

The Uses of Aluminum.

When we consider the excellent qualities possessed by this metal, its color, its brightness, its unchangeableness in air and in sulphuretted hydrogen, that it is not injurious to the health and can be worked into any shape, it seems remarkable that it has found so little use, and that the great hopes, which greeted its preparation according to Deville's process, are so far from being fulfilled. The price of aluminum would be considerably less if it were made in large quantities, as it depends on the price of sodium, the manufacture of which could also be conducted more cheaply if there were a certain and large demand for it. But there is at present no such inquiry for it. The advantages of vessels made of aluminum are not so evident and conspicuous as to be able easily to overcome old habits. At the London Exhibition of 1862, numerous articles of aluminum were exhibited; the Paris Exhibition of 1868 and the Vienna Exposition of 1873 showed that the interest in this "silver from clay" had died out.

Aluminum made by Deville's process was used at first for ornaments and other *articles de luxe*; on account of its lightness the tubes of opera and spy glasses were made of it. In physical apparatus and all fine instruments where weight is an objection, aluminum replaces other metals with advantage. Saber sheaths and dagger handles have been made of it. The eagles on the flag staffs of the French army are about $4\frac{1}{2}$ lbs. lighter since they have been made of aluminum. As the metal can be drawn out to the finest wire, it has been used for embroidery, lace, fringe, and other decorations. They have some advantages over the same articles when made of silver, being lighter, and they do not tarnish.

Nevertheless, the use of aluminum has, as we have said, greatly diminished. Aluminum jewellery is scarcely seen at the present day. Opticians still use it for spy glasses and the like. Recently it has been much employed for surgical instruments. In the *atelier* of C. Schmidt, in Berlin, a considerable quantity is consumed in the manufacture of splints.

Although there is no mistaking the fact that the high expectations, with which the appearance of aluminum filled the public mind, have not been fulfilled, yet the aluminum industry has a safe guarantee of its existence in the use of the metal for aluminum alloys, which are capable of the most extensive use on account of their excellent qualities.

Aluminum will alloy directly with most metals, generally with strong heat, which may increase up to the glowing point. Small quantities of other metals affect the properties of aluminum, while, contrawise, small quantities of aluminum change the properties of other metals.

The alloy of aluminum with copper, aluminum bronze, is of the greatest importance in the arts. According to Tissier, as little as 1 per cent of aluminum, added to pure copper, considerably increases its ductility, makes it more fusible, and gives it the property of completely filling the mold, making a dense casting, free from air bubbles. At the same time the copper becomes more capable of resisting chemical reagents, increases in hardness without losing malleability, and unites in itself the most valuable qualities of bronze and brass. The color of the alloy is almost a copper red.

A copper alloy with 2 per cent of aluminum is used in the studio of Christoffe, in Paris, for works of art. It works well under the chisel and graver.

The true aluminum bronzes, namely alloys of 90 to 95 per cent copper with 10 to 5 per cent aluminum were first made (says R. Wagner) by John Percy, in 1855. They became generally known through the researches of Deville.

For the preparation of this alloy, perfectly pure copper must be employed. If to a quantity of melted copper there be added one ninth its weight of aluminum, the two metals unite energetically, with the evolution of so much heat that the crucible, if it be not exceedingly refractory, softens and sinks together. The bronze obtained is at first very brittle, but by frequent resmelting increases in strength and ductility; the right degree is determined by hammering out a piece after each fusion. As a rule, two or three refusions suffice. Probably the amount of aluminum sinks somewhat below the original 10 per cent. Aluminum bronze with 5 or 10 per cent aluminum possesses a color very like that of gold. The alloy with 10 per cent has the color of green gold, an alloy of gold and silver. The alloys polish beautifully, make perfect castings, and possess great strength: according to Anderson's experiments, an average of 75,618 $\frac{1}{2}$ lbs. per square inch. They are also very flexible, and, at temperatures from a dark red heat to near the melting point, perfectly malleable. The castings are perfectly sharp, and can be worked more easily than steel. This bronze engraves nicely, is easily rolled into sheets, and offers greater resistance to the air than other bronze, brass, silver, cast iron, and steel.

