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STEAM PLOWING BY DIRECT TRACTION.

With some modifications in its construction, and which do not impair its usefulness as a hauling engine, the well known road and farm locomotive of Messrs. Aveling & Porter, of Rochester, England, has been successfully applied to direct traction steam plowing.

Although there can probably be no question that the double engine rope system of steam cultivation, as practiced in Great Britain, is more thorough and comprehensive in its application than any form of direct traction steam plowing, yet the large cost of the machinery necessary for working the first named principle, seems to preclude the probability of its general adoption in this country.

The requirements for an expeditious and economical means for tilling the land by steam power are, however, far greater in the United States than in Europe, and in view of the numerous inquiries for steam plows suitable to the wants of our agriculturists, Messrs. Aveling & Porter have, for a long time, given much attention to the subject and, after repeated and careful trials, have adopted, with some alterations, the Fowler balance plow as being the best form of implement to use in conjunction with an engine which has to travel over the land to be plowed.

The difficulties that have presented themselves in the many attempts at direct traction steam plowing have, it is claimed, been overcome by using the balance plow; which, it is stated, avoids the necessity and consequent loss of time in turning the plow at headlands, decreases the liability of breakage, and insures perfect control of the plows both with regard to steerage and depth of furrow. From repeated trials on heavy land, it has been found that an engine, weighing a little more than five tuns and working a four furrow balance plow, can accomplish eight acres a day, cutting a furrow from eight to ten inches deep and ten to twelve inches wide. Thrashing, hauling, and a variety of other duties can also be performed by the same machine.

The engine above referred to and illustrated does not materially differ in construction from the Aveling & Porter road and farm locomotive, which gained the first prize given by the Royal Agricultural Society of England, in 1871.

The engines have single cylinders, placed on the forward part of the boiler and surrounded by a steam jacket in direct communication with it. Engines having single cylinders and reversing gear, when connected to the driving axle by means of Aveling's usual gear, have proved themselves to be thoroughly efficient, more powerful, less complicated, and in every respect better adapted for general traction purposes than engines with double cylinders. They have tender and tank for an ample supply of fuel and water, and a steerage eminently simple and perfect in action. The compensating motion to the driving wheels of Aveling & Porter's engines is of malleableized iron, the use of which, although more costly than ordinary cast iron, greatly increases the strength of the working gear. One man only is required for the entire management of the engine. The boiler is horizontal and multitubular, and is a more economical consumer than upright boilers. It is made of "best best" Staffordshire plates, and the fire box is invariably of Lowmoor iron. It is lagged and felted, and proved to a pressure of 200 lbs. to the square inch. The daily expense of working a six horse power Aveling & Porter engine is approximately $6. The increased cost of using such an engine, in conjunction with the steam plow, would be simply the wages of one additional man.

To this time Messrs. Aveling & Porter have built more than 900 road locomotives, many being successfully in use in the United States and can be seen at work within a few miles of New York.

Mr. G. W. Dick, of Ross, Ohio, who has a six horse power Aveling & Porter engine, writes:

"We have used our engine for almost all possible purposes—on the gravel road, for drawing logs out of the wood, for thrashing grain, and are now hauling pork in the streets of Cincinnati, over a boulder pavement.

"On the macadamized road we draw from Hamilton to Venice, including wagons, 25,000 lbs. of coal in one load—a distance of eleven miles. For logs in the wood, it is unequaled; we detach the engine from the wagon, and roll the tree on to the wagon, an inch at a time if we choose, and hold it there —a feat that horse power will not perform. All who see it at this work are amazed at the power we possess, and say that it seems to be a thing of life.

"We have thrashed nearly 40,000 bushels of grain with it since harvest, and have found no place that we were unable to reach, no matter what the grade or how deep the mud. Its facility for taking itself and thrasher away makes it a great favorite with the farmers, who have been bored with hitching their horses to a heavy steam engine, and spoiling them with the over load. Our greatest gain is in time, moving from place to place. In five minutes after the last sheaf is through, we are on the road; and we once moved 600 feet and were thrashing again in ten minutes from the time the last sheaf was through at the last place (by a watch held on us by a friend)."

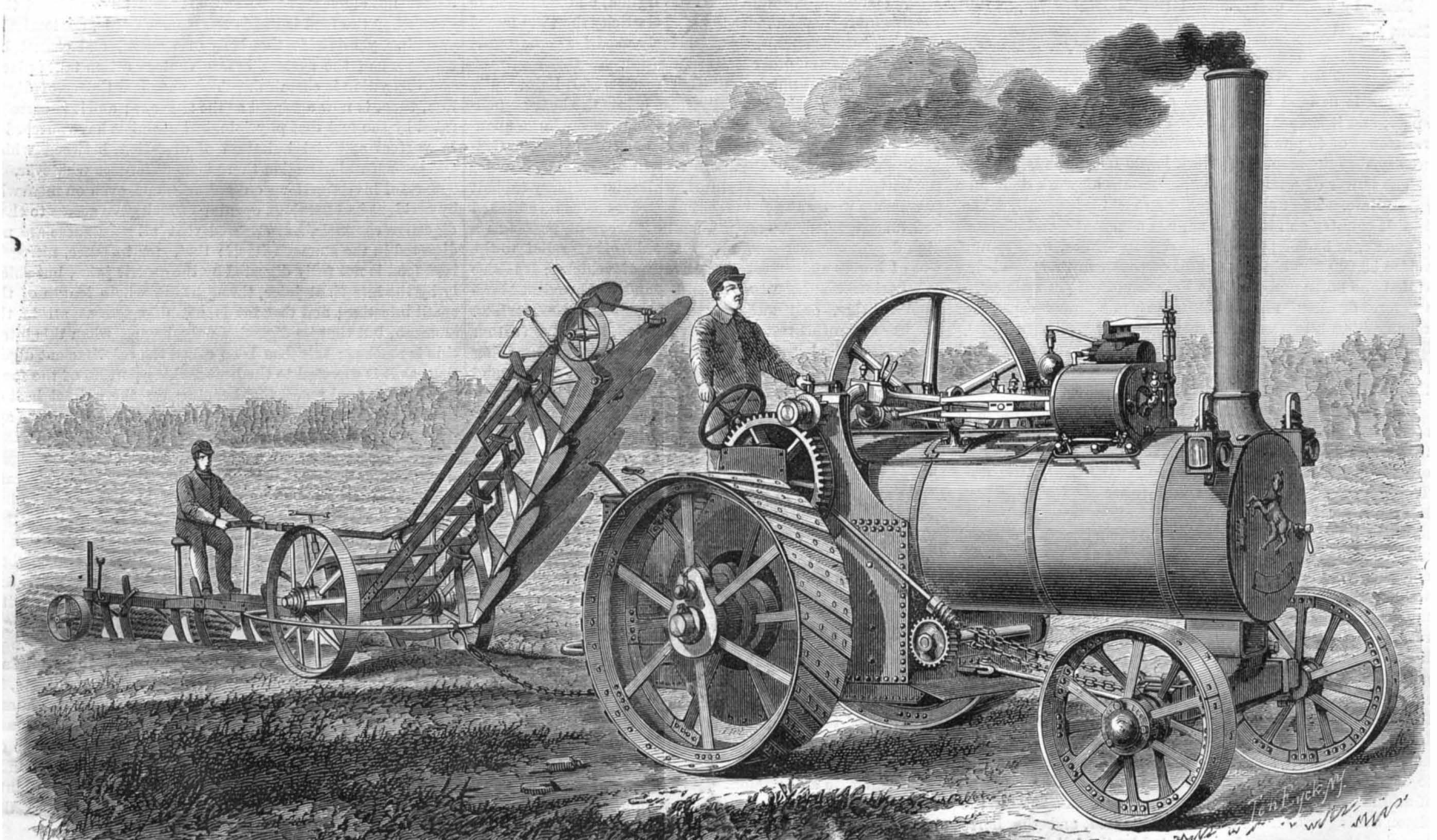
To the tests of these machines, made during the autumn of last year by Professor Thurston, of the Stevens Institute of Technology, we have already alluded in detail. During their progress, with one six horse power engine, the enormous load of 63,400 lbs., made up by a train of ten loaded wagons, was hauled up a long grade of one in nineteen, at the rate of two and a half miles an hour, the wheels showing no signs of slipping.

Messrs. Aveling's engines are often constructed with a steam crane attached to the fore part of the boiler, and at this time two of them are employed at the Vienna Exposition in unloading and removing packages from the trains as they arrive. By simply removing the road wheels and replacing them with ordinary flange wheels, the engine may be converted into a tramway engine.

We are informed that the machine may soon be seen in actual operation, cultivating the land on the Ogden farm, the property of Colonel G. E. Waring, Jr. The agent of Messrs. Aveling & Porter in America is Mr. W. Churchill Oastler, 43 Exchange place, New York city

Iron-Clad Vessels.

The invention of iron plates to protect vessels is far from being of as recent date as is generally supposed. During the 12th century, the Normans covered their ships, from the water line up, with an iron casing, terminating in a ram on the bow. Still earlier they had adopted a system of protecting the upper works with metal shields. In 1534, Peter of Arragon ordered his ships to be iron-plated in order to protect them from the burning missiles then in common use. In 1530, the squadron of André Doria contained a vessel built by the Knights of St. John, which was armored with several thicknesses of iron. At the battle of Lepanto, several ships protected their batteries with bars of iron. For two centuries, no progress seems to have been made. In 1782, at the siege of Gibraltar, an engineer officer constructed six ships, which were the types of the modern iron-clads. They were covered with an armor of hard wood, leather, and bar iron. It is said that they resisted the fire of the forts for a long period, but were finally sunk by red hot shot.



AVELING & PORTER'S ROAD LOCOMOTIVE ADAPTED TO DIRECT TRACTION STEAM PLOWING.

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(Illustrated articles are marked with an asterisk.)

PUBLISHERS' NOTICE.

All new subscriptions, or renewals of old ones, will be commenced with the new volume, July 5, unless a request to commence at some other date accompanies the order.

The volume from January to July, consisting of twenty-six numbers, may be had in sheets, by mail, at the regular subscription price, namely, $1.50, or in substantial binding, at the office of publication, for $3, or by mail, including postage within the States, for $3.75. The first volume of the SCIENTIFIC AMERICAN for 1873, in sheets, and a copy of the SCIENCE RECORD, for either 1872 or 1873, will be mailed on receipt of $3, or a volume of the SCIENCE RECORD for each year and the last or coming six months of the SCIENTIFIC AMERICAN (optional to the subscriber) will be sent for $4.50.

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THE MEASUREMENT OF POWER.

Work is defined to be force or pressure acting through space, and it is usually expressed in foot pounds. Thus if a resistance of 40 pounds is overcome for a distance of 10 feet, we say that the amount of work is 400 foot pounds.

The power of a machine is the amount of work done in a given time. The unit of time for a machine is usually taken, in this country and in England, as one minute, and the unit of work, as 33,000 pounds raised 1 foot high, or 1 pound raised 33,000 feet high—the unit of power in this case being called one horse power. The French unit of power is called the *force de cheval*, and is equivalent to a power capable of raising 4,500 kilogrammes 1 meter high in a minute, or 32,549 pounds 1 foot high in a minute. Hence the French unit of measure for the power of a machine is about $\frac{1}{73}$ less than the English.

The simplest way to test the power of a steam engine is to see how high it will raise a given weight in a minute, and this is readily accomplished by means of the friction brake, often called the Prony brake, from the name of the inventor. The fly wheel of the engine is covered by a strap, which has a lever attached to it, on which weights are hung. By tightening this strap, the friction between it and the wheel may be made to take all the useful power of the engine, the amount being measured by the number of pounds in the weight and the number of revolutions of the engine per minute. Suppose, for instance, that the engine makes 100 revolutions a minute, and maintains the lever of the brake horizontal when it has a weight of 50 pounds attached at a point that would move a distance of 30 feet in each revolution of the engine, if it were free to revolve. Then the useful work of the engine per minute will be $50 \times 30 \times 100 =$ 150,000 foot pounds, which is equal to $150{,}000 \div 33{,}000 = 4{\cdot}5 +$ horse power. The steam engine indicator can also be used to determine the power exerted by the engine. By means of an indicator diagram, the mean pressure exerted on the piston during one stroke can be ascertained, and the horse power of the engine can be calculated by the following formula: Horse power = mean pressure × effective area of piston in inches × twice length of stroke in feet × number of revolutions per minute ÷ 33,000.

The indicated horse power will always be greater than the amount determined by the brake, because by the use of the indicator we obtain the total power exerted by the engine, including that necessary to overcome the friction of the moving parts and other prejudicial resistances. The difference between the indicated and effective horse power varies in different machines from 10 to 50 per cent of the whole power exerted by the engine. By throwing off all the work from the engine and taking a friction diagram, the amount of power required to overcome prejudicial resistances can be approximately determined. It must be evident, however, that the test with the brake is the most accurate, as the friction of the moving parts, which increases with the pressure, is greater when the engine is doing useful work.

In practice, the friction brake must be constructed with efficient means for cooling, as a great amount of heat is developed by the friction between the fly wheel and the strap. The most perfect form of brake is that used by the Royal Agricultural Society of England in their tests of portable engines. This is arranged with compensating levers, which ease or tighten on the friction strap automatically, keeping the lever which carries the weight always horizontal. With this form of brake, all the power exerted by the engine is overcome by friction. Cases frequently occur in which it is desirable to measure the amount of power transmitted by a shaft or pulley, and here the friction brake cannot be employed. Recourse must then be had to transmitting dynamometers, which measure the power exerted by registering on a scale the amount of force necessary to keep the pulley from turning on the shaft, or to keep the shaft from turning in its coupling. In the use of a transmitting dynamometer, the pulley is loosened on the shaft, and is clamped to a portion of the dynamometer that is securely fixed, the connection being made by weights, springs, or levers. In transmitting the power, the pulley will turn on the shaft until the tension of the spring or resistance of the weight is equal to the force necessary to drive the machinery; and the amount of this force being registered on a scale, the calculation for the power is made in the same manner as with the friction brake. None of the transmitting dynamometers, in use at present, are free from objections; and they require frequent testing, and very careful application to make the results reliable. For these reasons, the indicator and friction brake are generally employed, when their use is practicable. In a future article, we may have some remarks to make about the importance, to owners and users of steam power, of frequent and accurate tests.

THE COMING PAVEMENT.

Recently there has been laid down on Fifth avenue, at its intersection with Broadway in this city (24th street), a trial specimen of the new Grahamite asphalt pavement. The example in question covers the street for half a block, and is placed just where it will receive the severest tests, from the wheels of omnibuses, ice carts, and throngs of vehicles of all sorts. If the new pavement can stand the racket here, no other test will be required. So enormous is the travel in this part of the city that the cross-walks, made of thick granite slabs, are soon grooved with ruts, cut by the wheels of heavy vehicles.

The new asphalt pavement is composed of a material termed Grahamite, found in West Virginia, and is alleged to possess more cohesion, tenacity, and elasticity than the famed *Val de Travers* asphalt, so extensively used for paving purposes in Paris and other European cities.

Grahamite does not fuse until it reaches 800° Fah., while the ordinary asphalts generally fuse below the heat of boiling water. The higher fusing point is due to the large quantity of asphaltene which the Grahamite contains. The Grahamite pavement will therefore remain hard and firm under the hottest natural temperatures, while the ordinary asphalt pavements under the same circumstances became softened and disintegrated. The Grahamite pavement possesses a high degree of elasticity, which affords great relief to the feet of horses and prevents the wear of vehicles; it is also so tenacious and hard that it will stand the heaviest blows from a sledge, only suffering compression at the surface. We have seen this test repeatedly applied, and have further noticed that the heaviest vehicles roll over it without making the slightest impression. It presents an even surface and forms, in every outward respect, a most admirable pavement. If the example now under trial shall prove, on the lapse of time, to be as really good as it now is, we have no doubt that our citizens will be glad to give it a general introduction. Wood pavements are a failure, and granite blocks are dreadful to travel upon. It may be that Grahamite is the coming pavement.

The pavement question deeply concerns every city and town in the land; and if anybody wants a subject to study upon, with a view to devising improvements, here is a grand one.

LETTERS FROM COMMISSIONER THURSTON.

Among the select number of scientific experts appointed by the President to examine and report upon the different departments of the Great Exposition was Professor R. H. Thurston, of the Stevens Institute of Technology, Hoboken, N. J. On the eve of his departure, we requested him, if time permitted, to favor the readers of the SCIENTIFIC AMERICAN with an occasional letter, giving an outline view of the most interesting matters that might come under his observation, and he kindly consented to do so.

We have the pleasure of presenting in another column the first of Professor Thurston's communications, which contains a variety of interesting matter, including an account of preceding expositions, indicating also some of the points to which his attention will be specially directed during the present World's Fair at Vienna.

In all that relates to practical science, especially the mechanical branches, Professor Thurston is eminently qualified as a judge and observer. He will enjoy the best opportunities for obtaining information, and his letters will have a peculiar value.

THE DIGESTIVE APPARATUS.

In a former article, we described the digestive channel from the mouth to the stomach. We will now trace the metamorphosis of the food into living tissue, which takes place after the food has reached its proper receptacle, the stomach.

The main agent in this process is the gastric juice, of which a healthy human stomach secretes not less than about 70 ounces (4$\frac{3}{8}$ pints) every day. As the muscles are those portions of the body most subject to waste, every motion of a limb requiring a consumption of fibrin, a large portion of gastric juice is consumed in making fibrin for muscular repair; it has been ascertained that, in average muscular action, the consumption of fibrin is about 60 grains per day, requiring nearly 60 ounces of gastric juice for the formation of new substance to replace it. The food, after reaching the stomach, forms a kind of pulpy mass, subject to an intermittent slow rotation by the alternate contraction of the fibers of the exterior muscular coat; in this, the respiratory movements assist greatly. If the contents contain too much liquid, a large portion of this is directly absorbed, by endosmose of the coats of the stomach, and enters the circulation at once, so that the mass remaining may have the consistency proper for the performance of this rotatory motion. The exterior portions of this pulpy mass, which have undergone complete treatment by passage and friction along the interior coat of the stomach, ooze out into the intestines through a valve (called the *pyloric*) in a semi-fluid state, apparently homogeneous, called *chyme*. Its formation requires from one to four hours, while the muscular movement of the intestine propels it forward to the duodenum, where it is mixed with the pancreatic juice secreted by the pancreas, the enteric juice secreted by Brunner's glands, and the bile secreted by the liver.

Several erroneous theories formerly prevailed in regard to the digestive power of the stomach. One was that digestion was simply a mechanical operation, and that the food was ground up fine; but this was disproved by inclosing meat in small hollow silver balls, full of holes, attaching them to a string, and causing them to be swallowed by a dog; when, after a few hours, they were withdrawn, the meat was found fully digested, which could not be due to any grinding power, as it was fully protected against this. The other theory was that digestion was due to nervous agency, because it was much interfered with when the pneumogastric nerve was divided; but then it was proved that this simply paralyzed the motion of the stomach, and prevented the rotation and expulsion of the food, while the secretion of gastric juice and its action on the food was in no way interfered with. A third theory was that the food was vitalized in the stomach; that is, by means of some mysterious change, it was made to share in the vitality of that organ; but such a theory is highly unscientific, and nothing more or less than an attempt to explain the mystery by a word of obscure meaning, while it does not elucidate anything. It must be considered that even when the food is inside the stomach it is, anatomically speaking, yet outside the body or system, and cannot become part of the system before contact action takes place; and this action is chemical. The chemical theory of digestion, then, is now accepted as the true one; and it is corroborated by the fact that physiological chemists have succeeded in perfect artificial imitation of digestion, between which and the natural digestion there is no difference whatever.

Careful investigations on animals, and even on men who by accident had fistulous openings which gave access to their digestive channels, have proved that all substances are not digested in the stomach itself: that, for instance, nitrogenized food is not fully digested by the gastric juice, but chiefly by the intestinal juice, through the whole length of the small intestine; and that fat is not digested at all in the stomach, but that its digestion only begins when this intestine is reached; this has been called the calorifacient digestion, as it is directed to the heat-making portion of the food, and has for final result the keeping up the animal heat of the body. The length of this portion of the digestive apparatus is about 20 feet, and its surface some 3,500 square inches, being much greater than those portions of the digestive channel devoted to nutrition. The latest view in regard to the calorifacient digestion is that of M. Bernard, who has published experimental evidence proving that the digestion of fats consists simply in bringing them into the condition of an emulsion, by means of the pancreatic juice; and so they enter into the circulation of the blood and, while there, are in a continuous state of slow combustion, combining with the free oxygen which the blood has absorbed in the lungs, and is always carrying through the system.

The emulsion of the fats with the pancreatic juice, mixing with the chyme from the stomach and other ingredients, is absorbed by the ends of the lacteals, called *villi*, which are delicate tubes with which the interior of the intestines are lined, and which convey the metamorphosed substances of the food, now called *chyle*, through the mesenteric glands into the lacteal tube, which discharges the chyle upward into the veins just before they discharge their blood into the lungs.

The functions of the lacteals and *villi*, which are of such minuteness that in every square inch there are some 10,000 of them, are coincident with the operation of the lymphatics. We have here two separate systems, the lacteal and lymphatic, which ramify from the intestines all over the body, and of which the anatomical and physiological actions and relations are at present an important subject of investigation for modern biologists, and not yet fully understood.

It is evident from the preceding that the blood vessels, which have received the material from the digestive apparatus, contain two distinct liquids, the original venous blood and the chyle; this mixture makes its way through the portal vein to the liver, which is a double structure, of which one function is to cause this mixture to undergo an enormous change, consisting in the formation of young blood cells, and the other is the economizing of the mineral ingredients of the disintegrated blood cells, which are also eliminated by the liver and of which iron is the principal ingredient.

The above outline may serve to give the general reader an idea of the highly elaborate complexity of the diverse operations belonging to the mysterious process by which foreign organisms are changed into the living tissues of our bodies, which tissues, by interstitional repair, take the place of the old ones; they do this so thoroughly that we may safely assert that, in the course of only a few years, not a single material atom is left of those of which the body originally was made up. In order to comprehend the truth of this, we have only to consider that the average amount of solid food required for each human being is 800 lbs. per year, of drink 1,500 lbs. and of oxygen, consumed from the air, 800 lbs., a total of 3,100 lbs., surpassing the weight of the body more than 20 times. The most wonderful fact to contemplate is that, with all this continual change of the material of which our bodies consist, we do not lose our identity.

MORDANTS FOR ANILINE COLORS.

While aniline dyes are remarkable for the ease with which they attach themselves to animal fiber, whether silk or wool, they are difficult to fix upon cottons and vegetable fiber in general. For this purpose albumen, the bichromates and other mordants have been used or recommended. The number of such mordants is not a small one; but the important question at present is which can be employed to the greatest advantage, and which will produce the most beautiful and cheapest colors. This cannot be answered by a series of experiments conducted on a small scale, but only by operating upon large quantities and in a practical workshop. The dyer in fine colors will not usually have an opportunity to decide which is the most suitable mordant for cottons. In this question, the value of the bath after the operation and its capability of being turned to account must be considered, and in all calculations, its value must be deducted from the total cost of the materials employed.

To discuss at this time all the different methods employed in fixing aniline colors would lead us too far; almost all have been superseded by the methods in which tannin is employed. This is especially adapted to fuchsin and iodine green. Both of these dyes produce, with tannin, brilliant colored compounds which are totally insoluble, so that tannin most completely fulfils the ends required of a mordant. Tannin is, however, quite expensive, and hence we must seek some substitute which either renders the use of tannin entirely unnecessary or at least makes a saving in its use. The substances previously suggested, such as oleic acid or stearic acid, do not sufficiently fulfil the requirements, and it seems probable that a substitute for tannin, which shall entirely replace it, will be difficult to find. A long series of experiments on a large scale have lead to the conviction that tannin, either pure or in sumach, is, in the mean time, still indispensable.

A German, named Austerlitz, has recently observed that a considerable saving of tannin can be effected by combining it with glue before using it, so as to employ both glue and tannin smultaneously as mordant. Under these circumstances, much less tannin is required to produce a given shade with fuchsin, iodine green or any other aniline color; in fact, the same results may be obtained with half the quantity of tannin required when no glue is used. Austerlitz says: "I have established this by a series of experiments on a small scale using weighed quantities of tannin with varying quantities of glue. A piece of cotton goods was first mordanted in a bath of tannic acid, and then cut in two, one half being drawn through a weak solution of glue or gelatin, the other immersed directly in a dye bath of known concentration at a given temperature. The half which had been through the glue bath was then dyed in a bath of precisely the same sort, and the two samples compared. The cotton on which glue had been employed was far more thoroughly dyed and of a deeper shade. It was also proved that the tannic acid bath might be much weaker, if followed by a glue bath, than when used alone. The amount of tannin saved in this way is not small.

