

it had reached the top it commenced descending on the opposite side; but, after a while, lost its foothold and fell into the water again. The pair of two-clawed appendages at the tail are used with much effect to assist it in climbing. The building which it must have climbed to reach the chimney, down which it is stated to have fallen, was only a low, one-story wooden one."

This larva can pinch with its formidable-looking jaws, but not forcibly enough to draw blood. In preparing for the pupa state, it burrows into the earth, where it forms an oval cell; or it hides under some large stone, piece of wood, or other substance. Here, in about two weeks, it casts its tough larval integument and assumes the pupa form, lying in a curved position in its cell, with the head, wing-pads, and legs deflexed on the breast. The color is yellow, with traces of the brown mottlings of the larva and of the lateral filaments. The spiracles are more conspicuous, and the upper jaws stronger than in the larva, and olive green. The pupa state lasts but a few days, and the perfect insect issues during the month of July. It is nocturnal in habit, and hides, for the most part, in obscure places during the day. It is sluggish at this time, and, if approached, will drop sooner than fly, or raise its head and abdomen and open its jaws menacingly.

The sexes differ greatly in this perfect state. The male is remarkable for having his upper jaws—which in the female are normal and fitted for biting—prolonged into incurved, prehensile appendages of the form of a grain cradle finger, and smooth and cylindrical, except at the tips, which are pointed, and minutely notched. As I have shown in my 5th report, there is no perceptible sexual difference in larva or pupa, unless it is, as stated by Haldeman, in the rather larger size of the jaws of the male. This feature cannot, however, be relied on. This similarity of the sexes, especially in the pupa, is the more remarkable that in the imago state they differ so greatly. The subsequent modification of the male jaws is assumed at the last molt; and if the jaws of a male pupa be dissected, the future finger-like jaws will be found crowded within them, like the "wrinkled finger of a glove pushed into a thimble," as Mr. Comstock expresses it. This modification in the male is evidently to enable him to embrace the soft body of the female, as it cannot well have any other use. The body of the hellgrammite is soft, and were the jaws of the male horny, and armed with teeth, in securing the female they would injure her, and thus defeat rather than aid procreation. In the large stag beetle or "buck-bug" (*Lucanus elaphus*, Linn.), on the contrary, where both sexes have very hard, horny bodies, the upper jaws in the male are greatly prolonged, but very stout, and armed with sharp prongs, the better to enable him to seize the female.

In these two cases we see how wonderfully the homologous organs have been modified in opposite directions to accomplish the same end. We find in Nature innumerable such curious contrivances and modifications, which at once excite our wonder and admiration. To quote Mr. Walsh's own eloquent words: "In so elaborate and diversified a manner does Nature adapt her plans and patterns to the ever-varying conditions of animated existence; and with such consummate care has she provided that the great fundamental law shall everywhere be carried out: 'Increase and multiply and replenish the earth.'"

It is worthy of remark that in both these large insects, in which the male upper jaws are so modified, this sex is far more common than the other. It is probably owing to the fact that the female seldom wanders away from her breeding place, and is, therefore, less often seen than her more restless and adventurous mate.

The Allen Governor.

The Allen governor, an extended illustrated description of which we published some time ago, is meeting, we are gratified to learn, with the substantial success to which, through its many merits, it is justly entitled. Over 2,000 of these governors are now in operation in this country and abroad, and the demand is constantly increasing. The manufacturers exhibit a series of testimonials, from those who have the machine in use, on all sorts of engines and under a great variety of conditions; and there seems to be but one opinion as to its great sensitiveness and general efficacy. We see from an advertisement in another column that agents are desired for the sale of the governor.

On the Estimation of Alum in Bread.

"For a long time past the old Normandy or soda process for the estimation of alum in bread, has been condemned on account of the great difficulty experienced in re-dissolving the aluminic hydrate or phosphate, after its precipitation, together with tri-calcic phosphate, etc. This has led to the production of several processes, most of which are very complicated. By a slight modification in the usual method of procedure, the Normandy method can be rendered as accurate in its results as any of those which have replaced it. This consists in adding the boiling acid solution of the charred bread to a boiling solution of sodic hydrate, containing a large excess. I proceed as follows: 1,000 grains of bread are burnt down to a small bulk, powdered with about 100 grain measures of hydric chloride, and warmed for a few minutes; about two ounces of water are then added, boiled for five minutes, filtered, etc. A solution containing about 250 grains of pure sodic hydrate is made in a very little water; and to this solution, when boiling, is very cautiously added the boiling acid solution of the charred bread, the whole boiled for a few minutes, filtered, and washed. The

filtrate, after the addition of a few drops of a concentrated solution of disodic phosphate, is slightly acidified with hydric chloride, and subsequently rendered just alkaline with ammonic hydrate and boiled. The precipitate is collected, washed, and weighed as aluminic phosphate.