These excellent qualities give it a number of uses. In the construction of physical, geodic, and astronomical instruments, it is far preferable to all other metals. In jewelry and articles of art and luxury, it is employed in large quantities. Many kinds of house utensils are made of it, and it is also adapted to journal and axle boxes. Gun and pistol barrels, as well as rifled cannon, have been made of it, and have done excellent service. At present the high price of aluminum bronze alone prevents its general use for arms. Morin (who has probably gone out of the business now) furnished these bronzes at the following rates: 10 per cent aluminum, \$6 60 per lb.; $7\frac{1}{2}$ per cent aluminum, \$5.50 per lb.; 5 per cent aluminum, \$4 40 per lb.

These prices are four or five times as tin bronze. In articles where the price of the raw material is of little consequence as compared to the value of the work, as in physical instruments and the like, the aluminum bronze is always to be preferred.

In England, kettles made of aluminum bronze are employed for making preserves and ices from acid fruits. Morin & Co. manufacture weavers' shuttles of bronze, which, of course, do not oxidize so readily as steel. Cambrien recommends this alloy for type casting. Type made of it can be used 50 times as long as those from lead and antimony. Hulot employs it for the bed of perforating machines for perforating postage stamps. Lange, in Glasshütte, Saxony, makes watch mainsprings of an alloy of 5 parts aluminum and 90 parts copper, or of 100 parts aluminum and 5 parts silver. The advantages possessed by such springs over steel springs are that they do not rust, are not magnetic, nor so brittle, but are very hard and elastic.

Aluminum alloys not only with copper but with most other metals. It does not unite with lead or with iron. R. Wagner therefore suggests the possibility of aluminum being employed for desilvering argentiferous lead.

An alloy of 100 parts aluminum and 5 parts silver can be worked like pure aluminum, but is harder and takes a fine polish. An alloy of 5 parts aluminum and 100 parts silver is almost as hard as coin silver, and has the advantage of containing no metal that is poisonous, or that alters the color of the silver. Such an alloy has been recommended for coinage, but in vain.

Small coins of pure aluminum, which can be stamped nicely, would be proof against mistake and deception on account of their lightness. Aside from the fact that the price of aluminum would vary with its increased product, another chief objection to its introduction into coinage is that the people cannot separate the idea of weight from the idea of a valuable metal.

Aluminum alloyed with 4 per cent of silver is used by Sartorius, of Göttingen, for making the beam of analytical balances, for which its lightness and unchangeableness especially fit it.

An alloy of 99 parts by weight of gold and 1 part of aluminum is very hard, but still ductile; its color resembles that of green gold; 90 parts of gold and 10 parts of silver make a white and brittle alloy.

The best alloy of aluminum and tin contains 7 per cent of the latter; it works easily, polishes nicely, but on attempting to cast it a portion of the tin separates from the aluminum.

An alloy with 3 per cent zinc is, according to Débray, harder than pure aluminum, but very ductile and brilliant.

A thousandth part of bismuth makes aluminum as brittle as glass, says Tissier.

According to the same authority, aluminum will unite with mercury only when moistened with caustic alkali. The amalgam is very brittle; the aluminum in it oxidizes easily in the air, decomposes in water, and in general acts like the metals of the alkaline earths. Jehn and Hinze have found that aluminum, when rubbed with leather impregnated with mercury, oxidizes to alumina.* Perhaps an aluminum amalgam was first produced.

With iron, aluminum produces an extraordinarily hard alloy. A compound of 24.5 parts aluminum with 75.5 parts iron is silver white, and does not rust in the air. On treating with dilute sulphuric acid, the iron dissolves and leaves the aluminum behind. A slight addition of 8 parts to 1,000 parts of steel imparts to it all the properties of the best Bombay wootz. Rammelsberg has, however, never found any aluminum in the samples of so-called aluminum steel analysed by him.—*Dr. Biedermann.*

SCIENTIFIC AND PRACTICAL INFORMATION.

THE SECRET OF EDUCATING FLEAS.

The editor of *La Nature* has been investigating fleas, with a view of discovering where, in those aggravating insects, resides the capability of being educated. His conclusion is radical; he says they cannot be educated, and that all the tricks so ingeniously exhibited by self-styled trainers are merely caused by the natural efforts of the insect to escape. Any one can make them draw minute wagons or go through similar performances, if care be taken to secure them to their work so that they cannot jump. It seems to us, however, that it must require considerable skill and ingenuity to hold the lively creatures while the securing operation is in progress.