By gradually diluting one of the tannin solutions and continuing the series of parallel experiments with tannin and glue and with tannin alone, a point is finally reached where both methods produce the same shade. When this point is arrived at, a comparison of the concentration of the two tannin baths will show how much is saved. This quantity, of course, depends greatly upon the quality of the tannin, so that my experiments have not given a result which can be expressed in figures. Samples from different sources gave different results, so that in some cases more was saved by the glue bath, in others, less."

The cause of these phenomena have not yet been ascertained but it is probable that a compound of tannin and glue is formed, which has an action upon aniline different from that of tannin alone.

FISH CULTURE BY FARMERS.

Why should not farmers and others raise fish for the market and for their domestic uses, as well as cattle, fowls or any other living stock? For so staple and healthy an article of food, it seems as absurd to be dependent upon chance capture in a wild state as it would be to rely for our poultry upon the fortune of the hunter or for our vegetable supply upon the finding of suitable esculents in localities in which a knowledge of botany may tell us they ought to grow. The efforts of the fish commissioners in this and other parts of the country, in stocking the waters with the spawn of valuable species of fish, will undoubtedly largely increase the numbers of the finny denizens of our rivers and streams; but the labor of securing an abundant and readily obtainable supply is thus only begun, and it seems to us that it may be continued by every dweller in the rural districts having the simple facilities requisite for the construction and maintenance of suitable fish receptacles.

Artificial incubation and the stocking of private ponds are of course no novel idea. History tells us of the vast sums expended for such purposes during the decline of the Roman empire; and pisciculture, especially in the monasteries, seems to have flourished through the middle ages. The success which has attended all modern efforts in a similar direction, even in the propagation of the trout and other delicate species, leaves little doubt but that, at a very moderate outlay of time and money, every farmer could provide himself with a well stocked pond, which he would find a constant source of valuable remuneration.

Dr. J. H. Slack, the New Jersey Commissioner of Fisheries, writes to the *Tribune* a letter containing many useful hints relating to this subject. Referring to the preparation of the ponds, he says that two points must not be overlooked: proper proportions of the banks and freedom from surface water. For the former, with ordinary loam, the following proportions will be found correct: Let the base of the tank equal three times its hight, and let the width of the top equal the hight. Thus, if the tank be 10 feet high the base should be 30 feet and the width at the top 10 feet. The sluices and overflow should be made of stone laid in cement. Wood, it is stated, will rot very rapidly and prove of no value. The services of a competent engineer may be employed to advantage, and the money expended for such supervision will save much trouble and vexation. Surface water is a fertile source of trouble, as it carries with it brush and leaves, which clog the screens, allowing the contents to overflow and permitting the escape of the fishes. In most cases, a series of ditches, entirely surrounding the ponds, will carry off the surface water, a gate being placed at the head of the ponds with an opening only allowing as much water to enter as can be readily conducted away. At the sluice gates screens of wire gauze must be placed to prevent the egress of the fish. These should be made of galvanized wire if of large mesh, and of copper if fine. A screen of coarser mesh, placed a few inches up stream from the fish screen, will arrest much of the floating trash and prevent clogging. This second screen, called the leaf screen, should be placed at an angle of about 60° that a greater surface may be exposed to the water.

As regards stocking the tanks, it can hardly be expected that every farmer can enter into the careful operations of trout culture, but there are plenty of other varieties of fish suitable for food which may be easily and profitably reared. The ordinary cat fish (*pimelodus*) will thrive and breed in almost stagnant water, and is hardy and enduring. The female takes care of her young, which, for some weeks after they are hatched, follow her about as chickens do a hen. For large ponds, through which a gentle current can be made to flow, the best fish for the south is the southern bass (*grystes salmoides.*) It has a variety of names and is known also as the yellow and black bass, trout, chub, and growler. The adult fish is of a greenish brown color with a bluish black spot upon the gill, the young having in place of the spot from two to four longitudinal bars; the back fin is spinous and high, and the tail is similar to that of the trout. Besides the above two varieties mentioned as examples, there are scores equally valuable as food, some indigenous to northern, others to southern waters, which will probably suggest themselves to our readers interested in the subject.

The temperature of the water in the tank is an important matter, as fishes respire not water but air mingled with water. At the temperature of 50°, six cubic inches of air are contained in each gallon of aerated water, while at 212° none is present. With a supply of 1,000 gallons per minute at a temperature of 50°, fish could be maintained in a tank of about 8,000 cubic feet sufficient for a small village.

If the pond be well supplied with aquatic insects and plants, the fishes will need no food; but generally overstocking is the case and hence a certain quantity is required. Any kind of animal food, cooked or uncooked, is suitable; the entrails of fowls, lights of beef, oxen and hogs, if thrown in in small pieces, will be eaten with avidity. Curd or "smear kase" should only be given with animal food, being apt to cause disease. For the small fry of trout, the larvæ of the common mosquito are stated to form excellent nutriment, a better utilization, by the way, of that tormenting insect than the Yankee project of capturing them in large quantities and using their bodies as manure. It is estimated that about two barrels of rain water will be required for each thousand fry, the insects being strained out from time to time as fast as they are developed, and thrown into the trout pond.

A SHOWER of frogs, which darkened the air and covered the ground for a long distance, is the reported result of a recent rain storm at Kansas city, Mo.

THE RECENT ARCTIC EXPEDITION.

Secretary Robeson's report of the official investigation regarding the Polaris expedition, based upon the testimony of the survivors rescued from the ice floe, has at length been given to the public. As far as the record of the voyage extends, the account is substantially the same as that already published in detail in our columns. Considerable information, however, has been elicited regarding incidental topics and that bearing upon the mysterious portion of the recital, notably the death of Captain Hall; while that relating to the separation of ship and crew is of especial importance and interest.

The circumstances attending the decease of the commander are fully detailed, and as far as possible the statements of the witnesses reconciled and carefully compared. From all the testimony, the examining officials are inclined to reject the poisoning theory, so eagerly grasped by sensational journals, and arrive at the unanimous opinion that the death was due to natural causes. This view is qualified by the statement that none of the survivors are capable of giving an accurate account of Captain Hall's symptoms, nor of his last illness, and consequently the true state of the case must remain indefinite until the return of the Polaris. There seems little doubt but that the breaking adrift of the ship was purely the result of accident. The vessel was suddenly beset by a tremendous pressure of ice, which was driven against her from the southward, throwing her on her beam ends. To ease her, the provisions, stores, etc., were being removed when, during the darkness of the night and in a fierce gale, she parted her hawsers and disappeared. The sighting of the Polaris on the next day and her non-response to the signals of the abandoned crew, even when, from the distance intervening, they must have been clearly seen, are carefully considered. It is believed that, from a dispassionate point of view, the apparent indifference of those aboard must be ascribed to both inability and caution. The vessel had been so roughly handled the night before that both captain and crew might readily believe she would be lost; hence the removal of articles to the floe was attempted. Then when she broke adrift, her steam pipes, valves and connection were solid; and she was for hours without steam, unmanageable amid the floating ice. Moreover she was leaking badly and totally destitute of boats, so that it appears to have been the duty of the commander, Buddington, to get her in a place of safety, such as was the shelter of Northumberland Island, as speedily as possible. Furthermore, he knew that the ice party had boats and consequently could have believed their safety assured; and at all events, whatever his doubts might have been, a severe gale decided the question, driving the ice floe out of sight of ship and land. From this array of considerations, the final judgment is reached that the entire circumstances of the separation were accidental and unavoidable.

The Polaris, it is stated, had a broken stem and was leaky. She had plenty of provisions but not much coal, and probably remained in winter quarters at Northumberland Island. There is a difference of opinion as to whether she will be able to reach Upernavik or Disco under sail if she gets free this season, and it is believed that she will need assistance to escape from the ice.

The scientific results of the expedition are better than first imagined. The records of the astronomical, meteorological, magnetical, tidal and other departments are extremely full, and extensive collections of objects of natural history have been made. Specimens of drift wood were picked up near the shores of Newman's Bay, in which walnut, ash, and pine were recognized. The dip of the needle amounted to 45° and its duration to 96°, being less than at Port Foulke and Rensselaer Harbor, as given by Drs. Kane and Hayes. Auroras were frequent but not brilliant, consisting sometimes of one arch and sometimes of several. Streamers were quite rare and shooting stars almost constantly visible. The average of the rise and fall of the tide was about $5\frac{1}{2}$ feet, and the greatest depth of water noted 100 fathoms. The existence of a constant current southward was also noted, its rapidity varying with the season and locality. The winter temperature was found much milder than was anticipated, the minimum being 58° below zero in January, though March proved to be the coldest month.

The open polar sea of Kane and Hayes was found to be a sound of considerable extent, and, it is believed, communicates with Francis Joseph Sound, and thus defines the northern limit of Greenland. Its length was not ascertained.

Pursuant to the recommendations of the investigating committee, the Secretary of the Navy has completed the purchase of the sealing steamer Tigress, the vessel which rescued the party on the ice field, and has ordered her prompt fitting out for a voyage in search of the Polaris. The Tigress is constructed especially for encountering the heavy ice of the arctic regions, and will be equipped in the most thorough manner so as to be ready for sea by the early part of July. She will be commanded by Commander James A. Greer, a well known officer of the navy. The Juniata, another naval vessel, has been got in readiness with the greatest rapidity and has sailed for Disco to carry supplies of coal and provisions for the Tigress, and also to seek information regarding the Polaris. The ship was fitted out at the navy yard in Brooklyn, and is heavily sheathed with iron. It is expected that she will return during the autumn, bringing the latest news and leaving the Tigress to penetrate to Northumberland Island.

"THE PIG IRONISTS IN COUNCIL" is the heading of a report, in the New York *Herald*, of the proceedings of a convention of gentlemen engaged in the iron trade, lately assembled at Cleveland, O. Rather a scaly sort of irony, that.

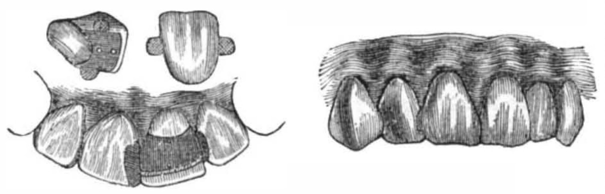
[Dental Cosmos.]

A Device in Dentistry.

The insertion of a porcelain tooth without a plate or clasps, and where no root remains, and where the remaining teeth are firm in their sockets, may be considered permanent when inserted as here illustrated. About two years ago an operation somewhat of this character was described in the *Dental Cosmos* by Dr. B. J. Bing, then practicing in Paris, now in London.

A patient who disliked the wearing of a plate, and desired something different, presented, when the operation now to be described was decided upon and performed. After forming appropriate cavities in the proximate surfaces of the teeth next the space left from the loss of the natural tooth, an impression was taken and a plain porcelain tooth selected, fitted to the parts and backed with gold, a portion of the backing extending from each side about one and a half lines, for insertion into the cavities prepared for them in the adjoining teeth. A small gold plate was then formed to fit upon the gum, covering as much of it as would embrace the neck of the natural tooth were it in position. The backing when riveted to the porcelain was then adapted to the position in which it was to be placed; and while the whole rested on the small plate upon the gum, the backing and plate were so secured by a cement that they could be removed intact, and, after the usual preparation, soldered. The surface of the extended sides of the backing was roughened, so that the gold would better secure them when filled into every part.

This being done, a thin piece of rubber coffer dam was placed on the adjoining teeth and over the gum upon which the porcelain, with the gold attachments, was to rest. The rubber occupies but little space, and, when ligated to the teeth adjoining, so presses up the gum that its thickness is more than compensated for. The porcelain, with its attachments, was then placed in position, and secured firmly by the solid impactation of small pieces of light cohesive gold foil around that portion of the plate extending into the cavities.



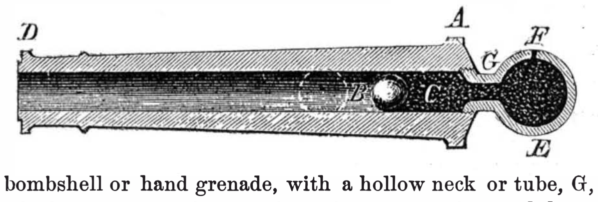
The parts when in position appear as here illustrated, the gold backing and fillings showing plainly on the palatine surface, while on the labial no gold is exposed to view, excepting a small portion of the filling in the lateral incisor. The porcelain and gold attachments as prepared for insertion are also shown. It will be seen that the cavity in the central incisor was formed to the cutting edge of the tooth. This was done to gain access to both sides of the plate extended into the cavity, which could not otherwise be done unless a portion of the labial surface were cut away, which would have been objectionable in consequence of the exposure of gold. In the lateral incisor this was deemed necessary, because, being smaller than the other, it was thought best not to cut it away in the same manner. It was so arranged, however, that though the filling can be seen, it is not conspicuous.

A Curiosity of Old Times.

In the *Mechanic's Magazine* of January, 1824, we find the following curious communication:

PROPOSAL FOR INCREASING THE STRENGTH OF GUNPOWDER.

A D is a longitudinal section of a great gun; C, the cartridge; B, the ball; E, a hollow metal sphere, similar to a



bombshell or hand grenade, with a hollow neck or tube, G, which screws into the breech of the gun: F, the touch hole.

The design is that the ignited powder in the shell shall throw a quantity of flame suddenly into the gun, and explode every grain of the cartridge powder. It is not, however, meant that preventing any of the powder from being blown out unignited is to give the additional force; on the contrary, it is certain that the expansive power of explosive mixtures is as the quantity of flame suddenly formed by them, particularly in confined situations, where the flame is supplied with matter from the combustible substance itself only. In proof of this, let flame be communicated to the powder of a charged gun, by firing a pistol containing powder only into its touch hole, and the result will be found to be, that the momentum of the ball from the gun will be much greater than if the same quantity of powder as that fired from the pistol had been added to the cartridge in the gun, and the whole exploded in the customary manner. This I ascertained by experiment nearly ten years since. The thing is now put beyond all manner of doubt, from the discharge of guns being effected by detonating copper caps. Sportsmen, using the same, declare that a less quantity of powder produces an equal effect to a greater quantity without these caps. It may be necessary to add, that trials are indispensable to ascertain the maximum of the size of the shell, E, and of the quantity of powder it should contain to be safe and most efficient.

Query.—Might not the guns of forts be constructed so as to slide backwards and forwards on *fixed* but *centered* carriages, by which much fatigue would be avoided by the men?

Chatham. J. H. PASLEY.

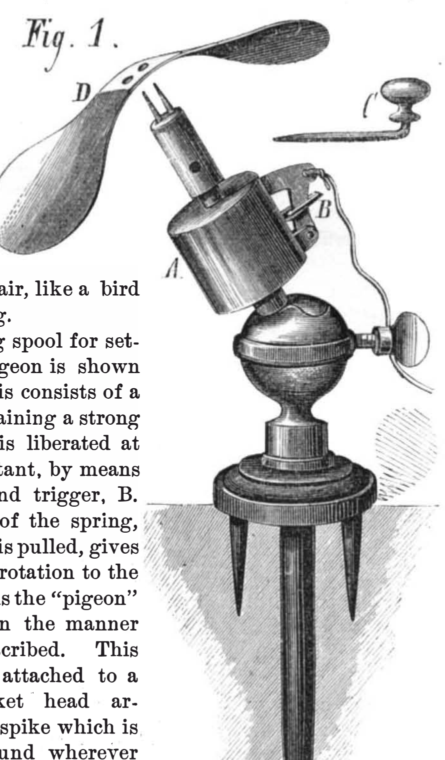
THE MECHANICAL PIGEON.

To attain dexterity in the shooting of birds upon the wing, it has been the practice of sportsmen to make use of live pigeons, which are placed in suitable cages, from which, by a string, they are liberated at the desired moment, to be needlessly shot down by the gunner. The great cruelty of this sport has led to the invention of what is termed the mechanical pigeon, the construction and operation of which is illustrated in the accompanying engravings.

The mechanical pigeon consists of a thin strip of sheet iron, six inches or more in length, having wings bent somewhat like the blades of a screw propeller, as shown at D, Fig. 1. When rapid rotation is given to this propeller, it rises high in the air, the wings are seen to flicker or vibrate, and its whole appearance resembles a flying bird.

To effect the aërial flight of the mechanical pigeon, two methods are employed. One of these, shown in Fig. 2, consists of a spool, A, mounted on a handle, thei spool being turned with great rapidity by the application of force to the cord, as shown. Upon the forks of the spool the pigeon is centered, and, when a proper rotating velocity is communicated, away it sails into the air, like a bird upon the wing.

Fig. 1.

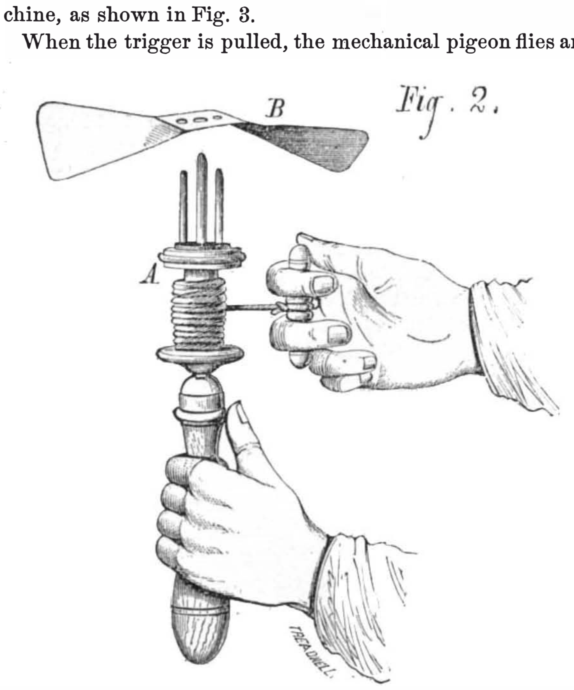


A self-acting spool for setting off the pigeon is shown in Fig. 1. This consists of a barrel, A, containing a strong spring, which is liberated at the proper instant, by means of the cord and trigger, B.

The power of the spring, when the cord is pulled, gives instantaneous rotation to the forks, and sends the "pigeon" into the air, in the manner previously described. This spring spool is attached to a ball and socket head arranged upon a spike which is set in the ground wherever desired. The cord leads to the position occupied by the sportsmen, which may be at some distance from the machine, as shown in Fig. 3.

When the trigger is pulled, the mechanical pigeon flies and

Fig. 2.



the sportsman fires, thus enjoying the best of gunnery practice without cruelty to innocent birds. If a shot strikes the mechanical pigeon, its direction is changed, and it falls to the ground. This contrivance has become an extensive article of sporting merchandize.—*Science Record for* 1873.

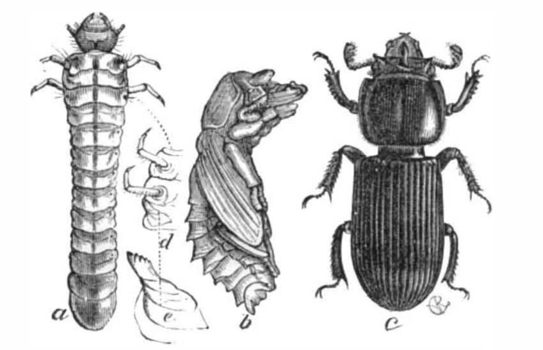
[From the Fourth Annual Report of Charles V. Riley, State Entomologist of Missouri.]

THE COMMON BEETLE.

Many an one will doubtless recognize, in the insect illustrated herewith, the bug with which he or she, as a child, was wont to play at "oxen," the curved horn on the head forming such an inviting projection on which to hitch, by means of a thread, small chips and other diminutive objects, to be dragged by the rather awkward beast of burden. Every pioneer in this Western country, as he rolled over huge decayed logs, in the work of clearing his land to make it ready for the plow, must have become familiar with this highly polished coal-black beetle. Every woodsman who has split or grubbed an old stump will be likely to recognize in this horned bug an old acquaintance. Every entomologist who has dug into or pulled to pieces old rotting stumps, in search for other treasures, must time and again have seen this lazy, clumsy *passalus* tumbling down with the loose and crumbling dust and excreta of its own making, and expressing its disapproval of such summary disturbance, in the plainest manner, by emitting a peculiar half hissing, half creaking noise. And though met with at almost every step in his forest rambles,

Where wild birds sing beneath the leafy bowers,

the inquisitive student has no doubt found himself repeatedly examining specimens, not only to admire the elegance and beauty of form, but to ascertain the means by which the peculiar noise is produced. A sufficiently careful examination



The Horned Passalus—*Passalus cornutus*, Fabr. (Coleoptera, Lucanidæ.)

will end in the knowledge that it is caused by the rubbing of the rather horny terminal joints of the abdomen, known as the *pygidium*, against the inside of the hard wing covers.

This insect cannot be considered injurious in any sense of the word, and might with propriety be introduced in the section of "Beneficial Insects." It is never found in sound or green wood, but invariably in that which is decaying, and it very materially assists and hastens the reduction of stumps which might otherwise remain treble the length of time, to occupy valuable ground and serve as an eye sore to the careful farmer in wooded countries. Unseen and unheard it carries on incessantly the good work of converting useless timber into mold which enriches the soil; and this has been its office in all the past ages of its existence. A decaying, moist condition of the wood is necessary to its development, and it will be found most common on low moist ground, and in oak, hickory, and sweet gum logs or stumps.

Common as is this beetle, its larva and pupa are rarely seen, and seem to be unknown even to most entomologists, while no good figures of them have been published.

The larva, *a*, is of a very exceptional character, being the only one in this country which possesses but four well developed legs, for though many butterflies in the imago state have the front pair functionally impotent, no other insect than our *passalus* exhibits a similar feature in the larva state. Indeed the only other larvæ in the whole class of insects which are similarly characterized are those belonging to the same genus in other parts of the world. The third pair of legs really exists, however, in a rudimentary state, as shown at *d*. This larva is of a bluish white color with the anterior joints broader and flatter than the rest. It transforms in the fall of the year, within the wood it inhabits, to a whitish pupa, *b*, in which the front pair of legs is thrown forward under the head, and the horns of the future beetle show plainly on its top. The pupa lasts but about a fortnight, when, throwing off the pupa garb, it becomes a perfect beetle. At first the parts are all beautifully white and delicate; then the head, thorax, and limbs gradually become amber brown, and lastly the wing covers assume this color. The whole body then deepens very gradually so that many days elapse before the coal black color is acquired; and in the month of August the beetle is as often found brown as black. As larvæ only half grown are found in company with those that are full grown, they require at least two years to mature.

Progress of Plated Ware Manufactures

By many the plated goods are preferred, not only on account of the difference in cost, but because the design and appearance of the goods are nearly identical with the solid ware. The Meriden Britannia Company confine their attention mainly to the manufacture of nickel silver and white metal silver plated goods. The company was established in 1852, at West Meriden, Conn., where they now occupy five acres of ground, and have eight factories, the largest of which is seven hundred feet long, presenting an imposing appearance. The capital invested is more than $2,00,000 and the capacity of the works about $4,000,000 yearly. The company employ 700 men.

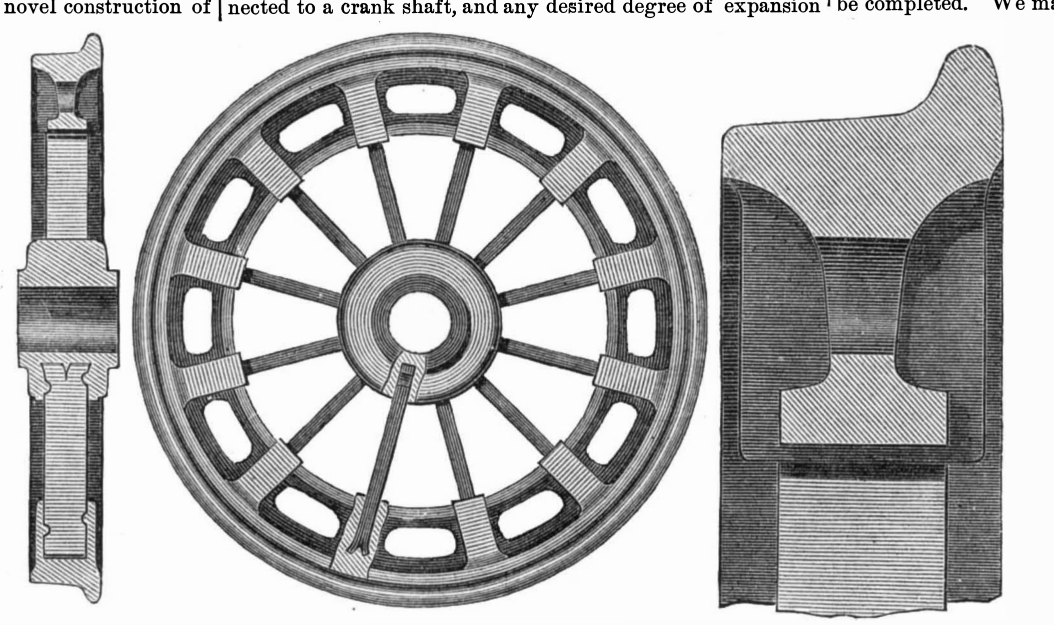
NOTES FROM THE VIENNA EXPOSITION.