"To test the accuracy of this method, I had four loaves of bread made in my kitchen, one with no alum, the others with varying quantities. Care was taken to leave as little as possible of the dough adhering to the sides of the vessel in which it was made, so that each loaf contained, practically, all the alum that was dissolved in the water with which it was made. The loaves were weighed when one day old, and 1,000 grains taken of each.

Weight of loaf.	Grains of alum put in.	Weight of Al. PO ₄ from 1,000 grains.	= grains of alum in loaf.
1. 2 lbs.	0	0.07 grains.	3.50
2. 1½ lbs.	10	0.33 grains.	12.39
3. 2 lbs.	20	0.46 grains.	23.80
4. 2½ lbs.	40	0.76 grains.	44.20

"It will be seen that the method leaves nothing to be desired in point of accuracy, and will favorably compare with any other in respect to simplicity.

"Since devising the above process, I have been informed by Mr. Heisch that he, and he thinks others, have for many years applied the same principle (namely, the addition of the acid solution to an excess of boiling alkali) to the separation of aluminic hydrate from other gelatinous precipitates, having found it impossible completely to re-dissolve the aluminic hydrate by any amount of sodic hydrate if it were once precipitated."—W. C. Young, F.C.S., in *The Analyst*.

Mount Carmel, Ill., Destroyed by a Tornado.

The town of Mount Carmel, Ill., was visited on the 4th instant by a terrible tornado, which laid nearly the entire place in ruins. About 20 business houses and 100 residences were either destroyed or badly damaged by the fury of the gale, and by the fires which broke out at various points. The storm came from the southwest, and, from its track, seems to have been a cyclone traveling at an estimated velocity of 150 miles per hour. During its prevalence, the air was filled with flying roofs, lumber, clothing, etc., some of the debris being carried miles away. Thirteen persons are reported as killed, many others injured, and some seventy families were rendered homeless. The loss of property is said to amount to nearly \$500,000. No warning whatever was afforded of the approach of the storm. It seems to have struck the town and to have passed over it within two minutes, preceding a heavy rainfall.

Mount Carmel has about 3,000 residents, and her industries were largely mechanical. The SCIENTIFIC AMERICAN has many subscribers among those who have been afflicted, for all of whom we have the heartiest sympathy.

The Meeting of the American Association for the Advancement of Science.

The twenty-sixth meeting of the American Association for the Advancement of Science is to be held at Nashville, Tenn., on August 29. Sessions will take place in the Capitol. Special arrangements are being made for decreased railroad fares, etc., and for the accommodation of members in the city. The permanent subsections of chemistry, microscopy, and anthropology are to be continued, and the co-operation of students of these sciences is requested. The Entomological Club will meet on the day preceding the meeting of the Association.

Inventions Patented in England by Americans.

- From May 15 to May 24, 1877, inclusive.
- BATH OVERFLOW, ETC.—Valve and Faucet Company, New York city.
- BOOK.—J. Clemens, Hartford, Conn.
- BOOT-NAILING MACHINE.—L. R. Blake, Boston, Mass.
- BOTTLE STOPPER.—N. Thompson (of Brooklyn, N. Y.), London, England.
- CAR COUPLING.—E. Miller, New York city.
- ELASTIC BAND.—F. Armstrong, Bridgeport, Conn.
- LAMP.—J. H. Lewars, Philadelphia, Pa.
- LAMP.—N. L. Rigby et al., Winfield, Kan.
- METAL CARTRIDGE SHELLS.—J. H. Bullard, Springfield, Mass.
- MOTOR FOR ROCK DRILLS, ETC.—E. S. Winchester et al., Boston, Mass.
- ORNAMENTING GLASS, ETC.—S. M. Adams, New York city.
- PAPER BOX, ETC.—E. B. Beecher, Westville, Conn.
- PARING FRUIT, ETC.—W. H. Goodchild et al., New York city.
- PORTABLE BOAT.—C. A. Fenner, Mystic River, Conn.
- POSTAGE STAMP, ETC.—A. B. Foster, Providence, R. I.
- POSTAGE STAMP, ETC.—J. Sangster et al., Buffalo, N. Y.
- REFINING STEEL, ETC.—J. E. Sherman, Boston, Mass.
- SCISSORS.—C. M. Meserole, New York city.
- SCREW MACHINERY.—E. Nugent, Brooklyn, N. Y.
- SCREW-THREADING MACHINE.—S. S. Townsend, Philadelphia, Pa.
- SCREW WRENCH, ETC.—B. L. Walker, Sing Sing, N. Y.
- SEWER GAS TRAP.—B. P. Bower et al., Cleveland, Ohio.
- SEWING MACHINE.—L. Dryfoos, New York city.
- SPLINT.—D. Ahl, Newville, Pa.
- TORPEDO APPARATUS.—H. S. Ross (of Chicago, Ill.), London, England.
- TOY HORSE.—J. H. Nolan, Boston, Mass.
- TREATING SLUDGE OIL.—W. P. Jenney, Brooklyn, N. Y.