ROYAL ROAST BEEF.

The traditional baron of beef, which since time immemorial has graced the sideboard of the king or queen of England on Christmas day, weighed this year 300 pounds. An English contemporary states that it was cut from a prize bullock bred from the choicest stock on the Royal Farm. Rounds of beef weighing 80 lbs. each, and spiced, were forwarded by the Queen, also in accordance with old custom, to the courts of Germany, Austria, and Belgium. The Queen's stock farm is said to be a model establishment. It appears certainly to be a productive one, judging from the fact that the Christmas sale of fat cattle netted Her Majesty the neat sum of \$15,935.

THE ARTIFICIAL BUTTER INDUSTRY.

The perennial French artificial butter has turned up again, this time under the name of *beurrine*. It has recently been patented in France, and consists of beef suet mixed with from 15 to 20 per cent oil (kind not stated) and from 5 to 10 per cent milk. This reminds us that at present there is an open field for artificial butter in this country, the so-called oleomargarin having gone out of existence. The material met with a fierce opposition from the butter and cheese trade and from dairymen generally, on the alleged ground that it

*Professor Henry Wurtz, of Hoboken, had previously discovered this property.

was used as an adulterant and not as a *bona fide* production. There is no doubt but that it met with very little popular favor, and probably this, together with misfortunes in business management, threw the concern eventually into financial trouble. Several well known scientific gentlemen of this city were interested as stockholders, and upon them some of the pecuniary losses fall.

Curiosities at Central Park.

A reporter of the *Evening Post* has been the round of the American Museum buildings, including the Zoological Gardens, located in Central Park in this city. We extract the following interesting observations from his report:

The Museum and Zoological department of live animals, and the Park in which they are located, are among the most attractive places in which strangers visiting New York can spend a half day. The new building of the American Museum will soon be finished. Contributions of fossils and other curiosities are constantly being made by our citizens and travelers. A very beautiful series of polished calc spars from England, and a large number of ores, were given by Mrs. Riley, of New York, who has also sent, for the archaeological department, a number of rare implements of ancient and modern date. The Museum received a very valuable Christmas present from its president, Robert L. Stuart, namely, the library of Mr. Carson Brevoort, which cost some \$15,000 and includes a large number of works on ichthyology.

A BIBLICAL DEPARTMENT.

An interesting department has been established, in which are certain of the animals that are spoken of in the Bible—a department for Bible animals. This was begun by the reception from Beyrout, in Syria, of a collection comprising foxes, wolves, some reptiles, and birds, all from the Bible neighborhood of Syria. The specimens were preserved and stuffed by students of the Protestant College in Syria, which is under the charge of the Rev. Stuart Dodge.

ANCIENT IMPLEMENTS.

The American consul at Shanghai has very kindly sent for the department of archaeology a collection of implements which represent the customs of ancient times. His object is to secure specimens of typical implements that have not become modernized. China and Japan, like every country opened to civilization, show many signs of innovation.

Lately he has sent a collection of the implements used in games. Dominoes in many shapes are among them, as are also playing cards, somewhat resembling those used at the present day.

THE CAT FAMILY.

Mr. D. G. Elliot, a naturalist of this city, who has long lived in Europe, engaged in publishing his large and valuable monographs on birds and mammals, has at various times given to the Museum valuable specimens. Being a gentleman of leisure and competence, he has devoted himself to the interests of this institution, and has secured many objects of great value which were offered for sale in the large cities of Europe. One of his latest gifts is a series of specimens of the cat family. Seven specimens of cats, represented by stuffed and mounted skins, that are included in the abovementioned work, have been given to the American Museum, and now are numbered among the elegant specimens in the case assigned to the cat family. One of the largest tigers ever captured is in this collection, mounted in the manner of those in the British Museum in London.

OTHER RECENT GIFTS.

A most valuable gift by Mr. Elliott is the collection of Madagascar monkeys or lemurs, mounted in the best style of taxidermy. Another exceedingly rare and valuable acquisition from the same source is the manatee, and a skeleton of another. The above are all mounted in the manner adopted at the British Museum.