LEATHER MANUFACTURES.

The display of leather and leather goods at the exposition is very large, and many countries are represented. Turkey has a fine representation of leather articles in great variety, also Austria, France, and the German states. The American display is small; but the exhibition of hand and machine sewed boots and shoes, from Lynn, Mass., is declared to be the best of anything of the kind in the exposition.

LUDWIG'S RAILWAY WHEELS.

We illustrate, herewith, a somewhat novel construction of chilled cast iron railway wheels with wrought iron spokes, of which a pair are exhibited at Vienna from C. I. Bergmann's foundery and iron works, of Graz, Styria. These wheels, which have been designed and patented by Mr. Ludwig, the manager of the above works, are intended as substitutes for the chilled cast iron disk wheels in use to some extent on Austrian and German railways, and their construction will be readily understood from our engravings. The rim is cast in a chill, and from its form it can, without risk, be cast of harder iron than is usually employed. The rim and boss are connected by wrought iron spokes, as shown, and the wheel is stated to be capable of being broken only with great difficulty. One hundred and sixty pairs of these wheels have already been running about a year on the Graz-Koflacher railway, and they are stated to have given good results. We are indebted to *Engineering* for the illustration.



LUDWIG'S RAILWAY WHEELS.

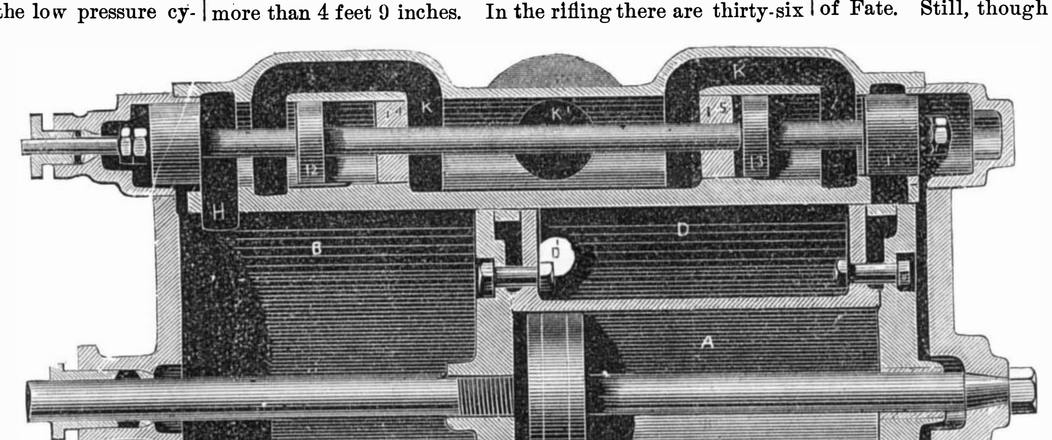
NEW COMPOUND ENGINE.

Messrs. Edward Field and F. M. Cotton, of Chandos Chambers, Adelphi, London, England, exhibit a model of a direct expansion compound engine, of which we give an illustration from *Engineering*. The arrangement consists essentially of a high pressure cylinder placed within the low pressure cylinder, and moving backwards and forwards upon a fixed piston; the annular space around this high pressure cylinder is always filled with steam direct from the boiler, which passes into the cylinder through the ports on the lower side, the admission being regulated by the piston valves shown in the engraving. By means of these valves, also, the steam from the smaller cylinder enters the low pressure cylinder, while at the end of each stroke a small quantity of steam passes from the annular reservoir into the low pressure cylinder, to serve as a cushion and to move the valves. Piston valves, on the top of the low pressure cylinder, regulate the communication between it and the exhaust.

In the section, A is the high pressure cylinder, the flange and covers of which serve as a piston to the low pressure cylinder, B; the fixed piston is shown at C′, and D is the annular high pressure steam chamber or reservoir in direct communication with the boiler by the pipe, D′, surrounding the cylinder, A, and moving with it. The piston valves belonging to this cylinder are shown at E E′, and are connected by a spindle, I^4 I^5. They work in cylindrical passages bored out of the lugs, N N′, and cushions, M, are introduced as shown to receive the blow from the valves at the end of each stroke. The valves for opening and closing the exhaust of the low pressure cylinder are shown at I I′: they are also connected by a spindle, and cushions similar to those just mentioned are provided at I^4 I^5, for the cushioned valves, I^2 I^3, to strike against. The exhaust opening is shown at K′. At each end of the low pressure cylinder is formed a small groove, L and L′, which admits steam from the annular chamber into the low pressure cylinder at the end of each stroke, for the purpose of throwing over the valves, E E′, and of forming a cushion for the moving high pressure cylinder. Small spindles, I, M and M′, are provided, the former at the end of the exhaust valve chest, and the latter at each end of the low pressure cylinder, in a line with the center of the valves, E E′, in order to move the latter if necessary.

Taking the position of the high pressure cylinder at the end of its stroke, as shown in the section, it will be seen that the valves, E E′, are thrown forward, so that steam from the annular chamber is admitted through the port, F, to the forward side of the fixed piston, C; at the same time the motion of the valve, E′, has opened the exhaust port of the cylinder, A, the steam from which passes into the low pressure cylinder. But before this takes place it is necessary to move the valves, E E′, which is effected as follows: The cylinder, A, in coming to the end of its stroke, passes over the small grooves, L, before mentioned, and admits steam from the annular chamber, D, which, passing into the small space in the low pressure cylinder, behind the end of the high pressure cylinder, acts at once upon the back of the valve, I′, which it throws over, opening the communication between the low pressure cylinder and the exhaust, and also upon the valves, E E′, which are moved into the position shown in the section, Fig. 1. The steam from the chamber then passing into the cylinder, A, and that from the same cylinder being exhausted into B, both act simultaneously in the same direction.

The arrangement just described and illustrated is adapted especially for working pumps direct, and steam is admitted into the high pressure cylinder during the whole of its stroke. By a modification, however, the engine may be connected to a crank shaft, and any desired degree of expansion obtained. The proportion between the cylinders is five to one.



FIELD & COTTON'S COMPOUND STEAM ENGINE.

THE GREAT RUSSIAN NAVAL GUN.

In the matter of great guns and other ordnance, it seems to be admitted that the Russians take the palm at Vienna. The great Russian naval gun is one of the largest breechloaders ever made. It weighs forty tuns, and cost sixty-seven thousand dollars. It is made entirely of cast steel. The bore is 12 inches, and the core is composed of a solid tube, 29 inches in diameter at breech, tapering towards the muzzle, the tube being reinforced by steel rings shrunk upon it and upon each other, four layers of rings being used; the entire diameter of the gun at the powder chamber being a little more than 4 feet 9 inches. In the rifling there are thirty-six grooves. The charge of powder is 113 lbs., the expected initial velocity of projectile 1,398 feet per second. The gun has not yet been fired. It is designed for service on the war ship Peter the Great.

IT is proposed to turn our Alaska possessions to account as penal settlements

Interesting Electrical Experiments.

At a recent soirée of the Royal Society, Mr. Willoughby Smith's discovery of the effect of light upon the resistance of selenium was illustrated experimentally by Mr. Latimer Clark. A piece of selenium was inclosed in a test tube connected at each end to platinum wires, and the tube was placed in a box with a sliding cover so as to admit any desired quantity of light. The resistance was balanced on a Wheatstone bridge, and with the aid of a Thomson galvanometer; the movement of the spot of light of course would follow any variation in the resistance of the selenium. With the box closed, the resistance of the selenium remained constant; but immediately the box was opened, the light index upon the scale began to move.

Another very interesting experiment was shown by Mr. Tisley, to prove the effect of magnetism upon ordinary electrolytic action. Water being decomposed in the ordinary manner, the gases were at once set free; but on connecting the electrodes of the battery with an electro-magnet, the gases commenced to revolve around the magnetic poles. A small bath was placed over the magnet, the bath itself forming one electrode and a plate, in the acidulated water of the bath, the other electrode. When the coil was magnetized, the evolved gases immediately commenced to revolve round the center plate at considerable speed.

Electrical Transmission by Cables.

As the first application of current to a cable is to charge it, it is evident that, before any employable electricity can issue from the further end, the corresponding charge must be completed. We may therefore assume that the time required by a wave to charge a cable, and the retardation on the time required for a wave passing from one end to the other to reach a given amplitude, are identical. Mr. Varley is of opinion that the electric current commences flowing out of one end of a cable at the very instant that contact is made with the battery at the other end, but that it is a considerable time before it reaches an appreciable strength; that it then goes on augmenting in strength, never absolutely attaining its maximum force. This may be so; but whatever the nature of electricity may be, it is difficult to imagine the total absence of inertia to its propagation. It is more probable that the velocity of electricity is the same in all conductors, whether submarine or overhead, or in any other form, and that it is very great, but that the resistance and induction of the circuit combine to prevent the wave reaching an appreciable strength for some time after it has commenced to flow out. This is a question, however, which can never be settled experimentally, because we can only recognize the issuing wave after it has attained strength enough to perform some mechanical effect.—*Robert Sabine, C. E., in the Telegraphic Journal.*

Scientific Immortality.

No doubt, says F. Papillon, there is no contradiction in conceiving of a perfect equilibrium between assimilation and disassimilation, such that the system would be maintained in immortal health. In any case, no one has yet even gained a glimpse of the modes of realizing such an equilibrium, and death continues, till further orders, a fixed law of Fate. Still, though immortality for a complete organism seems chimerical, perhaps it is not the same with the immortality of a separate organ in the sense we now explain. We have already alluded to the experiments of M. Paul Bert on animal grafting. He has proved that, on the head of a rat, certain organs of the same animal—as the tail, for instance—may be grafted. And this physiologist asks himself the question whether it would not be possible, when a rat, provided with such an appendage, draws near the close of his existence, to remove the appendage from him, and transplant it to a young animal, which, in his turn, would be deprived of the ornament in the same way in his old age in favor of some specimen of a new generation, and so on in succession. This tail, transplanted in regular course to young animals, and imbibing at each transference blood full of vitality, perpetually renewed, yet ever remaining the same, would thus escape death. The experiment, delicate and difficult, as we well see, was yet undertaken by M. Bert, but circumstances did not allow it to be prolonged for any long time, and the fact of the perpetuity of an organ, periodically rejuvenated, remains to be demonstrated.

THE Great Eastern finished laying the new cable on June 27.

THE GREAT EXPOSITION.—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER I.

At sea, latitude 53°3′ N., longitude 36°17′ W.: That is to say, at very nearly the half way point in the great circle course which has been taken by our "skipper" in running from New York to Glasgow, after clearing the Newfoundland coast.

June 1, 1873.

We are *en route* to Vienna in great haste, and yet in a somewhat roundabout course. The object to be attained is to learn as much as possible of the industries of the world, as illustrated at the great *Welt-Ausstellung*. This route has been chosen with the intention of obtaining a glimpse at some of the principal establishments which have produced the marvels of the exposition, and to learn something of the methods adopted and facilities possessed by British and continental manufacturers, and thus to learn how to imitate as well as what to copy from them. We shall find much to learn, undoubtedly, and as certainly shall be able to find many points in which our Yankee practice excels that of our friendly rivals across the Atlantic. Our time is limited, yet we hope to be able to acquire a valuable stock of interesting and valuable information before the equinoctial gales shall meet us on our return.

These great international exhibitions are becoming, as they should be, most powerful agents in the work of advancing civilization. Bringing together all nations in generous emulation, they lay before them the fruits of the labor of man in every part of the globe, presenting to each the *chefs d'œuvre* in art, of every country, the national productions of every clime, and every variety of manufactures from the whole civilized world.

The Vienna exhibition is the last of a series, of which the British exhibition of 1851 was the first.

In 1851, the whole world was at peace; even the threatenings of the storm, which so soon after burst upon the Crimea, had not attracted attention. There had been, for some time previous, exhibitions of British products, at more or less regular intervals, which had gradually increased in magnitude and importance, until their managers finally concluded to attempt the experiment of a "World's Fair." The experiment was quite successful, and it was, for several years, referred to as a display, marvelous in extent and wonderful for its varied attractions. America competed successfully with Europe, although her distance and the novelty of the scheme, as well as the comparatively short time allowed for preparation after its announcement, prevented as full contributions as would otherwise have been made.

Other "World's Fairs," including that in the Crystal Palace at New York, were attempted during succeeding years; but the next really important and truly international exhibition was also held at London. This was in 1862.

The area occupied was something more than half a million square feet, and the exhibition was a very successful one. The United States were quite well represented and our exhibitors had little cause to complain in the distribution of awards.

Five years later came the Paris exposition, in some sense the greatest triumph ever achieved by the late Emperor of the French. It can never be known how far Napoleon III. was influenced, in proposing this great plan, by a desire to acquire "victories of peace" for himself and for the French people, and how far by the necessity which he undoubtedly felt, even then, of taking every possible method of distracting the attention of his people from the schemes of domestic enemies, and from the work in which they were evidently actively engaged—that of fomenting internal dissensions. Bismark, the shrewdest and most skillful statesman and diplomat living, was quietly but not unsuspectedly perfecting his plans for the humiliation of France and the "unification" of Germany, and for the creation of a new empire; and the French Emperor could not but be fully aware that France would require perfect unity and all her strength to command success in what he must have known to be an irrepressible conflict.

Thus the Paris exposition preceded the French and German war of 1870, as the World's Fair, at London, in 1851, preceded the war of the Crimea of 1854.

It was a wonderful display of the manufactures and productions of the world. It covered an area of a million and a half square feet, and every civilized country on the face of the globe was well represented, while even the most distant islands of the Pacific and the most barbarous tribes visited by either missionary or trader, in the "uttermost parts of the earth," contributed rude weapons or yet ruder domestic utensils and industrial implements.

America distinguished herself at Paris as she had never done before. The American section was not remarkable for its extent, but our most important manufactures and productions were well represented, and our exhibition of labor-saving machinery, of machine tools, and of those apparently minor yet really important "notions," which so largely constitute the details of our material civilization, was far more remarkable in variety and in excellence than could have been expected, even by ourselves. The juries acknowledged the preëminence of Yankee ingenuity by the large proportion of awards made to American exhibitors. This exhibition was attended by an officially delegated commission, appointed by the United States Government to report upon the progress of foreign and domestic industry as there presented. The result of the labors of that commission was the production of a valuable series of papers, which were afterward published by the State Department, and which embody a vast amount of precisely such information as the American people most needed and most desired. The report of Dr. F. A. P. Barnard, upon the machinery and processes which it was his province to examine, is, of itself, a large volume, and contains matter of great value and material which can nowhere else be obtained. The reports of Commissioners Hewitt, Beckwith and others were also of great value, and embodied new and important information relating to their several departments.

The "Grand Exposition of 1867" was Napoleon's last success. The well laid plans of the Prussians were aided by the increasing discontent of the French people, and, in a desperate endeavor to save his shaking throne, the Emperor, while still unprepared, declared war with Prussia. Then the world saw what it had seldom, if ever, been seen before. The country from which came the declaration of war was invaded by a better prepared enemy. The war was as short, sharp and decisive as the Austro-Prussian war, which had so lately preceded it, and the victories of the first Napoleon were again avenged, in the misfortunes which accompanied the downfall of the second empire. It has been remarked, and probably with truth, that the weakness of the French and the strength of the Germans were well exhibited in their respective sections in the exhibition of 1867, and that the result of the inevitable war could have been, indeed was, predicted by the careful observer who made even a cursory comparison of their relative exhibits in the arts of both war and peace. As has been well shown by the events of our own late civil war, supremacy in pure science and in the arts of peace gives as great advantage in the contest as superiority in purely military sciences and arts.

The Paris exposition of 1867 revealed, also, to their British, as well as to their French competitors, the fact that the thorough system of technical training which had, for so many years, been kept in operation by the far sighted Teutons was, at last, yielding a splendid return. Even Great Britain was evidently threatened with the loss of her leadership as a manufacturing nation; and the lesson was promptly read, for immediately there arose a powerful movement, in which the great engineer J. Scott Russell took a prominent part, for the establishment, in Great Britain, of technical schools, and for a change of the existing standard curriculum that should enable the student to readily and effectively apply the principles which he had been taught to the useful and telling work of every day life. The Germans have, however, a quarter of a century the lead, and whether British supremacy in manufactures is to be maintained on the Eastern continent remains a doubtful question.

Our own people, while teaching others, were also themselves taught many useful lessons at Paris, the most important being that which the British were so ready to learn. We had already taken some steps in the right direction, and since that time technical, that is to say, in the best sense, practical education has become a subject of paramount interest in the United States. Our venerable institutions of learning are modifying their courses of instruction, in deference to the general demand, and are founding chairs of mechanical and civil engineering, and of applied sciences, while wealthy citizens, in almost every State, are exhibiting a noble patriotism and a real benevolence in applying some portion of their superabundant treasure in the foundation of new technical schools. We owe much, both directly and indirectly, to the Paris exposition of 1867.

Now another international exposition, on a still larger scale, is just taking shape, and the *Welt-Ausstellung* at Vienna, in 1873, promises, in spite of the delays and unfortunate accidents which have attended its opening, to be a far more extensive and complete exhibition of the *matériel* of civilization, from all parts of the world, than was even that of Paris in 1867.

The area assigned for the purposes of the exhibition is over eight millions of square feet, five times that covered by that of the Exposition of 1867. The immense buildings, which have been so well described in earlier issues of the SCIENTIFIC AMERICAN, were designed by John Scott Russell, the projector and designer, with Brunel, of that marine monster the Great Eastern. They are not specially remarkable, excepting, always, the colossal dome which rises above the *Industrie-Pallast*, to the hight of 250 feet and with a diameter of 118 yards. Of the exhibition itself we shall have much to say when we reach Vienna. Its opening has been attended with unfortunate accidents and delays, and our own department has been particularly unfortunate; but it is to be hoped that all difficulties have arisen at the beginning, and that all will now work smoothly and pleasantly to the end; and that, unlike the great exhibitions which have preceded it, this *Ausstellung* may not be followed by a less peaceful strife among nations.

We have taken passage for Glasgow for our little party, on a steamer which, only a half dozen years ago, was admired as the latest and best on the line. A ship 390 feet long, 33 feet wide, and of 20 feet draft of water, displacing over 3,000 tuns and driven by engines of the power of more than 800 horses, was considered then a wonder only excelled by the Great Eastern. Her speed, 10 knots an hour in smooth water, was thought very satisfactory; and accomplishing this with 35 or 40 tuns of coal per day was thought an equally successful attempt at economy of fuel. Other steamers, larger and faster, were, even then, afloat, but their success was generally deemed somewhat problematical.

To-day the "crack ship" of the line stands before the public much as did the one just described a few years ago, but how great the change! Her length is over 360 feet, her breadth of beam more than 40 feet, and ship and cargo together, ready for sea, weigh over 6,000 tuns. She is driven by compound engines of 1,000 or 1,500 horse power, at a speed of 14 knots, about 16½ statute miles, per hour, and yet consumes but 50 or 55 tuns of coal per day. The ship first described cost about $350,000, the last is worth something over a half million. Larger vessels than even the last are already building and some are afloat in the transatlantic trade, and it seems not at all improbable that the Great Eastern, whose dimensions, if memory serves, are 680 feet long, 80 feet beam, and nearly 30,000 tuns displacement, will, before many years, be looked upon as a ship of not at all remarkable size. Even now we think her a slow craft, for she only steams 12 knots at best.

Contrasting these leviathans with John Fitch's steamboat, which was the first to make regular trips, 80 years ago, on the Delaware, a little craft of sixty tuns, which paddled along in smooth water between Philadelphia and Trenton at the rate of six miles an hour, and with John Stevens' or with Robert Fulton's boats of a little later date, we can hardly conceive what will be the size, shape, or structure that shall be conjured up when, a century hence, some later Vanderbilt shall paraphrase Longfellow:

> "Build me swift, O worthy master,
> Staunch and strong, a goodly vessel,
> That shall laugh at all disaster,
> And with wave and whirlwind wrestle."

R. H. T.

Street Nomenclature.

One of our correspondents, writing from London, says: New Yorkers have substantial reason for exercising their powers of brag over their less fortunate neighbors in the English metropolis in some respects. A stranger in London is continually put to his wits' end not only by the different names given to what is substantially a single street, but by the very obscure manner in which the name of the street is indicated. Starting for a walk in "Leadenhall street," he will not have proceeded far ere a dingy sign on a dingy wall says "Cornhill;" and almost before he comprehends how that can be, another sign tells him that he is in "Poultry," and, without his knowing how, he gets out of Poultry into "Cheapside," and presently the dingy sign says "Newgate street," and next it says "Skinner street." After Skinner street comes "Holborn Hill," and "Holborn," and "High Holborn," and then "Oxford street"—most respectable in length—and after that "Uxbridge Road" and "New Road." And these twelve different names are applied to one long though not very straight street. And so "Marylebone" and "Euston" and "Pentonville" and "City" and "Grand Junction" roads are the several names of another single street. Nor are these exceptions. Go where you will in London, you will find streets that are long enough and bustling enough, but you might grow gray before you could master a knowledge of their names, and then find your lesson but half learned. Woe to him who seeks to thread the mazes of London by night! He cannot, by any device other than dependence upon such chance information, determine the name of the street in which he walks. The street names, dingy by daylight, are now utterly invisible. Could our New Yorkers appreciate the advantage which they enjoy of street names so placed as to be distinctly visible by night as by day, they might derive from it—as a Londoner would say—"no end" of satisfaction.

The Sun Cholera Mixture.

"More than forty years ago," says the New York *Journal of Commerce*, "when it was found that prevention for the Asiatic cholera was easier than cure, the learned doctors of both hemispheres drew up a prescription, which was published (for working people) in the New York *Sun*, and took the name of "The *Sun* Cholera Mixture." Our contemporary never lent its name to a better article. We have seen it in constant use for nearly two score years, and found it to be the best remedy for looseness of the bowels ever yet devised. It is to be commended for several reasons. It is not to be mixed with liquor, and therefore will not be used as an alcoholic beverage. Its ingredients are well known among all the common people, and it will have no prejudice to combat; each of the materials is in equal proportion to the others, and it may therefore be compounded without professional skill; and as the dose is so very small, it may be carried in a tiny phial in the waistcoat pocket, and be always at hand. It is: Tinct. opii, capsici, rhei co., menth. pip., campho.

Mix the above in equal parts; dose, ten to thirty drops. In plain terms, take equal parts tincture of opium, red pepper, rhubarb, peppermint, and camphor, and mix them for use. In case of diarrhœa, take a dose of ten or twenty drops in three or four teaspoonfuls of water. No one who has this by him and takes it in time will ever have the cholera. We commend it to our Western friends, and hope that the receipt will be widely published. Even when no cholera is anticipated, it is an excellent remedy for ordinary summer complaint."

We can fully endorse the remarks of the editor of the *Journal of Commerce* in reference to the excellence of the above remedy. Many years ago, when the office of the SCIENTIFIC AMERICAN was in the *Sun* newspaper building, Fulton street, the cholera prevailed to an alarming extent; this remedy was then employed at the *Sun* office for treatment of compositors, pressmen, carriers, newsboys, or whoever happened to be attacked with the disease in the neighborhood, and the number of cases was quite large. The remedy was always used with success if administered in time, and we then formed a high opinion of its value. It is now well known among the druggists here and, by most of them, kept on sale.

A NEW acid, termed acid of alorcine, has been extracted from aloes by M. Weselsky.

Correspondence.

On the Bodies Associated with Biela's Comet.