DECISIONS OF THE COURTS.

Supreme Court of the United States.

PATENT STONE-CRUSHING MACHINE.—JOHN ROBERTSON, CHARLES C. MARTIN, AND AUSTIN H. SMITH, APPELLANTS, vs. ELI W. BLAKE, ELI W. BLAKE, APPELLANT, vs. JOHN ROBERTSON, CHARLES C. MARTIN, AND AUSTIN H. SMITH.

[Appeals from the Circuit Court of the United States for the Eastern District of New York.—Decided October term, 1876.]

The patent granted to Eli W. Blake for a stone breaker, June 15, 1858, reissued January 9, 1866, and extended June 15, 1872, is not anticipated by the earlier patent to Hobbs and Brown for "improvements in the application of well known mechanical means for the purpose of crushing ice," and to Hamilton for "crushing and grinding quartz or other substances," they not containing any of the essential elements of Blake's invention.

The substitution of one part of the operating mechanism, of a combination the equivalent of that omitted, does not avoid an infringement. When an original machine and an improvement upon it are both patented, neither patentee can use what does not belong to him without the requisite authority from the owner.

The complainant was found entitled to nominal damages only, the burden of proof being upon him; and it appearing that the proof was mea-

ger and indefinite, but four machines made, no established license fee, the profits made being due in part to inventions covered by other patents, and no distinction made between profits accruing from the use of complainant's invention, and that from the other inventions and manufacturers' profits.

Mr. Justice Swayne delivered the opinion of the court. These are cross-appeals in the same cause. Both involve questions in mechanics. These being determined, the legal propositions which apply are so well settled as to admit of no controversy.

A patent was granted to Blake on the 15th of June, 1858, by the United States, for a stone breaker. On the 9th of January, 1866, the same authority reissued the patent to him, with amended specifications. It was extended on the 15th of June, 1872. The bill in this case is founded upon the latter patent. It charges infringement.

The answer avers that the machine described is of no practical utility, denies the novelty of the invention, and also the alleged infringement.

The description in the specification sets forth three things as the essential characteristics of the machine:

(1.) Two jaws within which the stones are to be broken. Their faces are to be so nearly in an upright position that the stones will descend between them automatically. The jaws are to be so far convergent that the interspace at the top will be sufficient to receive the stones, and that at the bottom only such as will allow the fragments to escape when broken of the required size.

(2.) A revolving shaft driven by steam or other motive power, imparting to one of the jaws a continual vibratory movement, causing it alternately to approach toward and recede from the other jaw, through a short and definitely limited space, so that when a stone is put in the movable jaw will advance and crush it, then receding liberate the fragments, which again descend, and, if too large, are rearranged and crushed again, and so on until the fragments have passed out through the open space at the bottom. The distance between the jaws is to be adjustable at pleasure, so that the stone can be broken of any desired size.

(3.) A flywheel is combined with the revolving shaft and movable jaw for the purpose of rendering the strain upon the power more equal.

The claim is for—

A combination of a stone-breaking machine of upright converging jaws with a revolving shaft and mechanism imparting a definite reciprocating movement to one of the jaws from the revolving shaft, the whole being and operating as set forth.

The combination in a stone-breaking machine of the upright movable jaw with the revolving shaft and flywheel, the whole being and operating as set forth.

In combination with the upright converging jaws and revolving shaft, imparting definite limited vibration to the movable jaw, so arranging the jaws that they can be set at different distances from each other at the bottom, thus producing fragments of every desired size.

A moment's glance at the model furnishes a sufficient answer to the objection of the want of practical value. It would be passing strange if a machine of that character could have gone through the severe conflicts of litigation which this patent has encountered and have come forth victorious from every contest. It has proved equal to every ordeal to which it has been subjected. The number sold by the complainant, as shown by the record, is conclusive upon the subject.

The patent to Hobbs & Brown of the 4th of September, 1849, and the patents to Hamilton of the 30th of January, 1854, and the 5th of January, 1855, anticipate the patent to Blake. It is insisted that each of them is for a machine substantially the same with the one described in Blake's patent, and that they are fatal to his claim of the requisite novelty of his alleged invention.