Mr. Elliott has also given several thousand specimens of skins of North American birds, a collection made especially for the use of students in ornithology. These specimens are stuffed but not mounted; they are neatly laid out and placed in drawers to be placed in the ornithological rooms of the new Museum building. One room is arranged for a chemical laboratory, and another for work requiring lapidaries' tools, etc. Rooms are assigned for the various departments of conchology, geology, etc.

Dr. Rudolph Witthaus, of this city, has given recently a valuable cabinet, consisting of several thousands of species of beetles, in addition to his gift of foreign coleoptera which the Museum has already in its possession.

Mr. William Heins, of New Jersey, a prominent business man of New York city, has found time in his leisure moments to accumulate a very large collection of foreign and domestic butterflies of some thousand species. These will find place in the Museum as soon as the new cases are ready for them.

The fact that the new building of the American Museum is absolutely fireproof, both as an isolated structure and as one entirely built of stone and metal, gives confidence to those who desire to place objects there. Specimens are admirably exhibited also, which is another inducement, everything having a place worthy of its value.

THE ZOOLOGICAL GARDENS.

The wild animals of the zoological collection in Central Park seem to thrive very well, though the accommodations are not of the best. Much interest has been felt in the success of the experiment of trusting the important duties of nursing the infant king of beasts to a dog. One of the lionesses of the Park collection gave birth to two healthy kittens, and from some unexplained cause failed to give them requisite nourishment. A fine large mastiff was at hand

and the young lions were offered to her tender care. The gentle mastiff immediately fondled them and assumed the charge, and has since, for a number of weeks, nursed them with affectionate attention. The kittens are getting large and clumsy, and, in a playful mood, sometimes caress their stepmother with unheated claws.

There are frequently unpleasant deformities in the lions born and bred here. Their legs are too short and are sometimes bowed very noticeably. There are a number of hyenas now in the Park collection, which were reared there. They are nearly black in color when they are born.

Beside the common spotted hyena there is a striped species in the collection, which is regarded as new to Science. This creature has a stiff mane, which is erected at every movement.

THE "HAY CRITTERS."

The young camel was one of the most interesting of the creatures born in the Park. Then there are Cape buffalo calves, and the beautiful Zebu calf, and the bison calf, and several others.

Since the completion of the large new house for ruminants, or "hay critters," as they are familiarly called, the exhibition has been very fine. The equine antelope is exceedingly curious, and is rarely seen alive. Some fine elands and two antelopes, called blessbocks, are also here. Another Indian antelope, with twisted, lyre-shaped horns, has just been obtained. There is the gnu, or horned horse, also, who belongs to the antelope family.

THE SEA LIONS.

A recent improvement in the treatment of the sea lions is worthy of notice. The pond in the rear of the carnivorium, which has heretofore been used for the great wading birds, has been surrendered to the seals and such creatures. This exhibition is now one of the most entertaining. There are often six or seven large sea lions here, and they fully enjoy the ample space. They play briskly with their fellows, dive and leap, plunge in at one side of the pond and shoot out at the other. They hobble about on land, chasing each other, presenting a most grotesque appearance. One seizes a piece of ice in his mouth and tosses it in the air, catching it adroitly as it falls; another vaults upon the bottom, beneath the water, and pulls under his fellow who is quietly sleeping on the surface. It is surprising to witness the agility of these creatures on land. They chase each other very briskly around the yard, leaping much as a puppy does in his attempts to caper.

Poetical Soap.

Messrs. Water and Oil
One day had a broil,
As down in the glass they were dropping,
And would not unite,
But continued to fight,
Without any prospect of stopping.

Mr. Pearlash o'erheard,
And, quick as a word,
He jumped in the midst of the clashing;
When all three agreed,
And united with speed,
And Soap came out ready for washing.

DECISIONS OF THE COURTS.

United States Circuit Court—Fifth District of Louisiana.

PATENT STEAMBOAT STAGING AND DERRICK.—C. K. CONVERSE AND OTHERS vs. JOHN W. CANNON AND OTHERS.