To the Editor of the Scientific American:

Did the different bodies moving nearly in the orbit of Biela's comet (1826 I) enter the solar system as a single mass, or as a cometary group? The former alternative has been hitherto assumed. The latter, however, may perhaps be found at least equally probable.

The hypothesis of a primitive cluster was proposed, with some hesitation, in *Nature*, May 1, 1873. Let us now consider, somewhat more in detail, the principal facts by which it is supported.

1. It has been shown by M. Hoek, of Utrecht, that certain comets, which have approached the sun singly, existed as cometary systems in the interstellar spaces. Meteors and aerolites are also believed to have sometimes entered the terrestrial atmosphere as clusters. There is, therefore, nothing improbable in supposing the bodies of the Biela group to have been distinct and separate masses before their orbits were changed into ellipses.

2. As there seem to be at least three comets and two meteor clouds now moving in orbits nearly identical, it is highly probable that their united masses would have formed too conspicuous an object to have entirely escaped observation.

3. Was the first comet of 1818, as suggested by Dr. Weiss, connected in its origin with that of Biela, and, if so, can any previous return be identified? The computed elements of the comets, 1772, 1818 I, and 1826 I, are as follows:

Perihelion passage.	[illegible] of perihelion	Ascending node.	Inclination.	Perihelion distance.	Eccentricity.	Direction of motion.	Date of discovery.	Discoverer.	Duration of visibility.
1772, Feb. 8	97°21′	263°24′	17°39′	0·9118	0·6769	D	1772, Mar. 8	Montaigne	3 w'ks
1818, Feb. 7	95°7′	250°4′	20°2′	0·7332	1·0000	D	1818, Feb. 23	Pons	4 days
1826, Mar. 18	109°45′	251°28′	13°33′	0·9025	0·7466	D	1826, Feb. 27	Biela	8 w'ks

The elements of the first are by Gauss, and were obtained by direct calculation, without any assumption in regard to the period. The observations, however, as well as those of 1818 I, were very imperfect, and hence the elements are liable to considerable uncertainty. The resemblance is so striking as to render it highly probable that the comet of 1818 is intimately related to that of Biela. It is also probable that the comet of 1772, which has been regarded as a former return of Biela's, is really identical with that of 1818. The two dates of perihelion passage correspond to a mean period of 2,400 days. The question may be decided by calculating the perturbations between 1772 and 1806.

4. The comet whose discovery on the 2d of December, 1872, is due to Klinkerfues and Pogson, may be regarded as still another member of the same family. Its perihelion passage occurred nearly three months after the time predicted for that of Biela—a lengthening of the period which it is impossible to explain by any known disturbing cause.

5. When several bodies with slightly different periods revolve in orbits nearly coincident, collisions must sometimes occur between the various members of the group. If Biela's comet overtook, or was overtaken by, another of the same cluster in 1845, their separation after partial impact may have been the phenomenon observed at that epoch. The meteoric showers derived from this zone are the following: 1798, December 7th; 1830, December 7th; 1838, December 5th—7th; 1850, November 29th; 1872, November 27th. These dates appear to indicate the existence of two meteor clouds; the first, third, and fifth showers having been derived from the one, the second and fourth, from the other. The division of the comet may have resulted from its collision with one of these meteoric masses.

6. If we trace back the positions of Jupiter and Biela's comet, we shall find that they were in the vicinity of each other about September, 1734. This is the most recent date, previous to the apparition of 1772, at which they could have been in close proximity. That the members of this cometary cluster were at that time thrown into their present orbits seems probable from the fact that they have not yet become widely separated, as must have been the case if they had made a considerable number of revolutions. It is also worthy of remark that the earliest observed star shower derived from this source occurred less than 80 years since; whereas the meteors connected with the comets 1866 I and 1862 III may be traced back to the ninth century of our era.

Bloomington, Ind. DANIEL KIRKWOOD.

Professor Haeckel on Embryology.

To the Editor of the Scientific American:

In your issue of June 7, 1873, is a criticism upon Professor Haeckel's investigations concerning the embryology of man. Your correspondent, in his article, says, "certain theories" of Professor Haeckel's; while the Professor, in his article, uses the words "the following facts," etc. It is evident that J. L. has not a right understanding of the Professor's ideas, or, if understanding them, has an utter want of toleration. The Professor says nothing of "forming quorums, or nominating committees." But in a clear and concise manner, he sets forth the results of his investigations. J. L. may be very witty or keenly sarcastic when he speaks of "monkeys and winged individuals clothed with hair or feathers as the case may be," etc. But if he will look at the works of creation, he will find that the immutable laws of Nature invariably grow hair or feathers where "circumstances demand it." But there are exceptions to all rules, and in some cases there is a demand for common sense which Nature has failed to supply.

There must be evidence before belief, and there must be scientific investigation into the unknown, theory, before facts can be established. It does not follow that scientists do not acknowledge the Supreme Being because they do not use His name in every other line they write. The scientific man sees certain actions of the elements around him, which action begins in the yet invisible; and, as it emerges to the vision, it takes the form of man or monkey, according to the combination of the element producing the form visible. In the investigation, the scientist finds that everything in Nature works harmoniously. And because he will not deny what he can see, and look for the cause of causes, which he might do *ad infinitum*, J. L. flies to the rescue of theology, evidently thinking that of more importance than a right understanding of the laws of creation, through which knowledge, only, can we ever have a correct understanding of our being and our Creator. If every scientific investigator on the globe were to acknowledge God as the prime cause of all created things, it would not strengthen their deductions in the least, or give the facts any firmer foundation.

The cell theory has been under investigation for fifty years, by learned men of all countries; and such investigation has established the fact that all matter is made up of cells or atoms. In the last few numbers of your paper, it has been conclusively shown by our honored Agassiz that the cell theory is correct.

One glance through a good microscope ought to convince the most skeptical. It is possible that J. L. might become an unreasonable person should he look through the microscope and see what the investigations of fifty years have brought to light. I have read of an instance where a person (I suppose "reasonable") refused to look through a telescope, lest he should see what he had denied to be true. The same spirit has followed the scientific investigator from Galileo down to the present day. All matter is governed by immutable law, and every created form is of necessity formed to suit the circumstances of the thing created; different combinations of the elements producing different forms. J. L. claims that, "if the same elements which form the monkey and plants combine to form man, we should look for the original reasoning power in them." It is claimed by some that man is an epitome of the universe. I should infer from that that all the elements are combined in man. A want of the same combination makes the monkey. The very laws of combination forbid the reasoning man to look for complete reasoning faculties in anything below him; but, in proportion as the elements which make the reasoning faculties are combined with the other elements, these reasoning faculties are observed. There are born human beings that have less reason than monkeys. As all matter is made up from the elements, it is self evident that every form is a combination of certain elements. I have no doubt that the chemist will be able, in the future, to show why such a difference exists between a Daniel Webster and the idiot Emerson, and why the same elements should produce a man or a monkey. In the chemical laboratory, the chemist finds that the same combinations invariably produce the same whole. Common alcohol is composed of $C_4 H_6 O_2$, while $C_4 H_4 O_4$ produces acetic acid. Thus an exchange of two parts, between H and O, makes a different body.

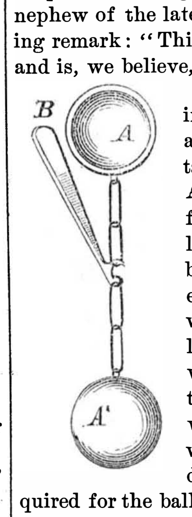
I fail to see, in J. L.'s letter, one word of argument, supported by fact, against the facts of Professor Haeckel. In this age of reason, railing at men of science or the expression of thought only serves to bring contempt upon him who indulges in it. J. L.'s article has failed to show even a microscopical proof against the article of Professor Haecker.

Bridgeport, Conn. A. M. W.

Deep Sea Soundings.

To the Editor of the Scientific American:

In your issue of May 31, you describe an invention for deep sea sounding without a rope, made by the brother and nephew of the late Professor Morse, and you add the following remark: "This sounding instrument requires no line, and is, we believe, the first of the kind ever invented."



In 1833, the writer invented and made an instrument, for deep sea sounding, to operate without a line. It consisted of two metallic balls, the one, A, hollow, the other, A', solid. They were each provided with a few links; and to those of the solid ball a lever, B, was attached by which the two balls were readily connected or disconnected. When connected and descending in the water, the long, thin, and broad end of the lever, B, would be raised to a position that would keep the balls connected; but when the solid ball reached the bottom, the lever would fall and disconnect the upper ball, which would return to the surface. The depth would be determined by the time required for the ball to sink and return to the surface. It was my belief that the apparatus would descend at a uniform rate of speed after the first yard or two, and that the light ball would return in like manner. It would only be necessary to know how much time is required for an hundred feet, to know how much would be required for a thousand or ten thousand feet. I experimented with the instrument, so far as I could in a country place, to determine this theory, which I believe to be correct. The invention was noticed at the time by a local paper, the York (Pa.) *Gazette*. *

Springfield, Ill.

THE yearly meeting of the British Association for the Advancement of Science, under the presidency of Mr. Joule, takes place at Bradford, England, on the 17th of September next. The American Association, Joseph Lovefield, President, meets at Portland, Maine, August 26th.

SUCCESSFUL LAYING OF THE FIFTH ATLANTIC CABLE.

The submergence of the fifth telegraph cable under the Atlantic ocean was begun on Monday, the 16th of June, 1873, by the departure of the Great Eastern from the coast of Ireland, for Heart's Content, Newfoundland, which port she reached June 27, paying out the cable over her stern as she proceeded. Only eleven days were occupied, during which seventeen hundred nautical miles of telegraph cable were laid. This is rapid work. The experience gained within the past few years in the construction and of laying submarine cables and the facilities afforded by novel machinery, relieves the business of all substantial difficulties. Telegraph cables can now be laid under the ocean with apparently as much ease and certainty as land lines can be erected.

Eleven days is not a long trip for a passenger steamer in crossing the ocean.

The success of the Great Eastern suggests the possibility of providing our ocean steamers with means of constant telegraph communication with the land throughout their voyages. From day to day, during the recent passage of the Great Eastern, the public was supplied with intelligence of the ship's progress, and this while she steamed along as rapidly as many of the Atlantic steamers are accustomed to do. Is it beyond a reasonable probability that some ingenious inventor will yet discover a method of making an extremely light but strong cable, which any vessel may easily carry and unreel or take up as she sails? We commend the subject to those who are desirous of obtaining fame and fortune by the exercise of their mental comet-seekers in this direction.

The first Atlantic cable was laid down by the British war ship Agamennon and the American ship Niagara in 1858. Each vessel took on board one half of the cable, sailed to mid-ocean, spliced ends, and departed, one for Ireland, one for Newfoundland. The cable was successfully laid, but its construction was defective, and it ceased operation after a few messages had been exchanged.

The second cable was laid by the Great Eastern in 1865; but before the voyage was completed, the cable broke and was lost.

The third cable was laid in 1866 by the Great Eastern with success, and the second cable was, by the same vessel, also picked up and completed.

The fourth or French cable, from Brest in France to Newfoundland, was laid in 1869 by the Great Eastern.

The fifth cable, as already stated, is the one just put down. The cable consists of seven fine copper wires, insulated in gutta percha covered with jute yarn, and sheathed with wire and hemp, which is passed through Clark's silica compound, an excellent preservative.

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 May, 1873:

During the month, 1,044 visits of inspection were made, and 2,165 boilers examined, 2,024 externally and 910 internally; 210 were tested by hydraulic pressure. The number of defects discovered in all was 973, of which 210 were regarded as dangerous. The defects in detail were as follows:

Furnaces in bad condition, 38—4 dangerous; fractured plates, 68—37 dangerous; burned plates, 51—14 dangerous; blistered plates, 174—32 dangerous; deposit of sediment, 161—18 dangerous; incrustation and scale, 141—19 dangerous; external corrosion, 63—13 dangerous; internal corrosion, 28—13 dangerous; internal grooving, 33—4 dangerous; water gages defective, 28—4 dangerous; blow-out defective, 12—4 dangerous; safety valves overloaded, 21—16 dangerous; pressure gages defective, 167—13 dangerous; boiler without gages, 1—dangerous; deficiency of water, 11—6 dangerous; braces and stays broken, 46—14 dangerous; boilers condemned as unsafe to use, 10; mud drum condemned, 1.

Hiram Powers.

The most celebrated of contemporary American artists, Hiram Powers, died at his residence in Florence, Italy, on June 27, aged 68. He was a native of Woodstock, Vt.; and, believing in his own ability as an artist, he quitted a mechanical trade and obtained an appointment at a museum at Cincinnati, where he remained seven years. By the liberality of Mr. Nicholas Longworth, he was enabled to travel to Florence to study; and his career there was first signalized by the production of his statue of "Eve," a work which at once placed him in the front ranks of the world's genius. His "Greek Slave," exhibited at the London Exhibition of 1851, is probably the best known of his works, not only for beauty of expression, but for the vivid animation with which the marble was endowed. His productions are numerous, and have been eagerly sought for by the art patrons and amateurs of both worlds.

Mr. Powers was also an ingenious inventor. Among other devices produced by him was a sculptor's file, in which were arranged, between the serrated cutting edges, holes through which the marble dust could pass away so as not to clog up the tool.

A COLORADO paper gives a very graphic account of the descent of Clear Creek, through the cañon, with its cliffs two to three thousand feet high, by a couple of boys in an open boat. They are reported to have made a distance of one hundred and forty miles in two hours' time, shooting over falls and rapids of from ten to sixty feet in hight, finally bringing up safe on a sand bar, with the boat half full of water.

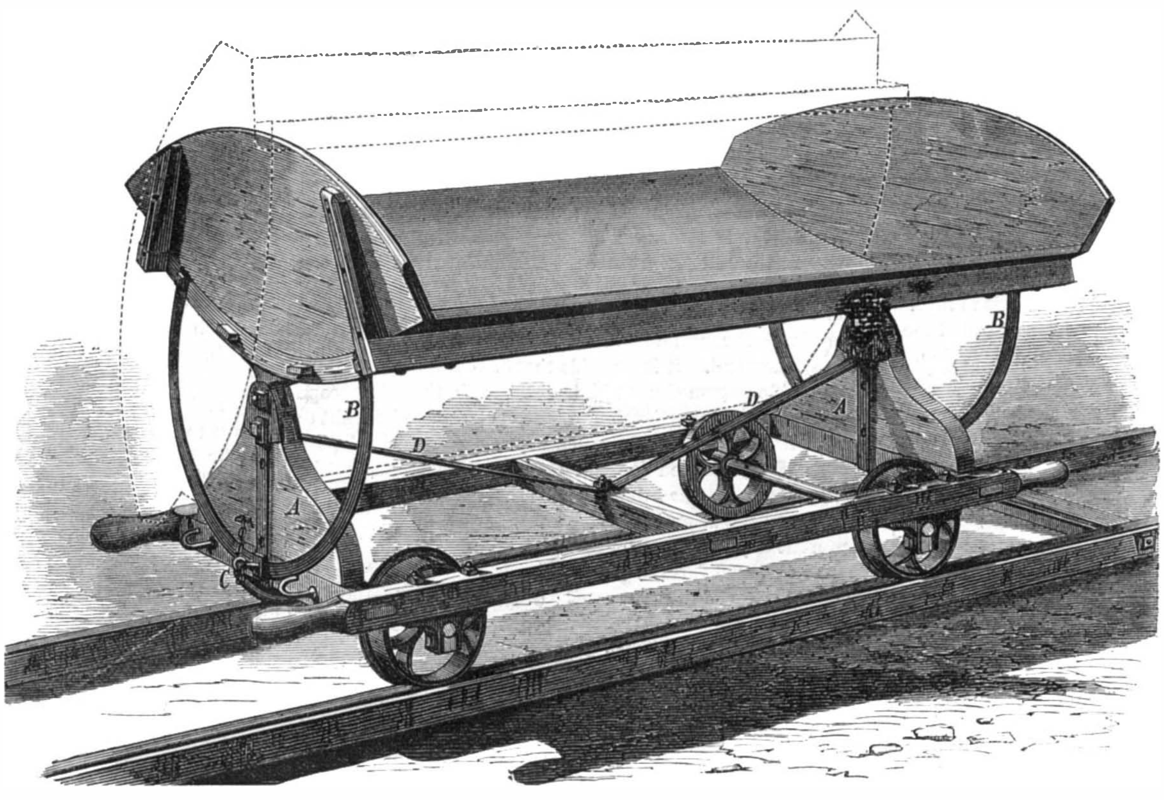
IMPROVED PORTABLE DUMPING CAR.

Our illustration represents a recently invented portable dumping car, which possesses the advantages of simplicity, capacity, and ready facility of transportation. It is adapted to carrying earth from excavations, or for the building of embankments, or any similar purpose necessitating the carriage of material from one locality to another.

The containing portion is constructed to hold one cubic yard of earth, and is pivoted, by central lugs upon its ends, to the slotted metal extremities of the bolsters, A. Attached to either end of the receptacle is a segmental shaped bar or plate, B B, which passes through a guide, C, on the bolster, and is secured therein, holding the car in an upright position by means of a pin. The bolsters are attached to the quadrilateral frame, which is supported upon trucks, and has handles formed upon the ends of its two longitudinal bars. Suitable metal braces, D D, extending from the cross piece to the bolsters, are provided to insure strong construction. The trucks are designed to carry the device over ordinary portable rails which may be laid down wherever desired.

In using the apparatus, a large number of cars may be coupled together, by the hooks shown, and drawn by a single horse, their light construction and small weight enabling a great quantity of material to be thus transported. From any point on the route the car may be lifted from its track, by hand, by the aid of the handles, and thus carried bodily to any required locality. To dump the load, it is only necessary to withdraw the pins which confine the curved bars, B, when the body is readily pushed over on its pivots to either side of the track into the position shown by the dotted lines. The lower portion of the receptacle, when thus turned, rests against and is supported by one side of the bolsters.

Patented April 15, 1873. For further particulars address the inventor, Mr. Henry J. Peters, Box 253, Quebec, Canada.

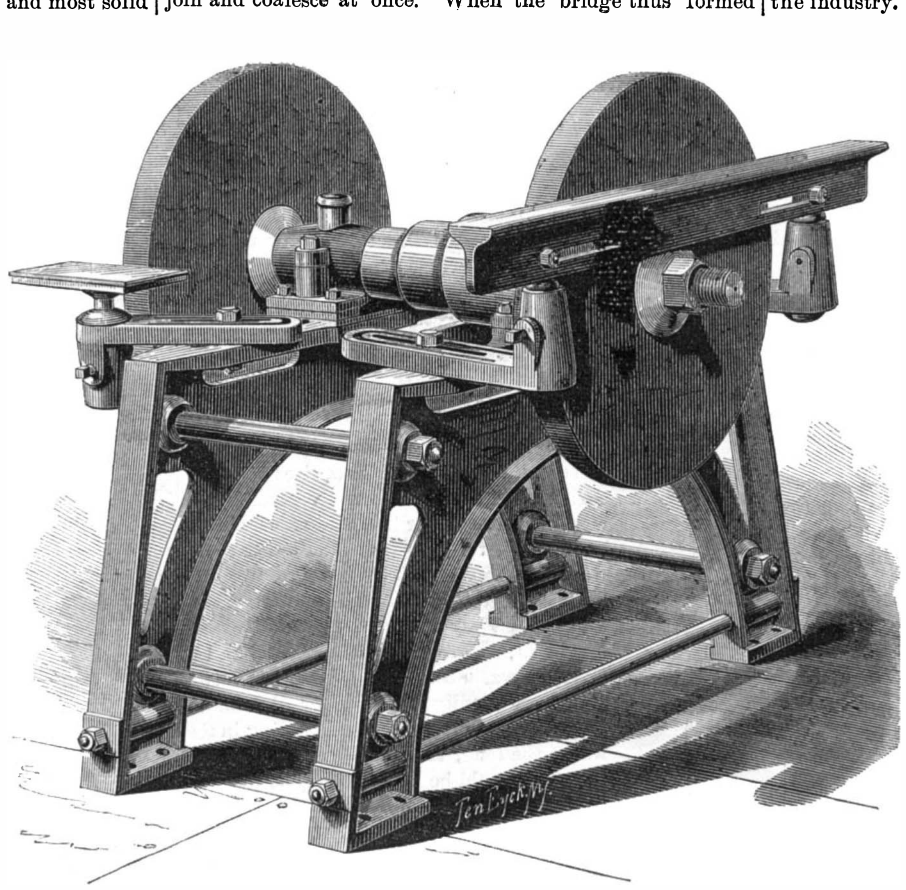


PETERS' PORTABLE DUMPING CAR.

THE TANITE COMPANY'S EMERY GRINDER "E."

This is claimed to be the largest, heaviest, and most solid emery grinder yet put on the market, which, while running such large wheels, attains proper speed without jar or tremor. The special advantage due to the use of large wheels is illustrated in the engraving, which shows wheels 24 inches in diameter, with a stove rest across the side of one of them. This use of a long rest across the side of a wheel of large diameter enables the workman to accurately edge on square large plates or long bars. The rest arms, the reversibility of which is shown in the engraving, allow of the rests having unusual variation in hight.

The feature which especially distinguishes the Tanite Company's emery grinder "E," from others is that the frame, instead of being composed of one solid casting, consists of two side frames, strongly arched, and connected by heavy iron bolts. This allows of the machine's being constructed of any desired width. The grinder is made in various forms—to carry one wheel, centerhung, two wheels overhung, five or more large wheels hung between boxes, and also with side frames set four feet apart, wheels so separated that two men can use the same machine at once, handling large stove or other plates without interference. This device is manufactured by the Tanite Company, Stroudsburg, Pa.



THE TANITE COMPANY'S EMERY GRINDER "E."

Overhead Telegraph Cables.

One of the things which attract the attention of a New Yorker visiting London is the telegraph cable stretched over the roofs of the houses in many directions. There are few of the single wires which are so common in New York, and none of those street nuisances the telegraph poles. Many wires are packed together with insulating material, and thus formed into a cable; but as the wires are slender (and presumably of copper), and the insulating material is soft, the cable requires support at short distances. To this end a steel sustaining wire is first put up, and from this the cable is suspended.

Experiments with Ice.

If two lumps of ice be pressed together, they will be welded at their points of contact. Faraday having communicated this observation to Tyndall, the latter took a hollow steel cylinder, put in some snow, which he compressed with a piston fitting tight, and thus obtained a cylinder of transparent ice. In the same way two pieces of solid ice, if subjected to pressure in a mold of any shape, will come out in that precise form. Professor William Thomson explains this by saying that by pressure the points in contact are liquefied, that the water thus produced has rendered latent a portion of the caloric of the surrounding ice, whereby the temperature falls below zero; and that, consequently, as soon as the pressure ceases, this water freezes again. Both M. Helmholz and Professor Tyndall accept this explanation; only the latter finds it so far insufficient that it does not take into account the air contained in the water. He also describes the following experiment of his: Having put a lump of ice into hot water, he submerged it by pressing it down with another piece of ice. Notwithstanding the all but infinitesimal pressure exercised, the two lumps instantly froze together. Again, it is well known that two floating bodies wetted with water will attract each other. Now, if they be two lumps of ice swimming on hot water, they will join and coalesce at once. When the bridge thus formed has melted away, they will again separate, then meet and freeze together again, and so on, as long as there is any ice left. He concludes with mentioning an experiment made by M. Duppa, the upshot of which is that ice may be pressed into any shape—that of a statuette, for instance; a plaster cast may then be taken of it; and when the ice has melted away inside, there remains a hollow mold into which any metal may be poured. Professor Helmholz replies that the non-conducting property of ice is an objection to the supposition that the caloric set at liberty by pressure can spread into the ice, and that great obscurity still prevails on the question.

The price of nails, by the keg, has lately fallen from $5.50 to $4.75.

The Resources and Productions of Morocco.

Under this heading we find, in the *Bulletin du Musée*, the following interesting facts regarding the above mentioned country, derived from the minutes of the Artistic, Literary, and Scientific Club of Antwerp:

As regards mineral wealth, gold is often found superficially disseminated, united with quartz and limestone, sometimes in grains but generally in thin scales. Native silver is obtained in the province of Soos, with the gold, and also with galena. The Sultan has absolutely forbidden the extraction of either of the above precious metals, and reserves the right for his own benefit; but in spite of the restrictions and severe penalties, the Arabs succeed in stealing large quantities. Copper is very abundant, notably in the suburbs of Tetuan and Taroudant; the inhabitants work the mines with great ability, notwithstanding their rude and primitive methods. Iron exists in immense deposits, there being a mountain, Djibel Hadrid, said to be formed entirely of the ore. Lead is found principally in the state of galena, and tin has been discovered in small amounts, both metals being obtained from the mountains of Tedla. Rock salt is derived from the same locality, and large quantities of marine salt are obtained, almost without labor, on the shores of the salt lakes. Niter is also found to a small extent, and a peculiar kind of clay called *ghasoul* exists in the northern part of the country, which is largely employed as a substitute for soap.

