle.—Wm. A. Demuth, New York city.
4,857.—Chain Link.—Virgil Draper, Attleborough, Mass.
4,858.—Handle Cap for Satchels.—G. Havell, Newark, N.J.
4,859.—Palm and Back Pieces of Gloves.—F. E. Hotchkiss, Gloversville, N. Y.
4,860.—Knitted Trimming.—M. Landenberger, Philadelphia, Pa.
4,861 and 4,862.—Rubber Shoe.—C. Meyer, New York city. Two patents.
4,863.—Muff and Collar Box.—R. M. Seldis, New York city.
4,864.—Woven Cloth.—R. C. Taft, W. B. Weeden and J. W. Taft, Providence, R. I.
4,865.—Thumb Piece for Gloves.—I. B. Whipple, Gloversville, N.Y.
4,866.—Bow Instrument.—L. P. Wildman, Danbury, Conn.

TRADE-MARKS.

231.—Tobacco.—L. L. Armistead, Lynchburg, Va.
232.—Balm.—Demas Barnes, Brooklyn, N. Y.
233.—Liniment.—Demas Barnes, Brooklyn, N. Y.
234.—Insect Powder.—Demas Barnes, Brooklyn, N. Y.
235.—Preparation for the Hair.—D. Barnes, Brooklyn, N.Y.
236.—Billiard Cushion.—H. W. Collender, New York city.
237.—Jewelry.—Wm. M. Elias & Brother, New York city.
238.—Medicine.—T. S. Hodgson & Co., McKeesport, Pa.
239.—Twine, Warp, Yarn, etc.—E. W. Keeler, Yardville, N.J.
240.—Tea.—C. A. Low & Co., San Francisco, Cal.
241.—Whisky.—Mills, Johnson & Co., Cincinnati, Ohio.
242.—Billiard Table.—Phelan & Collender, New York city.
243.—Wood Pump.—Rich & Burlingham, New York city.
244.—Cigar.—Smith, Crosby & Co., New York city.
245.—Fertilizer.—Smith & Harris, Philadelphia, Pa.
246.—Toys and Fancy Goods.—Strasburger, Fritz & Pfeiffer, New York city.
247.—Medicinal Preparation.—G. B. Thurston, Lynn, Mass.

EXTENSIONS.

Paper Bags.—Roxanna Rice, South Lancaster, Mass. Letters Patent No. 17,184, dated April 28, 1857; reissue No. 990, dated March 6, 1860.
Harvesters.—Chas. Crook, New Hope, Pa. Letters Patent No. 17,305, dated May 5, 1857; reissue No. 548, dated May 4, 1858; reissue No. 3,391, dated April 20, 1869.
Harvesters.—Chas. Crook, New Hope, Pa. Letters Patent No. 17,305, dated May 5, 1857; reissue No. 548, dated May 4, 1858; reissue No. 3,394, dated April 20, 1869.

DISCLAIMER.

Harvesters.—Chas. Crook, New Hope, Pa. Letters Patent No. 17,305, dated May 5, 1857; reissue No. 548, dated May 4, 1858; reissue No. 3,394, dated April 20, 1869.

Inventions Patented in England by Americans.

April 12 to April 17, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

Axles and Axle Boxes.—C. W. M. Smith, San Francisco, Cal.
Button Holes.—G. M. Wells, Boston, Mass.
Clothes Wringer.—August Albrecht, Philadelphia, Pa.
Elastic Compound.—A. G. Day, Seymour, Conn.
Fabrics for Mattresses.—G. C. Perkins, Hartford, Conn.
Frame for Hop Boxes.—J. T. Parlour, Brooklyn, N. Y.
Hair Washer.—M. L. Winn, New York city.
New Fiber.—J. H. McConnell, Springfield, Ill.
Phosphates of Lime.—C. Morfit, Baltimore, Md.
Preparation of Meat.—M. S. Valentine, Richmond, Va.
Propeller.—Dr. R. Hunter, Cincinnati, Ohio.
Sash Fastener.—Nathan Thompson, Brooklyn, N. Y.
Stretching Picture Frames.—James Fairman, New York city.
Stringed Instruments.—L. P. Wildman, Danbury, Conn.
Superphosphate of Lime.—C. Morfit, of Baltimore, Md.
Treatment of Bone.—N. B. Rice, E. Saginaw, Mich., S. Driggs, New York.
Whip.—Charles T. Shelton, New Haven, Conn.
Window-blind Holder.—Nathan Thompson, Brooklyn, N. Y.

Foreign Patents.

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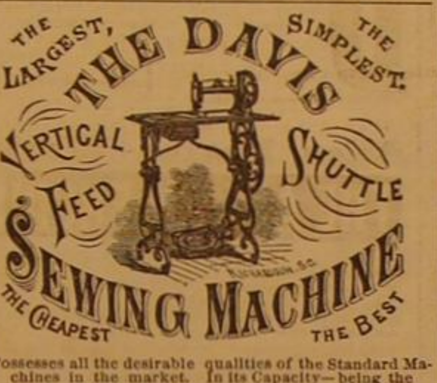

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