WOODS, Cir. J.:
The complainants allege that they are the assignees of a patent issued to one A. John Bell, dated January 22, 1861, for an "improvement in steamboat staging," that they are also the assignees of two patents issued to Hannibal S. Blood, the first dated June 7, 1876, being "a new and useful improvement in derrick or hoisting crane, and relating particularly to a means for avoiding the labor and delay incident to handling and manipulating heavy landing stages used on steamboats and water craft by manual labor," and the second being a patent dated March 26, 1872, for an "improvement in derricks." That all of the inventions named in said three letters patent relate to the manner and mode of manipulating and handling stages used on steamboats and water craft for landing freight and passengers, whereby manual labor is, in a great measure, dispensed with, and great economy in the navigation of such vessels effected, as well as a large decrease of expense in the navigation and use of such vessels and water craft.

That the defendants, John W. Cannon and William Campbell, the first largely interested in the steamer Robert E. Lee as owner, and the latter being her master, are using upon said boat two several machines, which are substantially in their mode of construction the same as the machine described in said three letters patent.

The bill prays for a perpetual injunction against the defendants to restrain them from infringing upon the patents owned by the complainants by the use of said machines now employed by them upon the steamer Robert E. Lee.

The answer of defendants denies any infringement of the patents held by complainants, and claims that they use an apparatus invented by one John Perkins, and patented to him by letters patent dated May 7, 1872, which differs substantially and materially from the apparatus covered by the patents owned by complainants, and is not an infringement thereon.

In passing upon the issue of infringement, the question to be determined is whether, under a variation of form or by the use of a thing which bears a different name, the defendant accomplishes, by his machine, the same purpose or effect as that accomplished by the patentee, or whether there is a real change of structure or purpose.

If the drawing introduced by the defendant constitutes a mechanical equivalent, in reference to the means used by the patentee, and if, besides being an equivalent, it accomplishes something useful beyond the effect or purpose accomplished by the patentee, it will still be an infringement as respects what is covered by the patent, although the further advantage may be a patentable subject as an improvement on the former invention. (Drummond, in Foss vs. Hubert, 2 Fisher 31.)

The material question is not whether the same elements of motion or the same component parts are used, but whether the given effect is produced substantially by the same mode of operation and the same combination of powers in both machines. (Story, J., in Odiorne vs. Winkley, 2 Gall. 54.)

In determining the question of infringement, we are not to determine about similarities or differences merely by the name of things, but are to look to the machines or their several devices or elements in the light of what they do, or what office or function they perform, or how they perform it, and to find that a thing is substantially the same as another if it performs substantially the same function in substantially the same way to obtain the same result. (Clifford, J., in Vincent Refinery vs. Mathiason, 2 Fisher, 602.)

The rule is, and so it has been settled, that if two machines be substantially the same and operate in the same manner, and if they may differ in form, proportions, and utility, they are the same in principle. (Washington, J., in Evans vs. Eaton, 3 Wash. 449.)

As shown by a device conceded to be new and a device alleged to infringe, because an equivalent, the alleged infringer could not protect himself by showing that, although his device was the equivalent of the patentee's device in all its functions and in its construction and mode of operation, yet by other additional features it possessed other and further useful functions. Such a device, though an improvement upon the patented one, would be an appropriation of it. (Woodruff, J., in Surren vs. Hall, Official Patent Reports, Vol. 1, 437.)

To constitute an infringement, the contrivances for the purposes in view must be substantially identical, and that is substantial identity which comprehends the application of the principle of the invention. (Page vs. Ferry, 1 Fisher, 323.)

It makes no matter what additions to or modifications of a patentee's invention a defendant may have made: if he has taken what belonged to the patentee he has infringed, although with his improvement the original machine or device may be much more useful. (Sprague, J., Howe vs. Morton 1 Fisher, 587.)

Applying these principles to this case in hand, there can be no doubt that the defendants have appropriated the invention covered by the patent of A. John Bell. That the mode of operation of the parts of the machine may be true, but they are using the idea first suggested by Bell and covered by his patent, namely, the handling of a steamboat stage by means of a rope attached to a derrick, through force applied by a power windlass.

The variations which have been made in the method of attaching the rope in the form of the derrick in the position in which the stage is placed on the deck are immaterial variations, which do not affect the question of infringement.

As the patent to Bell bears date prior to the use of stages by the Marine Brigade, or to the publication in Appleton's "Dictionary of Mechanics," the defense of want of novelty cannot be maintained. The averment that the device of Bell is not useful cannot be sustained.