Gum is exported to Manchester, England, for cloth-printing purposes. In the textile industries, the American agave or aloe furnishes a material for the manufacture of cord and various tissues. Attempts made to grow cotton have succeeded, but for some reason have not been continued, the inhabitants preferring to purchase their fabric of this substance from English makers. Wool is probably the staple article of Moorish commerce, amounting to one quarter of the entire export of the country. The best varieties are those of Dar-El-Berda and Rbat, where the French have a monopoly of the industry. Seventy to eighty dollars per 2,200 pounds is the usual selling price of the best wool, of which, with the exception of that used for making the magnificent carpets for which Moorish looms are celebrated and the "haïk" or Arab cloak, very little is employed in the country.

Goat skins, under the name of "morocco," are exported all over the world, and serve an innumerable variety of purposes. Within the country, they are employed solely in the manufacture of the peculiar shces of the people. The skins are sold principally during the months of May and November at from 3 to 6 dollars a dozen, according to size.

Leeches, for medical uses, are largely found in ponds between Tangier and Rbat. They are in color either green or black, the latter selling at six dollars and the former at five dollars per thousand; they are forwarded to the markets in boxes of wet sand, containing five thousand each.

The remainder of the productions of the country include ox hides, wax, honey, and ostrich feathers, about a quarter of a million dollars worth of the latter being yearly sold at Mogador.

The Dead Preserved like Wax.

The Brunetti method for the preservation of the dead consists of several processes: 1. The circulatory system is cleared thoroughly out by washing with cold water till it issues quite clear from the body. This may occupy two to five hours. 2. Alcohol is injected so as to abstract as much water as possible. This occupies about a quarter of an hour. 3. Ether is then injected to abstract the fatty matters. This occupies two to ten hours. 4. A strong solution of tannin is then injected. This occupies for imbibition two to ten hours. 5. The body is then dried in a current of warm air passed over heated chloride of calcium. This may occupy two to five hours. The body is then perfectly preserved and resists decay. The Italians are said to exhibit specimens which are as hard as stone and retain the shape perfectly and are equal to the best wax models.

A more simple form of preparation for injection, well suited for anatomical purposes, consists of glycerin, 14 parts; soft sugar, 2 parts; nitrate of potash, 1 part. It is found that, after saturation for some days in this solution, the parts become comparatively indestructible, and change neither in size nor figure.

COMPOSITE SHIP CONSTRUCTION.

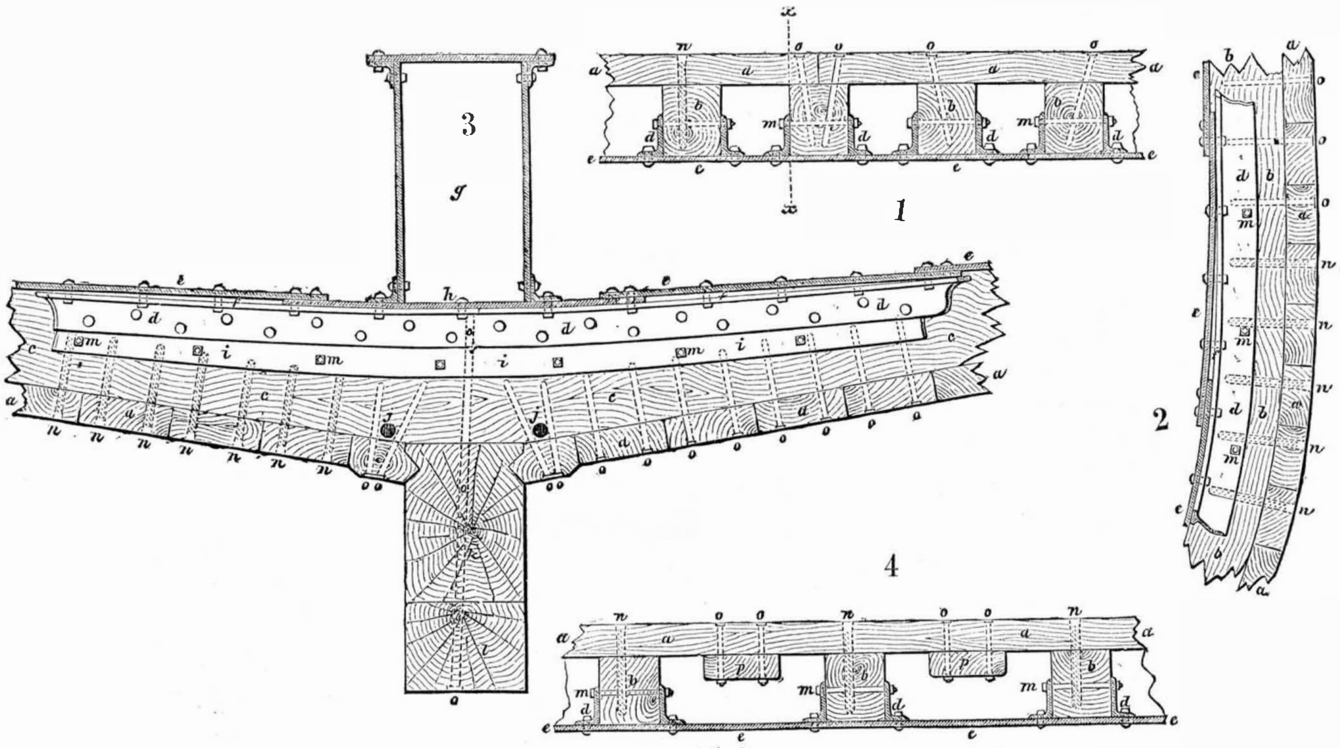
Having already presented a brief outline of the process of iron ship construction, extracted from the pages of Wilson's "Ship Building," recently published by Messrs. John Wiley & Son, of this city, we again revert to the same work for the following interesting particulars regarding the construction of vessels on the composite system. The chief object of this method is to combine the strength of the iron ship with the capacity of being coppered afforded by the wooden vessel. Special attention is required to see that the iron is completely insulated or cut off from electrical communication with the copper used in the structure; and owing to the difference in the expansion of wood and iron by heat, it has been found best to make all pieces which lie fore and aft of wood, and all those resting athwartships, vertically or diagonally, of iron.

JORDAN'S SYSTEM

of composite ship building is that most generally practiced. The whole outer skin, including keel, stem, sternpost, and planking is of wood, arranged as in the skin of an ordinary wooden ship, and the framework inside is of iron. The bolts fastening skin and frames together are of galvanized iron, and their outer ends are countersunk in holes of such a depth that the iron bolts can be electrically insulated from the copper sheathing by plugging the holes with pitch or other suitable non-conductor.

McLAIN'S SYSTEM

differs from the foregoing in that the keel, stem, sternpost, frame, and outer plating of the ship are the same as those of an ordinary wooden vessel, but instead of the ceiling or inside planking being composed of wood, it is constructed of iron, united all round at the bottom and ends of the structure, and made thoroughly water-tight, forming a complete inner skin.

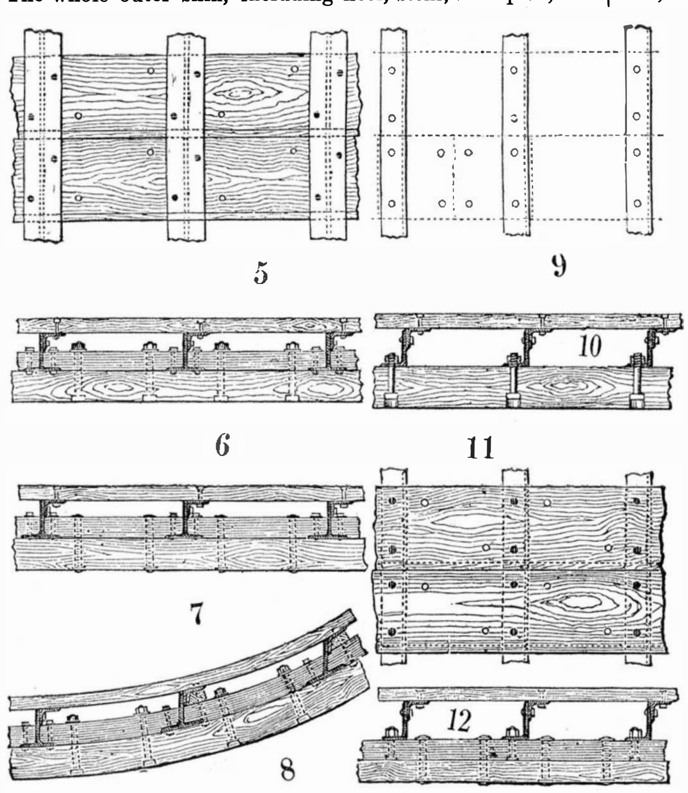


McLAIN'S METHOD OF COMPOSITE SHIP BUILDING.

Figs. 1, 2, 3, and 4 are sections of a composite vessel built on this principle. *a a a a* is the outer wooden packing, *b* the frame timbers, *c* wooden flooring inserted between the frames, *d* the angle iron frames riveted all round to the outside of the iron ceiling, *e*. Fig. 1 is a horizontal section of broadside, Fig. 2 a vertical section of the same at *x*, Fig. 3 a transverse section of keel, etc., and Fig. 4 a horizontal section of the broadside.

SCOTT'S SYSTEM

consists in making the frames of T iron instead of angle iron, all fore and aft the ship. Being stronger they are consequently spaced further apart. Betwixt the frames are fitted chocks of teak bolted with iron bolts and caulked throughout. Over these chocks and over the frames is wrought the outside planking, which is fastened, as shown in the engravings, Figs. 5 to 8, by brass bolts, which pass through the chocks and planking. With existing appliances, the frames fore and aft are somewhat more difficult to set to the figure of the ship than frames of angle iron; but, on the other hand, the number of frames to be set is less than in the ordinary method of building composite ships. Thus in a vessel 200 feet long, the number of frames would fewer by at least twenty. Fig. 8 shows the construction in an extreme case, and Figs. 9 to 12, referring to other systems, are added for the purpose of comparison.

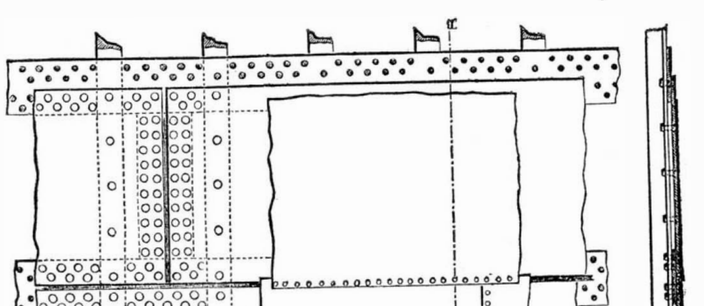


SCOTTS' METHOD OF CONSTRUCTING COMPOSITE SHIPS.

DAFT'S METHOD OF SHEATHING IRON SHIPS,

with copper, mixed metal, or zinc, is as follows: The inner layer of the iron skin consists of narrow strips of plate merely wide enough to make lap joints with the outer layer, and to leave a groove, between the edges of each pair of outer plates, about as wide as the plates are thick. Into this groove is placed a filling of teak or ebonite, a compound of india rubber and sulphur. Outside the plating is a layer of tarred felt about one quarter of an inch thick, upon which the sheathing is laid and fastened with sheathing nails of the same metal, driven through the felt into the fillings. Intermediate fastenings are obtained, if required, by inserting ebonite plugs into holes drilled in the iron plates and driving sheathing nails into them.

Fig. 13 shows this arrangement, the black lines being the filled portions between the plates. Fig. 14 is an enlarged section through a sheathing nail.

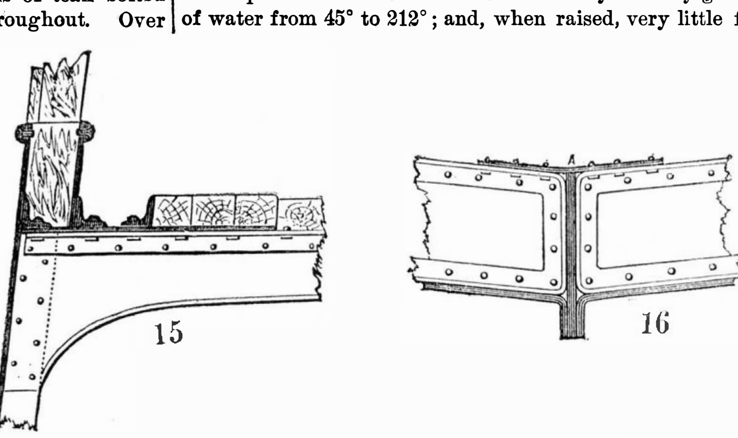


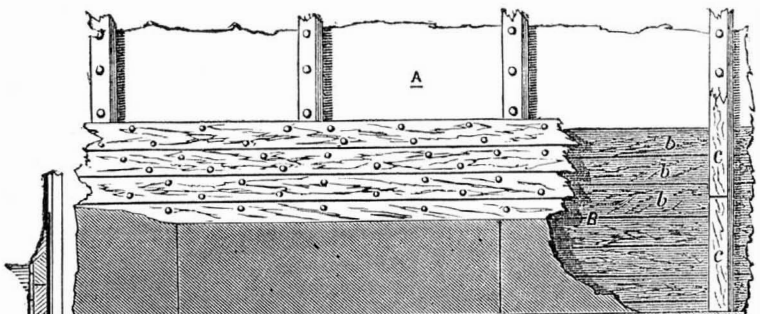
DAFT'S CONSTRUCTION AND SHEATHING OF IRON SHIPS.

GRANTHAM'S METHOD OF SHEATHING IRON SHIPS

is as follows: Outside the iron skin are riveted angle iron ribs, the projecting flanges of which are dovetail in section. The inner skin is coated with pitch, and the spaces between the dovetail flanges are filled by packing and wedging into them short pieces of plank. The outside ribs, with their wooden filling, rise to a short distance above the water line, and the upper edge of the filling is guarded by a longitudinal angle iron. The outer surface of the filling having been payed with pitch, a complete wooden sheathing, about one and a half inches thick, is put on and fastened to the filling pieces with mixed metal nails, which should not pass through those pieces. This is also pitched and afterwards sheathed with copper or mixed metal in the usual way, care being taken to keep the metal sheathing two or three inches from any exposed piece of iron.

Figs. 15, 16, and 17 show different sections of a vessel thus sheathed.





GRANTHAM'S METHOD OF SHEATHING IRON SHIPS.

Domestic Economy of Fuel.

Captain Douglas Galton, in an interesting article in the *Journal of the Society of Arts*, calls attention to the need of new inventions in devices for cooking, whereby the great waste of fuel now experienced in the best of our stoves and ranges may be prevented.

The question of saving fuel for cooking purposes, he says, is even more important than economy in warming; because cooking is an operation required every day in the year, and the waste of fuel in cooking is even more considerable than in warming. To realize the question of economy of fuel, it is necessary to consider, in the first place, what a given quantity of fuel is capable of doing.

One pound of coal should raise from fifty to sixty gallons of water from 45° to 212°; and, when raised, very little fuel is required to maintain it, in a properly constructed boiler, at that temperature. The total amount of water, at such a temperature, used daily in an ordinary middle class house, does not exceed thirty or forty gallons; and therefore, if the boiler were made so as to absorb as much heat as possible, the hot water used in an ordinary middle class house, with a family of ten or twelve persons, ought not, with thorough economy, to consume more than one sixth of a tun of coals in the year. Count Rumford shows in his treatise that 25 lbs. of bread ought to be baked with one pound of coal, and that 100 lbs. of meat should be cooked with $2\frac{1}{4}$ lbs. of coal. If, therefore we fully utilized our fuel, it is clear that, in the preparation of our food and hot water for domestic purposes, $\frac{1}{2}$ lb. of coal per head of the population ought to be a sufficient daily allowance, which would be equivalent to one twelfth of a tun per annum; and in large households even less than that quantity ought to suffice. I do not suppose that we shall ever attain to this minimum of consumption, but it is well to consider what the standard is, so that we may not rest satisfied till it has been much more nearly approached than hitherto.

The three main parts of the ordinary cooking apparatus are the oven for baking and roasting, and the boiler, and the hot plate. If the boiler is to be of the form most effectual in saving fuel, the flame and gases from the fire should play under and round every part of it.

Then, as regards the oven. The baker's oven of firebrick, in which the fire is made inside the oven and the whole heat retained in and reflected back from the sides and top and bottom, is a very economical instrument when in continual use. With iron ovens, attached to a kitchen range, the case is different. An oven which roasts requires a temperature of from 400° to 450° at least. Therefore, to maintain this temperature, the gases must pass off into the flue at a temperature even higher; when the oven is a roaster, a considerable volume of air is being continually passed through it to carry off the steam from the meat. This air, if admitted cold, as is the case with many ranges, acts so as to cool down the interior, and therefore additional fuel has to be consumed to counteract this cooling down process. Hence, it is desirable to utilize some of the heat, which passes off, at above 450°, into the flue, for the purpose of raising the temperature of the air to be admitted into the oven.

The hot plate is the third of the most important parts of the modern close cooking range. In its present shape, the hot plate wastes an enormous amount of heat. It is wasteful, because it radiates the heat largely; because the application of heat to the saucepans is only through the bottom of the saucepans, and the bottom of the saucepan is not always in immediate contact with the flame, but is frequently allowed to receive the heat through the medium of the cast iron hot plate, which is a very moderate conductor of heat. Just consider what the difference of effect is. The heat of the flame, if directly acting on the bottom of the saucepan, would be 1,200° Fahr.; but, unless the hot plate is red hot, probably not above 450° will pass through, but the heat in the flue which heats the hot plate will be at 1,200°, and the spare heat from the flame will be wasted up the chimney.

It is evident from the foregoing that, although hundreds of stove and range inventions have been made, there is still room for a new and better series of devices whose merits are to consist in their economy of fuel.

A NEW THERMO-ELECTRIC BATTERY.

When a bar of bismuth is soldered to one of antimony in the form of a ⋖ and the point of junction warmed, an electric current is set up, which may be increased by augmenting the pairs of the combined metals.

A new form of this battery, recently invented by Mure and Clamond, consists of 60 pairs, made of iron and lead, and the electro-motive power is equal to two Bunsen elements. By the use of 39 gallons of gas, about 2 drams of copper were precipitated in an hour, the surface of the electrodes being 11 square inches, and their separation from one another 0·4 inch. The cost of depositing $2\frac{2}{5}$ lbs. of copper by this battery, in Paris, where gas is sold at 3 cents per 35 cubic feet, would be $2.36.

The largest battery which has been as yet constructed upon this plan consists of 150 large pairs, and has an intensity equivalent to 5 Bunsen cells of medium size. A battery of 560 small pairs arranged for tension have an intensity equal to 60 Daniell cells. In both cases, the gas consumed is about 210 gallons per hour.

THE SOUTHERN CANAL.

A correspondent, P. K. McM., alludes to Professor Colton's lecture on a proposed canal to connect the Mississippi with the Atlantic, printed on page 376 of our volume XXVIII, and asks:

"Has your attention ever been called to the fact that the head waters of the Tombigbee are only 8 miles from Bear Creek, a large stream that runs into the Tennessee?

From Fulton, Atawamba county, Miss., to Bear Creek is only 8 miles, over an undulating country; from thence to the Tennessee river is 15 miles, down a creek that is nowhere less than 50 feet wide, with from 2 to 3 feet of water in the summer time and no fall worth mentioning.

Please look at it. We are agitating it now down here; and if the West wants as great a market for her productions as the Georgia canal would give her, at one tenth the cost, let her turn her eyes this way. By this route, too, corn could be laid down in Montgomery for 16 cents a bushel. All the advantages that would accrue to Alabama by the other route would also be afforded by this.

This canal would supply the richest part of Alabama (the cane brake belt) with a direct line to the West. It is also to be noticed that Bear Creek enters the Tennessee below Muscle Shoals."

NEW BOOKS AND PUBLICATIONS.

LANDSCAPE ARCHITECTURE, as applied to the Wants of the Great West; with an Essay on Forest Planting on the Great Plains. By H. W. S. Cleveland, Landscape Architect. Price $1.50. Chicago: Jansen, McClurg & Co., 117 State Street.

We have here an excellent treatise on an interesting and important subject, which may be read with profit by all who are building, planting, and laying out gardens and parks. The second part of the work, on the subject of forest planting, is especially valuable, the question of the effect of forests on the humidity of the climate being well explained and commented upon.

COMETS AND METEORS, their Phenomena in All Ages, their Mutual Relation, and the Theory of their Origin. By Daniel Kirkwood, LL.D., Professor of Mathematics in Indiana University, and Author of "Meteoric Astronomy."

The author, well known to all readers of the SCIENTIFIC AMERICAN, *Nature*, and many other contemporary journals, has here given the world some light on the vexed question of the origin of comets, which, coming from an undoubted authority, will be welcomed by all students of astronomy.

THE SPECTROSCOPE AND ITS APPLICATIONS. By J. Norman Lockyer, F.R.S. Price $1.50. New York and London: Macmillan & Co.

This elegant little volume contains three lectures, delivered by Mr. Lockyer, in 1869, before the Society of Arts, and carried down, by considerable additions, to the present time. The book is copiously illustrated, and is intended as an introduction to the whole science of spectroscopy, which has been exhaustively treated in the large work of Professor Roscoe.

DECISIONS OF THE COURTS.

United States Circuit Court--District of Maine.

PRESERVED GREEN CORN PATENT.—JOHN W. JONES *et al.* *vs.* R. K. SEWALL, Administrator.

CLIFFORD, *J.*:

Inventions lawfully secured by letters patent are the property of the inventors, and as such the franchise and the patented product are as much entitled to legal protection as any other species of property, real or personal. They are, indeed, property, even before they are patented, and continue to be such, even without that protection, until the inventor abandons the same to the public, unless he suffers the patented product to be in public use or on sale, with his consent and allowance, for more than two years before he files his application for a patent. (5 Stat. at Large, 123; 5 Ibid., 354.)

On the 8th of March, 1853, Isaac Winslow, of Philadelphia, filed in the Patent Office an application for a patent for "a new and improved mode of preserving green corn. The application was rejected by the Patent Office, which for nine years persisted in its erroneous decision. *

On the 18th of February, 1872, the inventor filed in the Patent Office a new application for a patent, referring to the fact that his prior application, as modified, was rejected, and renewing the prayer that letters patent might be granted to him for the entire improvement. *

Four several letters patent were granted * as follows: 1. No. 34,928, dated April 8, 1862, for a new and useful improvement in preserving Indian corn in the green state. 2. No. 35,274, dated May 13, 1862, for a new and useful improvement in preserving green corn. 3. No. 35,346, dated May 20, 1862, for a new and useful improved process of preserving green corn. 4. No. 36,326, dated August 26, 1862, for a new and useful improvement in the process of preserving green corn. *

The method of manufacturing the product is substantially as follows: Select a superior quality of sweet corn, in the green state; remove the kernels from the cob by means of a curved and gaged knife, or other suitable means; pack the kernels in cans, and hermetically seal the latter so as to prevent evaporation under heat or the escape of the aroma of the corn. When packed the cans of corn are to be exposed to steam or boiling heat for an hour and a half, then puncture the cans, and immediately seal the same while hot, and continue the heat for two hours and a half longer. Afterward the cans may be slowly cooled in a room at the temperature of seventy to a hundred degrees Fahrenheit. Indian corn thus packed and treated, the patentee states, may be warranted to keep in any climate. Being preserved in its natural state, as near as possible, it retains the peculiar sweetness and flavor of fresh green corn right from the growing field, and it is only necessary to heat the corn in order to prepare it for the table, as it is fully cooked in the process of preserving. What the patentee claims in that case is—

The described new article of manufacture, to wit, Indian corn, when preserved in the green state without drying the same, the kernels being removed from the cob and packed in cans hermetically sealed and treated substantially in the manner and for the purpose set forth in the specification.