All the law requires as to utility is that the invention should not be frivolous or dangerous. It does not require any given degree of utility. If the invention is useful at all, that suffices. (Cox vs. Gregg, 2 Fisher, 174; Hoffheim vs. Brant, 3 Fisher, 218.)

The result of this view is that there must be a degree for complainants directing a perpetual injunction to go against defendants as prayed in the bill, and a reference to a master for an account of profits.

Supreme Court of the United States.

OCTOBER TERM, 1875.—PATENT SAWMILL.—CALEB IVES AND GEORGE B. CROCKER, PLAINTIFFS, vs. PALMER HAMILTON, DEFENDANT.—IN ERROR TO THE CIRCUIT COURT OF THE UNITED STATES FOR THE EASTERN DISTRICT OF MICHIGAN.

MR. JUSTICE BRADLEY delivered the opinion of the Court.

This was an action brought to recover damages for the infringement of certain letters patent granted to Hamilton, the plaintiff below, for an improvement in sawmills. The defendants pleaded the general issue, with notice of special matter, setting up several prior inventions, amongst others that of one Isaac Straub. The plaintiff's patent was dated the 5th day of December, 1855.

The defendants insist that Hamilton's patent is defective for not clearly describing the position, perpendicular or otherwise, in which the curved guides should be placed; and that if any required position can be inferred from the patent it is a peculiar one, whilst the guides of the defendants' saw are inclined at a slight angle to the perpendicular. As to the alleged defect of the patent, there is nothing in the objection. The invention claimed is an improvement on an old machine; and it is properly taken for granted that the practical mechanic is acquainted with the construction of the machine in which the improvement is made; and nothing appears in the case to show that any peculiar position, different from that of sawmills constructed in the ordinary way, is necessary to render it effective and useful.

The improvement has nothing to do with the precise position of the guides. It is a combination of mechanical means to produce a rocking motion of the saw. And this combination is just as applicable to guides that have a slight inclination as to guides that are perpendicular. We think that there is no ground for either branch of the objection. The description in the patent is sufficiently specific; and the inclination of the defendants' guides cannot exempt them from the charge of infringement.

The improvement made by the defendants, that the patent is defective in not stating the nature of the curve for the guides, whether that of a circle or of some other figure, in view of the subject matter of the improvement and of the diagrams annexed to the patent, are not sufficient to affect its validity. Any good mechanic acquainted with the construction of sawmills, and having the patent and diagram before him, would have no difficulty in adopting the improvement, and making suitable curves.

The conclusion, which has been come to, is decisive of the case. It is unnecessary to discuss in detail the different points made at the trial, or the several instructions asked. We have examined them all, and find nothing on which to base a judgment of reversal. If Straub's patent would have revealed anything to affect the validity of Hamilton's, the parties did not see fit to spread it on the record, and therefore we have no means of deciding that question.

The judgment is affirmed.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED ISTLE MACHINE.

Guillermo Roberto Welke, Parras de la Fuente, Mexico.—The object of this invention is to produce an improved machine for making istle, or the fiber of the lechugilla, which is applied in Mexico to the manufacture of a large number of articles, as hammocks, sacks, ropes, nets, cotton bagging, wagon sheets, carpets, and similar objects. The invention consists mainly of devices for scraping the leaves, while being drawn by rollers through the scraping knives, which are made to yield to the thickness of the leaves. The leaves are placed between the scrapers up to a gage piece, and then carried by the scrapers toward the feeding rollers. Sliding and reciprocating scraping jaws are operated by suitable transmitting mechanism, by the forward motion of the scraper frame, for scraping off the ends of the leaves which are conveyed to a receiving platform, and dropped by the same to a receptacle below.

IMPROVED WIRE STRETCHER.

Seman Taber, Russel Taber, and Charles M. Morgan, Hesper, Iowa, assignors to Seman Taber, Darius F. Morgan, and Charles M. Morgan, same place.—This device is for tightening wires that have been strung up, and especially fence wires. A bent bar is held transversely with the wire to be tightened. The wire is passed between pins on said bar, and the latter is turned longitudinally with the wire. The wire is then passed into the slot of a drum secured to the bar. The drum is turned by means of a wrench, to give the desired tension to the wire, a pawl holding the drum securely in any position into which it may be turned.

IMPROVED ROTARY PUMP.

William O. Crocker, Turner's Falls, Mass.—There are two toothed pistons engaging the one with the other. The peculiar construction of the teeth of the pistons enables the said teeth to be made so small that at least one tooth may always be in contact with each abutment, while at the same time having sufficient water space. To each of the abutments are sweived set screws, so that they may be adjusted at any desired closeness to the pistons. A vent chamber and a suction chamber are formed in each head upon the opposite sides of a line joining the shafts.

IMPROVED TACK MACHINE.

Charles P. Weaver, Norristown, Pa.—This invention relates to machines with two cutting jaws for making tacks or small nails, and consists in so combining the header lever with the crank pitman by a lever, pin, and link, that the power can be applied directly in the line of the work, thereby avoiding all lateral strain and dispensing with the usual long arms and crooked ends of the heading lever, and allowing the size and weight of tack machines to be reduced fifty per cent.

IMPROVED CAR COUPLING.

Peter C. Murray, Sloatsburg, N. Y.—This invention consists of a centrally recessed drawhead, with a stationary link attached thereto, that is coupled by the laterally sliding cross pin of the connecting drawhead, the pin being guided and locked in open or closed position by a side standard and pin rod.

IMPROVED GAS BURNER.

David B. Peebles, Edinburgh, Scotland.—Between two half cases, made of cast iron, a flexible diaphragm is fixed, and a passage for the gas is made between the upper and lower chamber through the projecting part of the case. In the lower half a recess is made to receive a disk of metal not acted on by gas. In the center of this disk a hole is made, into which the conical point of a regulating screw is placed, so that, by moving it, the hole can be opened or closed. The top of the screw is surrounded by a bead forming a recess, into which wax can be run to receive a stamp for a seal. The valve, made of fusible alloy, is of a double conical shape, with a stem at one end. The other end rests in a step made in the head of the center screw, which keeps the metal disks to the diaphragm. The bottom of the burner tube acts as a valve seat, and by this arrangement the valve can be taken out for cleaning by unscrewing the burner tube, without taking the governor to pieces.

IMPROVED AUTOMATIC TELEGRAPH KEY AND REGISTER.

Lucien S. Crandall, New York city.—This is an improved automatic telegraph key and register, by which, it is claimed, the manual and mental labor in transmitting telegraphic signals are facilitated and simplified to a considerable degree, the working capacity of telegraph lines increased, and the accurate manipulation of the instrument acquired by the operator with little practice. The invention consists of a letter ring, which is divided along its circum-

ference by insulated and non-insulated portions and separating recesses, to correspond to the characters of the Morse alphabet. A number of spring keys are arranged around the letter ring, and lettered alphabetically, to correspond with the Morse letters of the ring. A bridge at the end of each key forms, when the key is depressed, the contact of the letter ring with one of a series of needles radiating from a vertical shaft that is intermittently actuated by the magnets by a local battery. The letter ring and spring needles form the poles of the main line battery, and record the depressions of the keys by a relay magnet with an armature, having lever with recording stylus at one end, and stop pawl at the other end. The stop pawl releases a spring-acted slip wheel that throws a local actuating battery in circuit, which imparts, by two magnets with armature pawls, switch, and governor, intermittent motion to a motor wheel, connected by a partially insulated and non-insulated step with a recess and spring rider, by which the motion of the motor wheel and needle arms may be kept up after the mainline circuit is interrupted, to register spaces in and between letters. The number of needle arms corresponds with the subdivisions on the lettering and the number of teeth on the motor and slip wheels, to expose at any moment one of the needles to the action of a key. This correspondence between divisions of letter ring and number of needle arms, and of teeth on motor wheel, in connection with the intermittent motion of motor, gives a dwell at the points of magnetization and demagnetization of main line circuit. The closing of the main circuit by the key throws the local circuit into operation, which revolves the needle wheel until the local circuit is interrupted by the action of the hook pawl on the slip wheel, and the return of the needle through the recess of the letter ring.

IMPROVED MILLSTONE DRESSING MACHINE.