The second patent purports to embody an invention for a new and useful improvement in preserving green corn, or, in other words, the patented invention is for the process of manufacturing the new product described and patented in the first mentioned letters patent. *

Two other patents are set forth in the bill of complaint, but it is clear that the patents are each for the new and useful improvement in the process of preserving green corn, and that they severally embody substantially the same invention as that described in the second patent. *

The third and fourth patents described in the bill of complaint are void. More than one patent for the same invention cannot be legally issued by the Commissioner, but the irregular issuing of the second patent cannot impair the right of the patentee under the first patent, if it was valid at the time it was granted. Tested by these rules of decision, it is quite clear that the bill of complaint as to the third and fourth patents must be dismissed, but that the complainants are entitled to a decree for an account and for an injunction for the infringement of the first and second patents, unless the defenses, or some one of them set up by the respondent, are sustained.

The first defense is that the patentee is not the original and first inventor of the respective improvements. *

Evidence was introduced by the complainants, of the most satisfactory character, showing that the patentee, Isaac Winslow, of Philadelphia, discovered the patented process of preserving green corn early in the year 1842, and that he made successful experiments in reducing his invention to practice at Westbrook, in the State of Maine, during the latter part of the summer or in the early part of autumn of that year, leaving no doubt that the process discovered was the same as that described in the second patent, on which the suit is founded. *

Much examination, in detail, of the parol proofs introduced by the respondent, to show that the patented process was known or used in the United States before the early experiments made by the patentee, may well be omitted, as it is not pretended, nor can it be, that any other person, resident in this country either before or since that time, ever invented such a process; and a careful scrutiny of the evidence given by those witnesses as to what was in fact done by the several deponents will show that no one of them ever preserved any green corn, in the mode of operation substantially described in the specifications of the patents, until the witness, in some way and to some extent, became acquainted with the process of the patentee, either from rumor or from some one who had assisted the patentee in making those experiments, and in most cases not until years after the invention was made, and in some cases long after the patentee had filed his application for letters patent in the Patent Office. *

Beyond all doubt, the patentee was the original and first inventor of the process in the United States, and sufficient appears, even in the proofs introduced by the respondent, to convince the court that the first knowledge which those witnesses ever had of the patented process was procured, directly or indirectly—as by report or rumor—from persons residing near the place where the experiments of the patentee were made, or who had at some time been the employees of the inventor and had assisted in his experiments. *

Next the respondent insists that the process described in the English patent to Peter Durand supersedes the invention of the assignor of the complainant as a prior discovery and for the same improvement. Vegetable substances intended to be subjected to that process, the specification states, are to be put into the vessels selected for the purpose, in the raw or crude state; but the patentee, in enumerating the articles to be preserved, does not mention green corn, nor does he state whether the kernels are or are not to be removed from the cob, or, if to be removed, whether the removal is to be effected in a manner to leave the kernels unbroken or by means of a gaged knife, as in the mode of operation described in the complainant's patent, nor is any mention made of preserving green corn or any other vegetable substance in the natural juices of the article, as in the mode of operation set forth in the patent mentioned in the bill of complaint. *

It is quite clear that a careful comparison of the descriptions given of the inventions in the respective specifications, fully justifies the opinion of the learned expert examined by the complainant, that the two patents are essentially and substantially unlike, to which may be added that persons having no other knowledge of the complainant's process than what they derive from perusing the specification of the other patent, would never be able to preserve green corn by that mode of operation. *

Patents otherwise valid may be avoided in a suit for infringement by proof that the invention was in public use and on sale more than two years, with the consent and allowance of the patentee, before he filed his application for a patent, which is the next defense presented by the respondent. *

Nothing short of proof that the invention was on sale or in public use, with the consent and allowance of the inventor, for a period exceeding two years, will support such a defense, as the party charged with infringing the rights of an inventor must bring himself fairly within the words of the act of Congress, which justify the acts charged as an infringement. *

If the sale or use is without the consent or allowance of the inventor, or if the use is merely experimental, to ascertain the value, utility, or success of the invention by putting it in practice, that is not such a sale or use as will deprive the inventor of his title. *

Tested by those rules, as the case must be, it is quite clear that the defense under consideration must be overruled, as there is no evidence in the record to show that the inventions, or either of them, were in public use or on sale more than two years before the inventor applied for a patent, or for any shorter period, with the consent and allowance of the patentee, or that he had any knowledge of any such sale or public use at the time it was made. *

Inventors have a right to employ all means necessary and proper to enable them to perfect their inventions and to reduce the same to practice, and it is clear that no such experimental act can justly be viewed as legitimate evidence to support the defense of a prior unauthorized public sale or use of the invention, or a use inconsistent with the right to apply for a patent to secure the exclusive authority to make and use the invention, and to vend it to others to be used, as provided in the patent act. *

As pleaded, the defense is that the inventor abandoned the invention to the public before he filed his application for a patent. His first application was filed on the 8th of March, 1853, and he filed the second application on the 18th of February, 1862, which it is conceded is substantially the same as the first one, which is still on file in the Patent Office. Evidence of an affirmative character to show that the inventor ever uttered a word or did an act signifying his intention to abandon his invention to the public before he filed his first application for a patent is entirely wanting, nor is there any circumstance introduced in evidence to support that theory, except the mere lapse of time from the discovery of the invention to the filing of the application, and it is settled law that the mere forbearance to apply for a patent during the progress of experiments, and until the party has perfected his invention and tested its value by actual practice, affords no just grounds for any such presumption.

Apply that rule to the present case, and it is clear that the proofs furnish no ground for such a presumption before his first application was improperly rejected by the Patent Office. Such an adverse decision operates as a great discouragement to an indigent inventor, as was strikingly illustrated in the case of the inventor of the improved mode of manufacturing wool, who, in consequence of such a decision, was kept out of the enjoyment of the fruits of his genius for forty years.

Abandonment or dedication of an invention to the public, being in the nature of a forfeiture of a right, is not favored in law, and Mr. Justice Nelson decided that such a defense could not be sustained, unless the acts of the party invoked for the purpose were corroborated by some declarations manifesting such an intention; but it is not necessary to apply that rule in this case, as the evidence fails to disclose either any act or declaration to support the theory. Argument to show that the inventor was entitled to a patent at the time his first application was rejected is unnecessary, as the proposition stands confessed by the Patent Office. Nothing beyond the decision of the Office reversing their former action would seem to be required to establish that proposition. * Truth was crushed for the moment, but, happily for the cause of justice, the reasons given for the erroneous decision remained on file, which enabled the Office, at a later period, to correct the error and to do justice to a meritorious inventor. *

Delays in the Patent Office, which an inventor cannot prevent, will not impair his title to his invention, nor can any use of the invention during such delays, if with his consent and allowance, afford any evidence to support the issue that the inventor abandoned the invention to the public. *

All must agree that he did not intend to dedicate it to the public, as his application for a patent was then pending in the Patent Office, and the evidence shows that he continued to press it, with confident hopes of success, until the adverse decision was announced. Nor does the record exhibit any evidence to show that the invention got into public use with the consent and allowance of the inventor, or through any negligence or improvidence on his part, as it appears that he visited the Patent Office as often as it was necessary, to ascertain whether the opinion of the Commissioner had undergone any change, and that he presented his second application for a patent as soon as he could obtain any hope of receiving a decision in his favor. *

[*Wm. Henry Clifford*, for complainants.

R. K. Sewall, Bradbury & Bradbury, A. A. Strout, for respondent.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From June 6 to June 11, 1873, inclusive.

CASTING ROLLS.—G. G. Lobdell, Wilmington, Del.
HYDRAULIC HOIST.—T. Stebins *et al.*, San Francisco, Cal.
ENGRAVING MACHINE, ETC.—H. D. Sedgwick, New York city.
GAS BURNER.—T. Clough, New York city.
IRON FURNACE.—G. E. Harding, New York city.
LOCOMOTIVE ENGINE.—H. Fairbanks, St. Johnsbury, Vt.
PRESERVING IRON.—W. H. Sterling, San Francisco, Cal.
RAISING COAL, ETC.—A. Lawton, Elizabeth, N. J., *et al.*
REFINER.—W. Neil, San Francisco, Cal.
REFRIGERATOR.—T. D. Kingan, Indianapolis, Ind.
ROLLING MILL.—W. Sellers, Philadelphia, Pa., *et. al.*
UMBRELLA FRAME, ETC.—A. and I. Herzberg, Philadelphia, Pa.
WASHING DISHES, ETC.—A. Fischer, New York city.

Recent American and Foreign Patents.

Improved Sewing Machine.

Lebbeus W. Lathrop, Philadelphia, Pa., assignor to Lathrop Combination Sewing Machine Company, of New York city.—This invention, which was fully described and illustrated in the SCIENTIFIC AMERICAN for October 26, 1872, relates to improvements in sewing machines, and it consists, first, in a combination of a rotary looper and an oscillating looper with a spool carrier and needle, the rotary looper being so constructed that the loop will not only be extended so that a commercial spool may be employed for introducing the locking thread to avoid the winding of bobbins for shuttles, new necessary in the common lock stitch machines, also much of the friction due to shuttle machines, but it is also so contrived that a chain stitch, also a combined lock and chain stitch, can be made. The second part of the invention consists in an adaptation of the revolving loop opener, and application of a shifting pin thereto, for so adjusting the loop, as it is opened for passing the locking thread spool through it, that a chain stitch will be formed by the upper thread, the lower thread being dispensed with; also so that a combined chain and lock stitch can be made, the lower thread being included. The third part of the invention consists in an arrangement of operating gear for working the loopers; also the feed, the revolving looper, together with the bulged palate for holding the discharged loop to avoid kinking. The fourth part of the invention consists in a construction of the metal case of the machine or cover for the working parts in sections, and jointing them together in such manner that by swinging the jointed parts the work below may be exposed readily at any time for inspection, oiling, and adjusting, while the plate on which the sewing is done remains stationary.

Improved Offal Drier.

Matthew Anderson, Chicago, Ill.—For drying and deodorizing the offal of packing houses rapidly and efficiently, it is proposed to have a jacketed cylinder, to be heated with steam, in which the offal will be inclosed, the said cylinder containing an agitator to stir the offal rapidly, and having air-pipes for discharging heated air throughout the mass at the same time. The air is heated in a coil surrounding the steam jacket, which connects with the shaft of the agitator, which is hollow, and conducts the air, which is to be forced in by a pump or blower, to perforated tubes on the agitating blades, from which it is distributed so as to circulate thoroughly through the substance to be dried, and then allowed to escape through a pipe to carry off the odor to a fire, if preferred, where it may be burned.

Improved Apparatus for Freezing Liquids.

Francesco Sajno, of Milan, Italy.—This invention is an improvement in the class of apparatus for freezing liquids wherein a horizontally arranged hollow rotating cylinder is employed. An outer cylinder is jacketed with a non-conducting material to protect the freezing mixture from the heat of the atmosphere. It has contracted ends, which are provided with screw caps, which close the openings so that the water of the freezing mixture will be held in the space below the joints as the cylinder is revolved, so that it cannot leak out. The inner cylinder, for holding the liquid to be frozen, is permanently attached to one end of the outer cylinder, so that the cap of that end opens and closes the passage to it only; also so that, in case the water rises as high in the outer cylinder as the joint, it cannot leak into the liquid to be frozen. Longitudinal plates divide the space between the cylinders into several compartments to confine the freezing mixture equally. A stationary rod in the axis of the inner cylinder has a scraper and kneader on it to scrape the frozen liquid off the surface where it freezes before the middle portion, and stir and knead the mass to facilitate the equal and uniform action. This rod can be removed with the cylinders when taken out o the bearings.

Improved Revolving Cotton Lint Room.

William T. Crenshaw, Burton, Texas.—This invention consists of a lint receiver of two or more compartments or rooms arranged so as to revolve on a vertical axis. Each compartment is provided with inlet passages for lint and doors for taking out the same, so arranged that while the inlet passage of one room is at the gin stand, where the lint will be delivered into it as it comes from the gin, the door of another room will be at the press, whereby the ginning and pressing may be carried on continuously without the hands being exposed to the dust.

Improved Axle and Axle Box for Vehicles.

Friederich Hunsinger, Morrisania, N. Y.—This invention consists in the improvement of axle boxes. Grooves or recesses are made in the bearing surface of the box, which operate as reservoirs for the lubricating material. The box is fitted to a collar, and a nut is so fitted to the axle that when turned up it makes a joint with the end of the box, and confines the oil or other lubricating material. The ends of the box will become worn after a while so that more or less of the material will escape, but the axle will still be lubricated from the material retained in the grooves and retarded by a shoulder or offset.

Improved Ribbon Block.

William Obrist, New York city.—The object of this invention is to furnish to manufacturers and importers of silk and other ribbons an improved ribbon block. This invention consists of a cylindrical tube, rolled of a cylindrical strip of cheap straw or other paper, the layers of which adhere by the application of some cheap mucilage or paste. This tube is strengthened sidewise by wooden disks, forming therewith a strong cylindrical ribbon block.

Improved Wardrobe Bedstead.

Edward Hunter and Daniel Van Sickle, Chicago, Ill.—This invention belongs to the class of folding beadsteads designed to form, when folded or not in use, a compact ornamental article of furniture ; and it consists in the arrangement of the foot legs to serve as an upper side finish of the imitation bureau formed by the bedstead when folded, and also to lock or secure the two parts thereof together.

Improved Combined Umbrella and Cane.

T. R. Lambert Chevers, Hoboken, N. J.—This invention has for its object to furnish an improved device which shall be so constructed that it may be readily adjusted for use as an umbrella or a cane, as may be desired, and which, when adjusted for use in either capacity, shall show no indication of any other use. The invention consists in the hollow handle provided with a detachable cap and a detachable ferrule to adapt it for use as a cane.

Improved Mortar Mixer and Grinder.

Edward Spaulding, Keene, N. H.—This invention consists of a series of rotary mixers suspended in a mixing vat from a reciprocating carriage, on which they are moved forward and back across the vat, and, at the same time, revolved for mixing the lime and sand. The invention also consists of another vat by the side of the mixing vat, with a grinding mechanism at one end, into which the lime and sand, after being mixed, are discharged to be worked through the grinder, while another batch is being prepared in the mixer. The machine is designed to be arranged on wheels, to be moved from place to place conveniently, and will be arranged for being worked by horse power or in any preferred way.

Improved Sole Channeling and Heel Burnishing Machines.

Caroline Vrooman, Boston, Mass., administratrix of Henry S. Vrooman, deceased.—The first invention consists in the improvement of machines for channeling the soles of boots and shoes. The pattern upon which the leather sole is laid to be channeled approximates nearly to the shape of the sole, so that soles varying somewhat in size and shape may be channeled on the same pattern. The edge of the pattern is a cogged rack, which gears with two small spur wheels, and is held in gear by means of a roll which bears against its inside. The roll revolves on a pin in a slide, which is forced up by a spiral spring, and the spur wheels are revolved by suitable means. For the removal of the pattern the roll and slide are forced back by means of a lever. A movable arm which projects over the bed may be moved laterally. A suitably arranged lever on the side of the arm carries a roller on its front end which bears upon the sole and keeps it down firm on the pattern. Attached to the back of the movable arm, by means of a hinge, is the adjustable guide, which is forced outward from the arm by a spiral spring, and bears against the edge of the sole as the pattern is revolved. By the pressure of the foot communicating motion to a cord, the arm is swung back for the removal of the pattern and placing the sole. The knife or channeler and the groover are also adjustably attached to the end of the roll lever. The knife and groover partake of the movement of the roller, and are raised and lowered by means of a cam lever. To operate with the machine the cam lever, which lifts the knife, groover and roll, is pressed down. Then, by pressing with the foot on the treadle, the arm is swung back, or to one side. The sole is then placed on the pattern and the treadle released, which allows the guide to press the sole. Then the lever, which throws down the roll and knife, is lifted, and by turning the crank the sole is revolved, and the channeling is completed. The top of the pattern is cross serrated, with spurs therein to hold the sole. The same inventor has also devised an improved machine for burnishing and polishing the heels of boots and shoes. The frame or bench consists of two stands and connecting plate. A spindle is hinge jointed, and slides in a threaded tube. The latter is adjustable in the socket of the stand, and clamped at any point of adjustment by a screw passing down through said socket. The spindle is in two parts, hinged together, so that one part can be turned one side to facilitate the putting in and taking out the shoe. A hand wheel nut works over the externally threaded tube, and against a shoulder on the spindle, to force the latter forward into the shoe and the shoe against the heel piece. When the shoe is placed in the machine it is given a revolving motion of about two thirds of a revolution by turning a crank, which can be increased or diminished, and the shoe turned more or less, as may be desired. The burnisher is adjustably attached to the end of a beam, to which is given a longitudinal motion. By bearing down on a suitably arranged treadle the outer end of the box and burnishing beam are tipped down, which raises the burnisher from the heel. A cavity in the burnisher is connected by means of a hole with a gas burner for heating the burnisher, if a high temperature is desired, but the burnisher is readily removed and heated and replaced, if required.

Improved Lamp Bracket.

George Jones, Peekskill, assignor to Thomas J. Fisher, New York city.—This invention consists in forming on the ring a projecting ear with double steps, and a similar projecting ear on the arm, so that, when the two ears are placed together, with their steps overlapping each other, a pin may be placed through the two ears to firmly lock the parts of the bracket together.

Improved Fireproof Roof.

Niels Poulson, New York city.—The object of this invention is to construct a strong, durable, and fireproof French roof of cast metal, for the purpose of avoiding the combustible material of which they are built at present. The invention consists of cast iron plates of suitable size, joined firmly together by means of outside ribs or caps and interior bolt arrangement, representing an elegant front, impervious to atmospheric influences and absolutely fireproof.

Improved Fly Protector.

Isaiah Daugherty, Rocky Station, Va.—The invention consists in a box-like case of suitable dimensions, with common or wire gauze for the admission of air and light, an entrance door, and a lounge or bed, book case, table, chair, and other pieces of furniture placed therein, the whole, movable on casters, forming a safe retreat against flies, mosquitoes, or other insects.

Improved Machine for Moving Logs.

George M. Hinkley, Milwaukee, Wis., and Alexander Rodgers, Muskegon, Mich.—This invention is an improvement upon the log turning machine patented to A. Rodgers on March 19, 1872, and consists in the application of a jointed push bar and certain actuating devices to the turning apparatus heretofore used for turning logs on the carriage, and whereby the logs may be rolled from the log way on to the carriage of a saw mill by power.

Improved Machine for Cutting Webbing.

William A. Rice, Bristol, N. H.—This invention consists of a shears for cutting webbing mounted on a stand with one blade fixed and the other movable, and worked by a foot motion, the stationary blade being provided with small nicks across the edge to prevent the webbing from slipping, the movable blade being held against the stationary one by an elastic washer surrounding the pivot bolt, and compressed against the blade by it.

Improved Instrument for Cleaning Gun Barrels.

William E. Turner, Fort Snelling, Minn.—The object of this invention is to provide ready and efficient means for cleaning and burnishing the inside of gun barrels ; and it consists in an instrument formed of a tube and movable central rod, and an expansible cluster of wire or similar material, the latter being expanded and adjusted to fit barrels of different caliber, or to give more or less friction to barrels of the same caliber by means of a screw thread and nut on the rod.

Improved Eye Glass.

Arthur D. Ansell, Hartford, Conn., assignor to Lazarus, Moses & Co., New York city.—The object of this invention is to improve the arrangement of springs on an eye glass so as to obtain a firm hold on the nose and bring the diameters of the lenses in line with each other when they are worn. The invention consists in connecting the glass frames with the bridge by suspension springs, so that the use of pillars, clasps, or spiral springs will be dispensed with, and so that the points of said springs will hug the glass frames when the latter are closed.

Improved Grain Drill.

George A. Pursley, Pittsfield, Ill.—This invention relates to a combination of springs and adjusting devices for graduating the force with which the flukes or seed tubes are pressed into the earth. By suitable arrangement the downward movement of a bar compresses springs and causes them to press upon the draft rods, and thus hold the flukes down to their work with a yielding pressure, so that said flukes may be held down with a greater or less pressure by moving the bar down or up. In triangular plates, which are pivoted at their angles to the side bars of the frame, are formed cam slots to receive pins attached to the bar so that the said bar may be drawn down by moving the said plates upon their pivots. The plates are connected and caused to move together by a pivoted bar.

Improved Soldering Compound.

Cary Cox, Covington, Ga.—The object of this invention is to improve and simplify the cost of soldering tin, copper, and similar wares ; and it consists in a compound for soldering, composed by combining muriatic acid, sal ammoniac, sulphate of copper, zinc, and water. The solder is preferably used in the form of wire, the end of which is dipped in the compound, and applied to the heated surface of the article to be soldered. By this process no soldering iron is required. The heat is applied by means of the flame of a lamp or heated iron upon the opposite side.

Improved Carriage Spring.

Thomas H. Wood, New York city, assignor to J. B. Brewster & Co., of same place.—This invention relates to an improved arrangement of transverse springs on light wagons, and has for its object to combine, in a wagon supported on single transverse springs and side bars, the advantage of elasticity, double elliptic transverse springs, and of the deep setting of the body obtained at present by using the single springs. Upon the axles are fastened the middle portions of transverse springs, the ends of which are secured to side bars. These side bars are made of hickory wood or other material, and aid, with whatever elasticity they may possess, in making the support of the body yielding. To the under side of the carriage body are secured transverse springs, the ends of which connect by suitable couplings with the side bars. The springs can be made of metal or wood or other material, and are semi-elliptic or flat springs, in contradistinction to the full elliptic springs heretofore used as direct supports for carriage bodies on their axles.

Improved Children's Photograph Chair.

Mark H. Prescott, Jr., La Crosse, Wis.—This invention consists of a vertically adjustable head rest at the back of a child's chair, in combination with an adjustable back and band for waist, for supporting small children steadily, so that they can be photographed clearly and accurately.

Improved Blast Furnace Alarm Apparatus.

Edwin Davis, Millerton, N. Y.—This invention has for its object to improve the construction of hot blast furnaces, to enable the escaping gases to be more effectually utilized for heating the air before it is driven into the furnace, and to indicate when the furnace is ready for another charge. The invention consists in the employment of a cover for closing the part of the furnace top outside of the air-heating chamber. To the forward edge of the cover is attached a chain, which passes over a guide pulley pivoted in the upper part of the flue, and to its other end is attached a weight, which so nearly balances the cover that said cover may be readily raised and lowered. A small weight is attached to the lower end of another chain, which chain passes up through a hole in the cover, passes over a guide pulley, pivoted in the upper part of the flue, and its other end is attached to the weight, so that, as the weight descends when raising the cover, the other weight may be drawn upward out of the way when charging the furnace. The small weight is designed to rest upon the ore in the furnace, and descends with said ore, straightening out another set of chains, so as, when the ore has descended so low that the furnace requires another charge, said charge will sound a gong to notify the attendant.

Improved Automatic Fire Alarm.

Henry L. Brown, Middletown, Conn.—It is proposed to have a small tube of lead, or other substance easily destroyed by fire, running throughout the building, where it will be exposed and burn off in case of fire in the building, and connecting with a collapsible air holder, inflated and connected with a lever and a spring, so that when the tube is burned and the air escapes the spring will move the lever and cause it to release a bell hammer of an alarm mechanism to allow it to be set in motion by its actuating spring to sound an alarm.

Improved Automatic Fan.

Jacob Lehner, Galena, Ill.—The object of this invention is to furnish an adjustable fan attachment for bedsteads, cradles, etc., by which the fanning is accomplished by the motion of a rocking chair, which may communicate to a cradle also the rocking motion. By attaching the fan arrangement to a cradle and placing the same on a bottom frame with lateral grooves, connecting the rocking chair by a rod with the cradle, the operation of fanning and rocking is accomplished at the same time, without the least inconvenience to the attendant.

Improved Grain Raker and Loader.

George S. Dudley, Dixon, Cal.—This invention consists in the improvement of harvester rakes. To the rear end of the machine is attached a series of parallel inclined bars, which at their lower end are slotted longitudinally to receive rake teeth. The teeth are pivoted to a cross bar attached to the bottom of the rear end of the frame, and are rounded off upon their forward lower sides to enable them to pass readily over any obstruction or unevenness of surface. By pressing a suitably arranged loop down into a vertical position, the rear ends of the teeth will be depressed, raising their forward ends away from the ground for convenience in turning or passing from place to place. Guide rods are inserted in the upper forward part of the teeth, and work up and down freely as the teeth move upon their pivots. The forward part of the machine is supported upon caster wheels, and its rear part upon wheels, one of which revolves loosely upon one journal of a cylinder or drum and the other is rigidly connected with the other journal of said cylinder, so as to carry said cylinder with it in its revolution. To the cylinder are attached rows of radial arms which are made of such a length that their outer ends, as the cylinder revolves, will sweep through the spaces between the teeth and guide rods without coming in contact with the ground or the framework of the machine. The cylinder has ring grooves formed in it, midway between the arms, for the passage of the prongs of the endless belts which pass around rollers pivoted in bars, which ride upon the cylinder, and the under sides of which have longitudinal grooves formed in them, which, in connection with the ring grooves in the cylinder, allow the pronged belts to pass, while the said ends rest upon the said cylinder. A shaft revolving in the forward part of the top of the frame is actuated by a band from the wheel that drives the cylinder. To the other end of the shaft is attached a pulley, with belting which connects with a shaft to the inclined carrier frame. The upper end of the carrier frame rises so high, and projects so far, that the grain may readily pass from it to the wagon. To the upper end of the carrier frame is pivoted a shaft around which passes an endless apron to which cross slats are attached to prevent the grain from slipping upon said endless apron. By this construction the grain is raised from the ground by the teeth, and from said teeth by the radial arms, the guard rods keeping it from slipping from said arms while being raised. As the arms pass a vertical position the grain falls upon the pronged belts, by which it is carried to the carrier, by which it is deposited upon the wagon.

Improved Sewing Machine Caster.

John H. Plank, Bloomfield, Iowa.—This invention consists of two pairs of bars having a foot rest for a sewing or other machine leg and two casters at one end and lapping each other at the other ends, where they are connected by a clamp screw, so that said foot rests can be adjusted to or from each other for machines of different sizes. These bars are to receive the machine in the said foot rests, so that it can be rolled about and the machine taken off and its legs set on the floor, when it is to sit firmly for use.

Improved Treadle Movement.

John Evans, Rosenhayn, N. J.—This invention consists in causing a spring, slotted at the upper end and applied to the treadle and crank pin, to act as a brake, to prevent the wheel from running backward and bring it always into such a position that it will start forward when turned, without being carried some distance with the hand.

Improved Liquid-Sealed Valve.

Louis Winterbauer, New York city.—This invention relates to barrels or casks of fermented liquors on draft ; and consists in allowing the ingress of air to fill the vacuum made by the withdrawal of liquid while the egress of the gases is prevented. A plug or spigot is designed to be driven into a hole in the upper side of the cask or vessel, and which is made with a projection or arm upon each side for convenience in drawing it out when required. A channel leads up from the inner end and out through one of the arms of the said plug, which arm is so formed as to receive the end of a small rubber tube. The other end of the tube is connected with the case of the valve, which case is made with a detachable bottom which is secured air and water tight. A small tube is connected with a hole in the bottom and extends up to a convenient hight along the side of the body of the case, and its upper end is left open. The hole in the bottom is covered with a small rubber flap, upon which is placed a weight and which is made exactly flat upon its lower side. In using the valve the case is half filled, more or less, with water, or other suitable liquid, so as to closely seal the valve.

Improvement in Coloring Metals.

Joseph Kintz, West Meriden, Conn., assignor to himself and J. P. Clark, of same place.—For coloring cast iron and other metals a dark brown color, the iron is first blacked, then coated with a sizing substance, which is partially dried. Then pulverized black lead is put on and brushed to produce a polish. The succeeding operations are to coat the lead with lacquer, and, lastly, to heat the iron, which produces the desired dark brown color. The blacking is mainly to hold the size.

Improved Beer Cask.

Michael Seitz, Williamsburgh, N. Y.—This invention has for its object to prevent the heads of large beer casks or tuns from being started or sprung by the pressure of the beer in working, and thus prevent the consequent leakage and loss. The invention consists in the combination of the rod having a head upon one end, a nut upon the other end, and screw threads or the same pitch and running in the same direction upon both ends with the cross bars and the heads of the casks. By this construction the threads of the said rod sinking into the wood of the said heads and bars prevent any beer from leaking out around the rod.

Improved Automatic Vent Opener for Air Springs.

John Walther, Brooklyn, E. D., N. Y., assignor to Calvert B. Cottrell, Westerly, R. I.—It is desirable to have a vent, in connection with the air springs used on printing presses, to stop the table, by which the air may be allowed to escape from and enter the cylinder freely when the press is running slow at starting and stopping : also when it is being turned over by hand for adjusting, cleaning, or any other purpose ; so that the moving of the press will not be obstructed by the compression of the air in front of the pistons in entering the cylinders, or by the partial vacuum formed behind in withdrawing from the cylinders in consequence of the leakage past the pistons in compressing the air. It is also desirable to have the vent so arranged that it be opened automatically when the press stops running, and closed in the same manner when it starts, to avoid the attention and labor necessary to do it by hand. This invention consists of a valve which is automatically opened by either gravitation or by the suction of the piston of the air springs, or by the same and gravitation, and closed by the air compressed to form the spring, without the aid of intervention of any apparatus for actuating it.

Improved Oil Can.

Henry Keller, Sauk Center, Minn.—This invention consists of a cylindrical body with flat ends, arranged horizontally on legs, with a filling tube the top, the spout on one side and a stationary handle on the other, and swing handle on the top side of the cylinder. The object is to have a can which will not be subject to the wear, as the ordinary cans are, on the bottom, and will be less liable to turn over when full in consequence of being top heavy, and will not cause its contents to spurt out on the ground.

Improved Journal Box.

John A. Althouse, New Harmony, Ind.—This invention relates to the construction of journal boxes for shafting and similar purposes; and consists in the mode of tightening the box to the journal when, from wear or other cause, it has become loose. It consists of the base, the cap, and two adjustable side sections. The base may be the plate of the pillow block, or it may be a separate plate. The cap fits on to the top of the pillow block and journal in the ordinary manner. The adjustable side sections are made with the back of each section recessed or cut away, with flanges which fit on the ends of the pillow block, and with the projecting lips which inclose and hold the adjusting screw. The back side of the section is cut on an incline. The adjusting screw is attached to a movable block with inclined face, and is provided with a collar. The block is allowed play up and down ; and the inclined surfaces of the section and block being reversed and placed in contact with each other, and the screw stationary longitudinally, it will be seen that, as the screw is turned, the block will be moved up or down, according to the direction in which the screw is turned, and will act as a wedge.

Improved Furniture Caster.

Cevedra B. Sheldon, New York city.—This invention consists of a collar on the under side of the horn which is formed on punching the pin hole, which gives the requisite thickness and strength to the horn at that point, and enables the stamping or striking out the horn from sheet metal. It also consists in a flanged socket, stamped or struck up.

Improved Stop Cock.

George W. Eddy, Waterford, N. Y.—This invention consists in the improvement of stop valves. It is proposed to pivot the two valves by ears to a cross head, which screws up and down the valve stem, and to arrange the pivot pins in inclined slotted round holes, which are so inclined that when the disks cease their downward movement the further down movement of the crosshead will force the disks against their seats, and at the beginning of the up movement draw them away from the seats. Cams or dogs are also pivoted to the crosshead on the same pins that are used for pivoting the disks, and have an eccentric face acting on the back of the disks, and a projection extending to within a short distance of the valve stem so as to be acted on by a collar on its lower end. By this arrangement, when the crosshead is screwed down on the stem till the stems of the cams are brought against the collar, it will, by its action on said stems, force the cam faces powerfully against the disks, and thus greatly aid the pivot pins and the slots in pressing the disks against their seats, both to close them tightly and to strongly resist any impulses of the water against them. The cams are arranged in slots in the crosshead, by which they are placed in the plane of the axis of the disks and the valve stem. The right hand threaded part of the stem screws through a nut in the cap below the stuffing box when the stem has endwise motion, to raise the lower end of the stem above the water way when the valves are open, and return it to the working position when the valves are closed, while the raising and lowering of the disks with the cross head are effected by the steam, by reason of a reversely threaded part which moves the crosshead down by the same movement that screws the stem down, and up by the same movement that raises the stem.

Improved Apparatus for Assorting Nails.

John Coyne, Pittsburgh, assignor to himself and Robert Chessman, Etna, Pa.—This invention has for its object to provide a simple device for assorting cut nails. This apparatus is constructed somewhat on the plan of certain screw feeders in use in this country and in England—that is to say, of inclined plates so arranged with a central angle plate as to form slotted or open channels or gutters between them, through which the refuse metal and headless nails will pass, and thus be ready for removal for economic purposes. To adapt the apparatus for separating nails of different sizes, as carpet tacks from shingle nails, etc., or for analogous purposes, the inclined side plates are made laterally adjustable.

Improved Breech Loading Fire Arm.

John Sidney Heath, of Thomas Street, London, England.—These improvements are exclusively applicable to breech loading fire arms, more especially those in which fixed ammunition is employed. The object of the invention is, principally, to prevent the premature or accidental discharge of fire arms ; and it consists in the provision of sliding bolts for locking the firing pins, the same being operated by a thumb lever arranged to project throug the gun stock.

Improved Washing Machine.

Elias M. Hodgson, Stanhope, N. J.—This invention is an improvement in the class of washing machines having a fixed and swinging or vibrating presser board. The improvement relates to the construction of the face of the presser boards, the same being grooved longitudinally and transversely to form rectangular projections or blocks, and perforations being formed in the grooves in such a manner that, when the boards come together, the blocks of one board will strike against those of the other, and the horizontal and vertical grooves in one board will come opposite those in the other, and the water be expressed through the holes.

Improved Loom for Weaving Piled Fabrics.

Edward Pickford, New Brunswick, N. J.—For withdrawing the wires used in weaving pile fabrics, a hook is provided with a guard on one side of it to wear against the side of the wire head, to which the wire is attached, to prevent the hook from shifting so far over as to engage the next wire at the same time, and to insure the hook against shifting in the other direction, so as to slip off from the head of the wire. The face of the hook, and also the face of the shoulder of the plate or head of the wire with which the hook engages, is made like a half dovetail, beveled, and relatively arranged with the guard so that they are locked together, and all liability to disconnect during the operation of withdrawing the wire is avoided.

Improved Rotary Churn.

George Walker, Whitley's Point, Ill.—In this invention, the dasher shaft the vertical ribs and inversely inclined arms. By this arrangement, as it is revolved forward, the tendency is to force downward the milk, which, by the bottom and sides of the churn and by the angles between said bottom the sides, is thrown into violent agitation, bringing the butter in a very short time. The churn body can be readily detached and set in a tub of cold water to cool the milk in warm weather, and in cold weather it can be set in a tub of warm water, or upon the stove, to warm the milk, thus enabling the milk to be readily brought to the proper temperature.

Improved Lubricator.

Henry V. Aiken, Gibsonburg, Pa.—In this invention, a large drip cup is arranged on the standard of the lubricator, below the middle oil chamber to secure the drip from above, whether escaping from the blow-off cock leaking or overflowing from the reservoir; the object being to economize the oil and prevent it from soiling the engine. For packing the cocks, a flexible packing jacket is provided, arranged with a tubular follower which is pressed firmly against a washer by a cap to pack it oil tight against the cock; and inside the follower is a spring, to press it snugly into its seat, but not so as to bind.

Improved Musical Instrument.

Marsena Cannon, Salt Lake City, Utah Territory.—This invention is an improvement in the class of musical instruments provided with coiled wires arranged to be struck by hammers, and thus act as substitutes for the wire strings usually employed in pianos. The improvement consists, mainly, in the arrangement of keys and coiled wires, so that the former act on the latter directly, or without the aid of intermediate mechanism.

Improved Hatchway.

George Follett and Adolphus Brummel, Brooklyn, N. Y.—This invention consists of an arrangement of gearing, in connection with sliding hatchway covers, whereby the elevator carriage is caused to automatically open the way for passing through and to close it after passing, so that all danger of accidents by falling through open hatchways will be avoided, and the keeping of them closed to prevent draft in case of fire will be insured. The essential feature of the invention is one or more toothed wheels on opposite sides of the elevator way next to the guides in which the elevator runs, gearing with the sliding door by a rack or racks, and a rack or racks on the top of the elevator carriage, which connect with said wheel or wheels sufficiently in advance of the carriage to throw the door or doors open by the time the carriage rises to the passage, and corresponding rack or racks on the lower end of the carriage connecting with the wheel or wheels, as soon as the carriage arrives above the passage, in such manner as to reverse the action and shut the way.

Improved Water Wheel.

Samuel T. Teachout, Troy, N. Y., assignor to himself and Joel C. Peck, of same place.—This invention consists in a guide rim with annular recess, and in combining flaring flanges with the buckets. An annular flange or rim projects downward from the under side of the top plate as far from the periphery of the disk as the width of the upper part of the buckets. At a point about half way from top to bottom, this flange turns from the vertical line, forming an inverted frustrum of a hollow cone. The buckets are attached there to this flange and flare outward to the lower ends, making a considerable increase in the width. The upper parts of these buckets are so inclined to the radial lines of the wheel as to range at right angles to the line in which the water moves, in passing through the spaces between the the guides so as to get the best results from the impact; and, as to width, they are in such proportion to the spaces between the guides that the water does not spread laterally in coming against them, by which no loss is incurred on that account. By the widening of the lower parts of the buckets, a greater quantity of water can be discharged with buckets of the same pitch or angle than could otherwise be, by which the capacity of any wheel will be considerably increased after the limit in the width of the buckets has been reached, said limit being about one seventh of the diameter.

Improved Carriage Spring.

Thomas Murgatroyd, Hiawatha, Kansas.—This invention consists in improved means for re-enforcing carriage springs. The frame of the carriage is composed of two longitudinal curved rods, laterally connected by metallic cross pieces. The mainsprings, consisting of three or more pairs, are placed longitudinally between the parallel rods and connected with the cross pieces by loops and links. Every pair of springs is applied to wooden seat rests, on which the body of the wagon rests. For the purpose of strengthening and stiffening mainsprings, every corresponding pair is connected about half way between the links and rests by horizontal brace springs, which are applied to the mainsprings by means of buckles and pins. The buckles are fastened to the mainsprings in such a manner that the larger part of the same is placed on the upper side of the springs, and perforated ears are bent under at right angles downward for the reception of links or pins. Into the latter are linked the brace springs by means of upturned loop-like bends. Resting centrally on the brace springs and fastened to them is the cross piece, of wood or other material, which furnishes, by means of vertical rods applied to the outer seat rests, additional supports to the body of the carriage, and by brace rods to the middle rest piece of the same. The foot rest of the body of the carriage is furthermore braced by two or more metal rods, which are applied by screws or otherwise to the lower side of the cross piece, and are adjustable thereon.

Improved Breech Loading Fire Arm.

Agostino Marelli, Milan, Italy, assignor of one half his right to Sante Marelli, of same place.—This invention refers to a breech loading fire arm for rapid firing. The operator places his finger on a guard lever under the piece, bringing it down, when the breech block is moved so as to open the breech of the barrel, thus permitting the extraction of the exploded cartridge and the insertion of a new one. The hammer being caught by a tooth on a projecting stationary appendage is turned on a pivot, thereby compressing a spring, when it is caught by the nose of the trigger; thus the downward motion of the guard cocks the gun, and consequently, after a fresh cartridge is introduced and the guard replaced, the trigger may be pulled, when the firing of the gun takes place. By the former of these movements, the breech block is placed again behind the barrel breech; and by the latter the hammer, being freed from the trigger stop, is thrown forward by the spring and strikes the fulminate in the cartridge. The exploded cartridge is extracted by the down motion of the guard through two angular levers placed in grooves of the box sides and capable of turning on a pivot. In order to ascertain at any time from a mere outside inspection whether the arm contains the cartridge and the hammer is cocked, two indicative pointers are used.

Improved Bed Bottom.

Edwin L. Brockett, Nelson, Ohio.—This invention consists in constructing a compound slat without any additional spring, and supporting it upon a continuous crank wire at the head and foot so as to form a neat cheap, and comfortable bed bottom.

Improved Shoe Last.

Jno. A. Hechenbach & Anton Haertle, Mayville, Wis.—This invention relates to the spring lock bolt that fastens together two sections of a last, and consists in the application thereto of two plates and a hook whereby it becomes unnecessary to cut so near to the upper surface of the last, to make the bolt so long, or to use the ordinary transverse pin by which the last hook is enabled to unlock the sections.

Improved Tin Roof.

Patrick Wall, Allegheny, Pa.—This invention consists in corrugated tin sheeting for roofs, with a plain and smooth portion near each edge, whereby the lap and joints between adjacent sheets may be easily and conveniently made, while the corrugations give the desired stiffness and strength, allow for contraction and expansion, and avoid the tendency of the metal to buckle.

Improved Boot and Shoe Packing Case.

Matthew Euhler, La Moille, Ill.—This invention consists of a case, rectangular and oblong in form, and provided with a series of transverse shelves or partitions placed at such distances apart as will form a series of compartments adapted to accommodate medium or large size books. Each of the compartments thus formed is subdivided into two compartments by means of an inclined partition which is so arranged that the cubical space of the compartments on one side of it equals in the aggregate that of the compartments on the other side. On one side of the partition, the smallest or shortest compartment is at the bottom of the case and the largest at the top, while on the other side the arrangement is reversed, the smallest compartment being at the top and the largest at the bottom. Thus constructed, the box answers as a shipping and packing case in which the boots or shoes cannot become disarranged or abraded by friction against each other, and in which the salesman can select the size he requires without the loss of a moment's time.

Improved Tanning Compound.

John B. Hite, Guyandotte, West Va.—This invention relates to means for preventing the formation of an incrustation upon the surface of leather which is being tanned, whereby it is often rendered hard, inflexible, and, to a great extent, impermeable to the tannic acid. This invention causes the hide to become rapidly saturated with the tanning liquid, thoroughly softened, and also rendered tough.

Compound for Destroying the Cotton Worm.

William B. Royall, Brenham, Texas.—This invention relates to compounds for killing bugs and insects that infest, eat and damage the leaves of growing vegetation. It consists in combining a poisoned adhesive and a diffusive ingredient in one and the same compound.

Improved Electro-Magnetic Telegraph.

George D'Infreville, New York city.—The invention consists mainly in so connecting a telegraph apparatus at two stations that messages may be sent simultaneously from opposite directions over the same wire, and also at different times. There is one main wire between two stations, connected with similar poles of the two batteries. When one of these batteries alone is set in action by the depression of the key near it the current passes from it over the wire; when the other battery only is brought into play the current will pass in the opposite direction over the same wire. Thus far all is plain. Now comes into play the invention, which allows the transmission of messages simultaneously in opposite directions over the same wire—not the transmission of simultaneous opposite currents, but of messages. This object is obtained by so connecting the local battery with the relay at each station that it will be set to work and give an impulse to the sounder by the cessation of the current over the main wire. The operator will thereby be enabled to receive a message partly by the main current, if uninterrupted, partly by the induced current when the main is interrupted. Thus, if two parties, A B, telegraph each other, at once, over the same wire, and both depress the keys at once, A will, by B's local induced current, receive a signal as long as B depresses his key; as soon as A raises his key, B's being still depressed, the main current from B's station will go to A and continue the signal, the same as the local gave it to him before. The same will be the effect on B's side. While both keys were depressed, B too received a signal by his local, which was put in action by the very absence of the main current toward him; and he too will receive signals, *via* main current, when B raises his key from the main wire. In other words, the local current is in action when the main wire is interrupted, and gives, therefore, a sort of negative message—that is to say, it records at one station the interruptions of the main current produced by the attempt to send a main current from the other station, but only records such interruptions when the same are occasioned by a simultaneous depression of both main keys. Thus simultaneous messages can be sent in opposite directions over the same wire. When the main current only is started at one station, both relays will be magnetized so as not to allow the local batteries to come into play.

Improved Trunk Catch.

Henry C. Faber, Utica, N. Y.—This invention has for its object to furnish an improved catch to take the place of straps usually employed for holding the cover or lid down to the body of the trunk to relieve the lock from having to sustain the strain. It consists of an improved trunk catch formed by the combination with each other of a top plate provided with a tongue having a slot formed in it, a bottom plate having a wide transverse slot into which is fitted a bar which is hinged at one end, and is provided with a spring at said hinged end to throw it open when unfastened, a spring, and a latch with a spring attached. Upon the inner side of the free end of the hinged bar is formed a catch hook, to enter a notch in the latch and fasten the said bar when closed down. The latch is bent to pass around the lower end of the tongue, and its lower end is pivoted to the lower plate. It is held up by a spring attached to the plate. A stem which passes through a slot in the side flange of the plate is attached to or formed upon the upper end of the latch and has a thumb piece formed upon its outer end for convenience in operating the latch to release the bar. Upon the inner side of the hinged bar is formed a lug to pass through the tongue and thus fasten the parts together.

Improved Corn Planter.

Daniel F. Taft, New Bedford, Mass.—This invention consists in the improvement of corn planters The seed hopper is secured to the rear side of the axle. To the bottom of the hopper is pivoted or hinged the forward end of the spout, which is curved downward and rearward, and in which is formed the hole through which the seed escapes to the ground. To the spout, a little in front of the discharge opening, is attached the standard of the plow for opening a furrow to receive the seed. The rear side of the standard of the plow is concaved, to adapt it to serve as a channel to guide the seed to the furrow. The standards of the covering plows are attached adjustably to the sides of the rear end of the spout, so that they may be adjusted to cover the seed to a greater or less depth, as may be desired. Arms are attached to the rear end of the spout to which are pivoted the wheel by which the soil is pressed down upon the seed. One part of the face of the wheel is so formed as to mark the hills. The dropping slide moves back and forth in the rear part of the spout to drop the seed. The rear part of the slide, made with an offset, is connected with the arm, so that the said arm may serve as a guide to the slide in its movements. A pin at each revolution of the wheel strikes against this offset and moves the slide forward. As soon as the slide is released from the pin it is moved back by a spring. By suitable arrangement of shafts and gear wheels or equivalent cranks, the two wheels will be made to revolve exactly alike, so that the hills will be planted directly opposite each other, enabling the planting to be done in accurate check rows.

Improved Wheel Plow.

Isaac B. Green, Gillespie, Ill.—This invention consists in the improvement of wheel plows. In connection with the usual mechanism, a pendent standard and guide are arranged under the axle and combined with a two barred plow beam. By this construction, by operating a lever, the plow may be easily raised from the ground for convenience in turning or passing from place to place. The lower end of the standard passes through a slot in the frame, and is secured in place by a wedge key driven through it below the said frame. All the parts by which the plow is connected with the frame may be moved laterally toward or from the furrow wheel to adapt the machine to be used with a two three or four horse team, as may be required.

Improved Hub Band for Vehicle Wheel.

George H. Johnson, Bridgeport, Conn.—This invention consists in the improvement of trimming bands for wheel hubs. The iron band of the outer end of the hub of the carriage wheel, to which the ornamental trimming band of ductile metal is to be applied, is cylindrical, or it may be of flaring or bell shaped form. A cylindrical band of brass or other soft fine metal capable of being spun and of being polished brightly is formed so as to fit in the iron band, and is provided with a collar at the inner end, the collar being made to fit against the end of the hub. At the outer end of this band it is provided with a flange, bending back parallel with the part to fit on the outside of the iron band, making a deep annular groove. To attach the band the inner surface of the main part, also the outer surface of the flange, is coated with a solution of Spanish whiting to protect it from the solder or other composition for uniting the bands, and then dipped in a bath of melted tin metal, to coat the surfaces to be united with the iron band. A coat of solder is next applied. The two parts are then placed together, melted solder is poured into the cavity, which fills the said cavity and rises up between the flange and the iron band, and unites with the coated surfaces of each, and secures them firmly together.

Improved Railroad Frog.

James Brahn, Jersey City, N. J.—This invention has for its object to furnish an improved railway frog, made of ordinary rails. Bars, which extend along the sides of the point and between said sides and blocks of wood or metal, are secured in place by bolts, that pass through the said point, its supporting blocks and the guard rails and also by rivets. At or near the extreme end of the point the ends of the bars are bent outward, are bolted to the guard rails that connect the rails of the track with the rails of the frog, and are made U shaped, their bend being toward the frog. Each of the U shaped bars is secured in place by one long bolt that passes through it near its bend, through the rails of the frog, and through the outer bars of the joints. The arms of the U shaped bars are secured to the rails and to the outer bars. The U shaped bars thus act as fish plates in forming the joints, and they also act as braces to hold the rails in their proper relative positions.

Improved Stock for Drilling or Tapping Instruments.