William B. Chase, Faribault, Minn.—This is an improvement in the class of millstone-dressing machines in which a pick or cutting tool is operated by a vibrating lever, and caused to travel over the face of the stone by means of pawl and ratchet mechanism. The construction is such that a greater or less degree of forward motion of the pick may be produced, and the operation of the same on the stone accurately adjusted and interrupted by the handle of the pick lever, the forward feeding of the pick being obtained by a screw-turning lever pawl and ratchet mechanism.

IMPROVED LEVELING AND TRAMMING APPARATUS FOR MILLSTONES.

James T. Beckwith, Cameron Mills, N. Y.—This consists of a frame suspended from another frame, on which the stone rests, and is leveled by screws from below. On the suspended frame are screws, which, being adjusted in the frame when the stone is first leveled by its face, serve afterward to level the stone at any time without removing the runner. This lower frame serves for tramming the spindle. In addition thereto, a couple of plumb lines are suspended from an upper frame on the spindle through a lower one, by which the spindle may be trammed.

IMPROVED MACHINE FOR BORING AND WALLING WELLS.

Charles B. Stough, Monticello, Ill.—A wheeled frame supports a circular way, beside which is a toothed rim, which gives rotary motion to a horizontal shaft, which is mounted in a frame, the said frame being rotated by suitable power. An arrangement of rollers in the frame holds the auger shaft, which is rotated with said frame, and said rollers also allow the shaft to settle as the auger penetrates. As the auger enters, the soil passes upward to a case from which it is removed and raised to the surface by an endless bucket chain working on the auger shaft.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED SLED PROPELLER.

William H. Shelton, Jr., New York city.—The sleigh is provided at both sides with slotted guides, and fulcrum lever handles slide loosely therein. Said handles have end claws that take hold of the ice or ground, and produce, by the weight of the body, the forward motion of the sleigh or carriage on the fixed lever fulcra.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED OILER.

George W. Parsons, Salisbury, Md.—The construction of this oiler is such that it may be overturned without spilling any of the oil, and the amount of oil discharged can be readily controlled. There is an ingenious arrangement of rack and pinion mechanism inside, which ordinarily keeps the nozzle shut, but which opens the same to a degree corresponding to the distance in which the bottom of the can is pressed inward.

IMPROVED STEAM RADIATOR.

George P. Jacobs, Brooklyn, N. Y.—This is a one-piece radiator tube, having four steam ducts surrounding the central air tube, said ducts being in pairs, the two of a pair being connected, but each pair being independent of the other. By this arrangement, in addition to the increased outer radiating surface, there is a large inner radiating surface, along which an active current of air is induced.

IMPROVED LEACH.

Marion P. Wolfe and Edwin M. Henke, Crawfordsville, Ind.—This consists essentially of an ash receptacle and leach having an inclined and channeled bottom, and a top reservoir with perforated bottom to distribute the water and draw off the lye.

IMPROVED STREET SPRINKLER.

William Westerfield, New York city.—This is a piston shaped valve located in the main pipe connected with the sprinkling tube. The pipe which leads water from the tank enters the main pipe, and as the valve is adjusted, one or the other side of the aperture of the former water is shut off or admitted to the sprinkler. This enables the flow to be governed more conveniently.

NEW AGRICULTURAL INVENTIONS.

IMPROVED CHURN.

James L. Sprague, Hermon, N. Y.—This invention includes propeller shaped paddles which draw the cream to the center of the churn, and through suitable apertures in which air is forced through the cream. Devices are added to prevent clogging of the cream at the corners of the churn.

IMPROVED GRAIN HEADER.

Charles K. Myers and John W. Irwin, Pekin, Ill., assignors to Peter Weyrich and C. K. Myers, of same place.—In this apparatus the cutter bar can be adjusted for cutting the grain higher or lower, and can be regulated to suit varying heights of grain. There are novel devices for moving the sickle bar, and various useful improvements in construction, tending to add to the general efficiency of the machine.

COMBINED SCRAPER, CHOPPER, AND DIRTER.

Arthur L. Spence, Alma, Ark.—This machine scrapes the cotton plants, chops them, and then, by means of plows, dirt them as it advances. The new feature introduced is a device in connection with the choppers which, should they strike an obstruction, allows them to stop their motion, while that of other parts of the apparatus continues.