George Bunch, Bonnot's Mill, Mo.—The object of this invention is to furnish a convenient device by which nuts may be rigidly placed on and taken off the bolts; also for the purpose of threading nuts and bolts, and for similar purposes. The invention consists of a forked handle frame, having applied between its prongs a cog wheel set in motion by a crank, and meshing into a pinion placed on a hollow cylindrical shaft, with two projecting trunnion heads which are applied to the nuts or, by insertion in dies, thread the nuts or bolts. By setting the crank in motion in the direction required, the nuts may be loosened or tightened, or the bolts or nuts threaded.

Improved Running Gear for Carriages.

Rufus Kline and Robert M. Jack, Pottstown, Pa., assignors of one third their right to Fortunato G. Pompeji, of same place.—In this invention, the main part of the axle is formed of the inverted U shaped bar, arched in the middle. Spindles or journals, made of separate short bars, with a shank behind a collar, are adapted to fit in the ends of the bar. A thin plate extends from collar to collar under the part, and is either welded to the shanks of the spindles or fastened by a stud pin and socket and a clip. This bar or plate is so adjusted as to length that it holds the collars firmly against the ends of the main part of the axle, and its tensile strength is brought to the aid of the main part of the axle in support of the load. The bars of the perch or reach, of which there may be one or more, are made in the same form in cross section as the part of the axle, employing filling pieces at the ends, welded in to attach the clips for connecting the bars to the axle and the bolster. The bolster is also made of an inverted U-shaped bar of the same kind as employed for the axle and the reach, with a thin flat plate upon the bottom fastened to it by clips.

Improved Self-measuring Oil Tank.

Jacob Schalk, Jr., Guttenberg, N. J.—The invention consists in the improvement of self-measuring oil tanks. A number of measuring compartments are filled from a tank in any convenient manner by means of a tube or tubes, or the liquid may be discharged into one compartment and run from that into the others. When any one of the compartments is emptied or drawn off, a suitably arranged valve may be raised to fill it, so that they may all be kept full and ready at all times. By this arrangement the exact quantity required is always measured out and ready for being drawn off, and may be drawn into measuring vessels or directly into the vessel of the customer. In the bottom of the opening is a drip pan, the cover of which is perforated. The tank is made preferably of wood lined with metal, and presents a neat and handsome appearance.

Improved Knife Cleaner.

Timothy Gingras and Louis Gingras, Buffalo, N. Y.—The object of this invention is to furnish a practical instrument for families, boarding houses, and hotels, by the use of which knives and forks may be quickly cleaned without dust. An outercase is connected by screws and suitable brackets to the wall. An inner box is made movable therein and may be taken out to be used on a table. A drawer and button contains the polishing powder. Above the drawer is a horizontal board divided into two parts by a projecting piece, to which are applied lids fitting exactly into the parts of the board. The inner sides of the lids as well as of the board are lined with strong buff leather pieces glued and riveted to them, so as to adhere rigidly thereto. The polishing powder, with moistening material, is placed on one side and dry polishing powder on the other. The knives are placed between the leather surfaces and first rubbed in the moistened powder slightly, then in the dry powder till perfectly clean and polished. The box is slightly drawn open, so that the escaping powder may drop therein. The lids are not closed when forks are polished, the rubbing of their prongs being sufficient.

Improved Turning Lathe for Wood.

Anderson R. Park, Columbia, Texas.—This invention consists in the improvement of machines for turning saddle trees. The work and pattern carrying spindles are mounted in the heads of a slide, and they are coupled, detachably, with the shaft, which is splined in and slides lengthwise through its driving wheel to move forward and back with the slide, also to turn the spindle. Between the housings the said spindle carries the different patterns used for controlling the action of the cutter wheel through the medium of the guide wheel, the said guide wheel and cutter disk being both mounted on the shaft, which is mounted in the swinging end of the frame which is mounted at the lower end in the axis of the driving shaft. The blanks or pieces of wood to be dressed are carried between the face plate and the tail center on suitable carrier plates or forms, either attached to the said face plate or fitted on an elongation of the spindle, and differing in form according to the different kinds of work to be done.

Improved Sample Holder for Displaying Boots, etc.

Jacob Closs, Decatur, Ind.—The object of this invention is to supply to the trade a sample holder by which shoes and other samples may be exhibited on the outside of the boxes containing the goods, to be easily attached and detached, and holding the samples firmly thereon. The invention consists of a spring holder of strong wire, bent in such a manner that the same can be rigidly connected to the box, and at the same time the samples quickly be placed on the holder or be taken off, the spring action preventing any accidental detaching of the samples.

Improved Breech Loading Fire Arm.

James Aston, of Hythe, England.—This invention relates to that class of breech loading fire arms which are provided with vertically sliding breech blocks; and the principal feature consists in the provision of devices for cocking the hammer ready for firing simultaneously with the descent of the breech block. The devices employed for accomplishing this result consist of a bifurcated claw lever, located within the breech chamber, and provided with a swivel or forked stirrup at its rear end, which engages with a hooked rear prolongation of the hammer, so that, when said claw lever is depressed by means of an external lever handle applied to its fulcrum pin the breech block will be lowered for exposing the rear of the barrel, and the hammer brought to a full cock by means of the stirrup on the claw lever, in which position it is retained until the breech block is elevated when it is disengaged for exploding the charge by means of the ordinary trigger.

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Business and Personal.

Notes & Queries

J. N. F. asks: Is there any cheap white metal, of which castings can be made, that will not melt and that can be furnished as cheaply as common gray iron? Something similar to white wire clothes line is wanted.

E. E. M. asks: If a glass tube $\frac{1}{8}$ inch in diameter contains 1 lb. of mercury, what would be the pressure on a pis on fitted to such a tube for every degree of heat applied?

J. F. C. says: I wish to kill some large trees before cutting them down. What solution can I use for the purpose?

R. H. A. says: An oscillating piston, 2 feet long by 1 foot wide, vibrates on a rock shaft within a properly constructed chamber. Where, in its length, is the location of its average power? The speed, of course, is an element in the calculation, but does not vary the point of average delivery, be it much or little.

G. J. says: I heard a man say a few evenings since that he was the party sent by a firm in England to fit up the first self acting lathe, drill press, and slotting machine that was in any of the Eastern States. What makes me doubt him is that he is a man not over 50 or 55 years of age. Can you give the name of the party who first had the above-mentioned in that section of the country, where they came from, and who fitted them up? [We must ask some of our readers to answer this question for our correspondent, and thereby settle a question about which there is a great deal of dispute. There are many claimants even for the invention of the slide rest. It was described in a patent by Sir Samuel Bentham of England, in 1793, but is claimed to have been first introduced by Mr. Henry Maudsley.]

Answers to Correspondents

S. asks what is the best and simplest mode of measuring power? Answer: There are quite a number of dynamometers in the market, for measuring the power transmitted by a shaft or pulley. Where it can be applied, the ordinary Prony brake is the best. The power of an engine can be determined quite accurately by the use of the indicator. As you do not give particulars, we cannot tell what is the best method for you to employ.

C. H. A. asks: Should a tightening pulley be placed as close as possible to the driving pulley, without regard to the relative size of the driven pulley, or near the smaller of the two pulleys, whichever that may be, in order to increase the amount of contact? It is conceded that, in case of the driving pulley being the larger and the belt being liable to slip on the smaller, the tightener should be put about midway between them. But it is asserted that it consumes more power when placed near the driven than when close to the driver. Is it so, and, if so, why? Answer: The loss of power occasioned by the use of a tightener is the power required to bend the belt under that pulley, and to drive the pulley. It would appear, then, that by placing the tightener near the smaller pulley, there is a greater loss than when it is close to the larger, since the belt requires to be more bent in the former case. This would indicate that the best place to put a tightener is as close to the larger pulley as it can be arranged, to have it work satisfactorily.

J. B. T. asks: Why is it that engineers, firemen and conductors, jumping from moving trains, invariably jump in the direction of the moving train? I say that there would be less danger in jumping in a contrary direction from a vehicle whose speed is equal to that at which a man might jump, which, by the way, is greater than most people are aware of. Supposing I am able to jump at the rate of 10 or 15 miles per hour; if I jump from a moving vehicle of the same rate of speed, in a contrary direction to the moving train, one motion destroys the other and gravity brings me in a vertical line to the earth. Answer: Our correspondent forgets that, although he might be able to jump at the rate of a moving vehicle if starting from a position of rest, it would be very different, if he were to attempt to do the same thing from the vehicle when it was in motion. His body would then be in motion, and it would be necessary to overcome the inertia or resistance to motion in a contrary direction. The amount of work necessary to be overcome would be half the mass of his body, multiplied by the square of the velocity of the vehicle. We imagine that it is because they have found, by experience, that they cannot make one motion destroy the other that conductors and others jump off in the direction of the moving vehicle.

R. A. C. says: 1. Last fall, while riding along in West Tennessee by a black locust thicket, I observed that the trees were killed, root and branch. Not a living sprout did I see. I enquired of the owner how he did this. He stated that on June 22 and 23 he skinned round the trees, taking the bark from the body of the trees all round, leaving a bare space about 12 inches long. He also said that willow trees could be killed in the same way. I chopped around some honey locust last August; and where the work was well done, the trees are dead: but I am still waiting to see if it is a fact that they are killed root and branch. Is this so? 2. How many lbs. of Pittsburgh coal will do the work of one cord of good oak wood, all things being equal? The object is economy in fuel. 3. Is the coal more liable to injure a heavy 2 flue charcoal iron boiler than wood? 4. What is the best known remedy for bleeding at the nose? Answers: 1. It is generally supposed that winter is the best season in which to girdle trees to kill them. We would be glad to hear from some of our readers who have cleared land by girdling the trees. 2. About 1,500 lbs. 3. The coal is not more liable to injure the boiler than the wood is. 4. Probably every one thinks his own remedy is the best, and we must ask our readers, who know of efficient remedies, to favor us with communications. The best remedy of which we have heard is for the person who is afflicted to lie down on his back, without a raised support for his head. Of course, this might not prove to be a universal cure, as specifics are exceedingly rare.

A. L. B. asks: 1. Is there any industrial school in your city or vicinity that prepares men for mechanical engineers without their taking full collegiate, scientific, or classical courses, and of a not very expensive character? 2. Can a man in New York earn sufficient money during the first year at the machinist's trade to support himself? 3. Is there any market in this part of the country for scrap tin? Answers: 1. You may take a free course in mechanical engineering at the Cooper Union, but the instruction is given in the evenings only. At the Stevens Institute, Hoboken, they take special students in mechanical engineering, as also at the Polytechnic College, Market St., Philadelphia. Write to any of these for catalogue and list of studies. 2. Probably not, if you are an apprentice and just beginning to learn the machinist trade. If acquainted with the trade, yes. 3. Yes.

N. J. F. asks: 1. What is the amount of power to be obtained from a flow of water through an orifice 1 foot square? The water is to be taken out of a canal whose surface is 13½ feet above the river, into which the water used for power is to waste. 2. What is the difference between fixing the measuring orifice (1 foot square) at the top of the flume and at the bottom of it? 3. Is the manufacture of red cedar into buckets or pails generally considered a paying business? 4. Is *arbor vitæ* timber as suitable for that purpose as the juniper of the Dismal Swamp? Answers: 1. With the measuring orifice at the top, the useful effect of the water will be about eight horse power. 2. When the orifice is at the bottom of the flume, more water will be discharged through it, and the useful effect of the water will be much increased. 3 Yes. 4. You can only tell by constructing a bucket of *arbor vitæ* timber, and trying it. Generally, the *arbor vitæ* tree is too small to be worked profitably for such purposes.

E. H. B. asks: 1. What is the commercial value of pyroligneous acid and of tar produced by burning charcoal in kilns? 2. What is the best method of securing and storing it for market? 3. What gases are generated by the slow combustion of wood in coal kilns? 4. Can clay pipes, burned like ordinary brick, be rendered sufficiently non-porous to hold and convey water under pressure: and what would be the best material to render the joints watertight? Answers: 1. It depends upon quality and distance from market. 2. When charcoal is burned in heaps, the acid cannot so easily be secured. Retorts are best adapted to the preparation of pyroligneous acid, but kilns or ovens built of brick, with a pipe for carrying off volatile products of distilation, can be employed. In Russia the wood is heaped up on a plot of ground which is somewhat elevated above the level of the soil, and is funnel shaped, the whole being constructed of clay and lined with roofing tiles, on which the tar collects and flows off into a vessel placed in the vault beneath. The wood, generally of coniferous trees, is heaped in 6 to 8 inch layers, and is first covered with hay or dung, next with a layer of a few inches in thickness of sand or earth. The wood in the heap is ignited at the bottom, where 40 to 50 apertures are left in the covering; these apertures being closed with wet sand as soon as the combustion of the wood becomes active and has spread through the whole heap. After 10 or 12 days the tar begins to collect and is removed daily. The smouldering continues 3 to 4 weeks, and the quantity of charcoal obtained is very small. Illustrations of the various forms of kilns employed will be found in Wagner's "Chemical Technology." It may be converted into acetate of lime before sending it to market. 3. The gaseous product of dry distillation is a mixture of inflammable gases, the most important of which are marsh gas and olefiant gas. Where wood is very cheap, illuminating gas is prepared in this way. 4. The chimneys are probably thicker in one place than in another. Try annealing by placing in cold water and slowly heating to boiling; and after boiling some time, cool slowly. 4. By glazing them in the usual way before burning, or by coating with water glass or asphalt, they will be rendered water tight. Try the experiment on a short distance first. Use hydraulic cement for the joints.

S. L. D. asks what is the best, cheapest and most easily applied substance for blasting. "The rock I want to blast is inside a mill; 20 feet above are machinery, millstones, etc.; the space is 10 x 40 feet, and is enclosed by strong stone walls. I have heard dynamite spoken of as cheaper, more powerful in its effects, and quite as safe as powder. Please inform me if this is so; also how to put it up. Should it be in waterproof cartridges? How is it operated, what quantity is used and how is it fired? Where can it be obtained? Answer: We cannot recommend dynamite as safer or better for your use than powder. It is put up in cartridges, but we are unable to designate dealers to whom you should apply. See notice under "Communications Received."

W. O. D. asks what preparation can be used to remove varnish from the surface of an oil painting without injuring the picture. "I know that it can be done." Answer: In order to remove the cracks often observed in old pictures, and which we presume to be your object, Van Pettenkofer has suggested exposure to the vapor of alcohol at the ordinary temperature of the air, the picture being placed in an air-tight box, at the bottom of which is a tray containing alcohol. In some cases, however, it is unsuccessful. One of the best solvents of dried paint and of boiled oil varnishes is a mixture of alcohol and chloroform.

T. W. S. asks what will prevent flour paste from getting sour, or arrest fermentation? Answer: Flour paste will not sour or ferment if a little alcohol be added to it. Carbolic acid will also preserve it, but to many people the smell of the latter is so objectionable that they prefer the more expensive alcohol.

M. W. B. says: I wish to know what will clean and polish the brass work on a locomotive better and quicker than the oil and emery generally used. Answer: Use oxalic acid, in the form of powder, applying it with a piece of dry waste. This is a poisonous compound.

W. S. J. asks: 1. Can I melt old rubber boots in a mixture of pitch, asphaltum and shellac; that is to say, will the rubber be dissolved when boiled in this mixture? 2. Can waterproof clothing (such as has been waterproofed with alum and sugar of lead) be ironed when damp to take out the wrinkles without spoiling the waterproof quality? Answers: 1. No; the rubber must first be dissolved in bisulphide of carbon, and as the quantity of rubber required is very small, it would be cheaper to purchase the crude caoutchouc before it is vulcanized. 2. No doubt it can.

W. & R. say: How shall we learn what the Whitworth screw thread is, so as to be able to make it with precision? Answer: See editorial pages of last week's issue.

W. M. W. would like to know a way of removing sperm (such as is used in making candles) from clothing. Answer: A hot iron and a piece of brown paper will soon extract the sperm. Benzine will also remove it, but it occasionally affects the color.

W. H. B. asks: Which is the most accurate, a long or short bubble in a common spirit level? Answer: The best length of bubble depends somewhat on the length or curvature of the tube, a short bubble being required for a tube with small radius of curvature, and increasing regularly in proportion with the increase of the radius of curvature.

N. S. asks: Is it dangerous and, if not dangerous, is it advisable to pump water into a boiler during the process of blowing off? Answer: It is not dangerous, under ordinary conditions: but it is not generally considered advisable to blow off while feeding a boiler, because, as feed and blow pipes are usually arranged, the clean water that is forced in by the pump is blown off, not having time to mix with the other water in the boiler.

T. J. says: Does water offer less resistance to one large ship than to an equal bulk comprised in several smaller ships of the same shape? Answer: The resistance of the water is made up of resistance to greatest immersed cross section and skin resistance, the latter depending upon the amount of wet surface. The large ship, having the bulk of several smaller ones could probably be arranged with less cross section and less wet surface than the sum of cross sections and immersed surfaces of the smaller vessels. You can readily make the calculation for any assumed dimensions.

M. J. S. asks: 1. How is the nitrate of gold produced, which is employed in electro-plating? Is it gold leaf dissolved in *aqua regia*? If not, what is it? 2. I have a very fine meerschaum pipe of which the amber is broken, and I cannot get one to fit it. Is there anything with which I can cement it or otherwise fix it? Answers: 1. A solution of gold in cyanide of potassium is used for electro-plating. When gold is dissolved in *aqua regia*, the chloride of gold is formed. Dissolve 7 grains of very fine gold in *aqua regia*, evaporate the solution to dryness on a water bath, and dissolve the residue in distilled water, then add to this solution some cyanide of potassium. (See also answer to W. A. B. in last week's issue.) 2. Ordinary glue, or a cement made as follows: Soak white glue in hot water; warm the jelly formed, add enough pulverulent slaked lime to give it consistency. The object to be cemented is to be slightly warmed. Another cement is shellac dissolved in borax.

F. E. C. asks: 1. How can I make a crucible for melting brass? 2. How can I make a mold for casting brass? 3. How can I cast lead pipes? Answers: 1. You can make the crucible of clay, and line it with fine coal dust, 2. Use ordinary molding sand, and either a metal or wooden flask. 3. For short pieces of pipe, use wooden molds and wooden cores. Make the core in two pieces, cut at an angle, so that it can be withdrawn from the casting.

H. H. asks: What is the best and surest means of cleaning old boiler flues from dirt and scales without removing them from the boiler? Answer: Our correspondent does not state the nature of the scale; but in ordinary cases we would advise the use of tannate of soda, which is highly recommended by many who have tried it.

P. T. R. asks: What kind of lenses and how many are used in a magic lantern, and how are they arranged in the tube? Can there be a lantern or camera made which will show any opaque object, such as a common photograph, a steel engraving or a coin, upon a screen, in its natural colors? If such a camera can be made, please give a description of it. Answer: One double convex lens is required in the tube. The magic lantern will show images of opaque objects with their colors on the screen, and beautiful effects are produced if the objects are strongly illuminated.

L. H. asks: How can I make a small engine to drive on a common road? How large a boiler and engine will it take to carry two persons? If one could be made, would it be against the law to drive it in the road? Answer: The engine and boiler should be designed to give a useful effect of about one horse power. Road steamers have occasionally been used in this country; and we believe no objection has been made by the authorities, probably on account of their novelty. You will find a very interesting paper on road steamers, by Professor R. H. Thurston, in the *Journal of the Franklin Institute*, for January, 1873. An abstract of the paper has been published in the SCIENTIFIC AMERICAN.

MINERALS.—Specimens have been received from the following correspondents, and examined with the results stated:

J. N. M.—Iron pyrites and sulphate of lime are the minerals you send—of no value. If a stream flows from the spring you can, by means of a water ram, send up water into your house, thirty feet high or more. Apply to prominent booksellers for works on cultivation of trees.

J. G. W.—It is galena or sulphide of lead, a rich and valuable ore, containing about 86 per cent of lead.

J. H. S.—Chiefly iron pyrites.

A. G.—Iron pyrites.

G. B. B.—Red hematite and sulphur. The value of the latter depends on its distance from a market.

J. J. T.—Red hematite, an ore of iron, valuable if no too far from coal mines and transportation.

G. R. E. G.—One specimen contains some iron pyrites quartz, etc., but nothing of value. The others are magnesian limestone and iron ore.

G. C. P.—The soft substance had become quite hard by the time it reached us, and most of it was infusible and insoluble, like quartz. It also contained some organic matter.

COMMUNICATIONS RECEIVED.

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

On the Solar System. By G. W. T.
On Propelling Fire Engines. By C. A. M.
On Plow Points. By P. F. B.
On Inserting Screws in Plaster. By W. A. A.
On Kingfishers and Fish. By D. S. H.
On Boiler Explosions. By J. E. E.
On Creeping Rails. By J. H.
On the Location of the Great Telescope. By S. H. M., Jr.
On the Value of Science. By J. M.
On the Purification of Rivers. By J. J. L.
On Tidal Action. By J. A. B.

Also enquiries from the following:

J. T. R.—J. M. W.—C. T. S.—G. M. V. P.—J. H.—E. C. D. J. T. B.

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

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

June 10, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Pump, R. M. Lafferty (r) 5,441
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Tub, stationary wash, B. Morahan 139,685
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Vehicle wheel, G. J. Cross 139,661
Vehicle wheel, S. T. F. Sterick 139,830
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Washing machine, N. F. Reed 139,736
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Watches, aluminum springs for, F. A. Lange 139,678
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Wire cage, M. Grebner 139,784
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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

25,395.—BOOT HEEL.—S. Dodge, Jr., B. Potter, Jr. Aug. 27.
25,442.—BOILER AND STEAMER.—D. R. Prindle. Aug. 27.
25,443.—SEEDING MACHINE.—S. G. Randall. Aug. 27.
25,747.—EMERY AND CAOUTCHOUC.—T. J. Mayall. Sept. 24.
25,484.—GRAIN SEPARATOR.—J. L. Booth. September 3.
25,499.—RAILROAD CAR SEAT.—E. Wheeler. September 3.

EXTENSIONS GRANTED.

24,367.—ORE SEPARATOR.—W. O. Bourne.
24,402.—STEAM PRESSURE REGULATOR.—A. P. Pitkin.
24,428.—TRIP HAMMER.—B. Hotchkiss.
24,412.—ROLLING METAL FOR JEWELRY.—J. S. Palmer.
24,436.—RAILROAD BAR.—H. Webb.

DISCLAIMER.

24,367.—ORE SEPARATOR.—W. O. Bourne.

DESIGNS PATENTED.

6,699 & 6,700.—ALE PUMPS.—S. Lane, Jr., Englewood, N.J.
6,701.—COOKING STOVE.—G. Smith & H. Brown, Phila., Pa.
6,702.—CAPE.—M. Landenberger, Philadelphia, Pa.

TRADE MARKS REGISTERED.

1,299.—DRUGGISTS' GOODS.—Arnold & McNary, N.Y. city.
1,300.—WHISKY.—J. Bumgardner & Sons, Staunton, Va.
1,301.—HOG PRODUCTS.—G. Cassard & Son, Baltimore, Md.
1,302.—MEDICINES.—S. De Grath, Jersey City, N. J.
1,303.—STOVES, ETC.—Hicks & Wolfe, Troy, N. Y.
1,304.—SILICIAS, ETC.—Lesher & Co., New York city.
1,305.—CURED FISH.—H. Mayo & Co., Boston, Mass.
1,306.—FLAVORING EXTRACTS.—Steele & Price, Chicago, Ill.
1,307 & 1,308.—FRUIT JARS.—Consolidated Fruit Jar Co., New York city.
1,309.—BOOKS.—D. C. Cutler, Carthage, Ill.
1,310.—RAISINS.—F. C. Lewis, Trenton, N. J.
1,311.—CHEWING TOBACCO.—Liggett & Myers, St. Louis, Mo.
1,312.—COD LIVER OIL.—H. M. Rogers & Co., N. Y. city.
1,313.—MEDICINE.—E. M. Tubbs & Co., Manchester, N. H.

SCHEDULE OF PATENT FEES:

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

VALUE OF PATENTS,

And How to Obtain Them.

Practical Hints to Inventors

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

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

HOW TO OBTAIN *Patents*. This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, New York, for full particulars.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co. 37 Park Row, New York

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief, any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

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 1851 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, New York.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Canadian Patents.

On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

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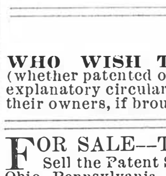

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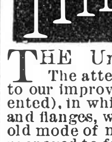

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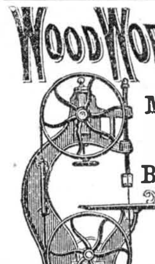

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