The machine for Hobbs & Brown is for—

Improvements in the application of well known mechanical means for the purpose of crushing ice. * * * The improvements consist in applying a hopper with one diagonal fixed side and two parallel sides to contain the ice, and compressing the ice by a movable fourth side, the fixed diagonal side and moving side having within them dental projections cut or cast on, to operate downward and prevent the ice from rising in the hopper when compressed, and also to enter and split the ice.

The machine is operated "by the combination with these parts of a lever fitted with an eccentric or cam-formed point."

There is in this description neither of the ingredients nor the compound of the Blake machine. Every element and the combination are both wanting. There is no mention of the converging adjustable jaws, of the revolving shaft, nor of the flywheel. The differences are as marked in the mode of operation as in the structural elements of the machine.

The Hobbs & Brown machine does its work by the downward and sweeping movement of the jaw and the grasping and splitting by the teeth. The motive power is supplied and applied by a hand lever, which gives a motion irregular and varying with the varying exigencies of the ice during the process to which it is subjected.

The Blake machine performs its functions by the short, regular, and unvarying vibrations of the smooth-faced adjustable jaw driven without intermission by the revolving shaft.

It is obvious that the Hobbs and Brown machine could not be applied with effect to the purpose of breaking stones without essential changes of principle and details.

Hamilton's machine was "for crushing and grinding quartz or other substances."

In the specification annexed to his original patent, he says: "My invention consists in the use of a cylindrical nut or pestle in a similarly formed basin, the pestle having a partial rotary and crushing motion communicated to it by means of a lever attached thereto.

A is a basin, the lower part of which is made circular, and the sides parallel to each other; *b b* are flat ends or heads secured to the basin by bolts. C is the shaft carrying the cylindrical pestle, *d*. E is a lever attached to or formed with the pestle, *d*, the upper end being connected by a joint, 2, to a pitman, passing to a crank, eccentric, or other suitable mechanical contrivance to give the arm, E, an oscillating movement, and the pestle a partial rotary motion on its shaft, C.

The claim of this patent is for—

The means herein described and shown for crushing and grinding metallic ores, consisting of the cylindrical pestle, *d*, provided with grooves in its upper part to crack the lumps of ore and set a shaft, C, on which it has a partial rotary motion, and operating in connection with the basin, A, in which said pestle moves to grind the ore into powder by the gradual approach of the sides of said basin to the cylindrical pestle, said pestle being also provided with a scraper or agitator, 5, in its lower surface to operate as specified.

The second patent is declared to—

Consist in providing means for keeping the pestle down with sufficient force to pulverize the material operated on, and also to prevent the pestle from grinding too finely, i. e., to furnish material for simply cracking the ore or other material into small lumps of any desired size instead of grinding the same to a powder, thereby adapting the machine to different characters of metallic ores or other substances.

We have here no reflex or embodiment of either of the ideas that found expression in the Blake machine. The converging jaws, the revolving shaft, and the flywheel are all wanting, as in the Hobbs & Brown machine. Instead, there is a cylindrical nut or pestle, having a partial rotary and crushing motion communicated to it by means of a lever attached thereto. The pestle rotates on a central axis within an eccentric concave. The work is done by this pestle. There is nothing of the vibratory motion of a movable jaw, alternately advancing and receding, as in the Blake invention.

The difference is not that of mere mechanical equivalents. It is radical and goes to the essence of the organisms. These considerations are so obvious that further remarks upon the subject are unnecessary.

The proofs show that but two of the Hamilton machines were ever made. Practically the invention was abandoned.

This brings us to the question of infringement.

There are numerous points of similarity, and, indeed, of identity, in the respondent's machine, which are not controverted. It is for breaking stone. It has two upright jaws for this purpose, one fixed and the other movable. The jaws converge. The breaking is effected by the convergence. The movable jaw alternately approaches toward and recedes from the fixed one. This movement is produced by a short and powerful vibratory motion communicated by a revolving shaft with a flywheel upon it. There is an opening at the upper end of the jaws where the stones are received, and one below where they are discharged.

The only point of diversity insisted upon by the respondents is that the vibratory movement in the Blake machine is limited and unvarying, while in the machine of the appellants it is not of this invariable character.

In the Blake machine the movable jaw receives its movement from the revolving shaft through iron rods and levers. In the respondents' machine it is communicated from the revolving shaft through a confined column of water.

In the appellant's model the revolving shaft is not shown. In their machine it works the plunger of the pump from which the water is conveyed to a cylinder behind the movable jaw, whence it is applied to that jaw by means of a ram, the ram taking the place of the piston in an ordinary engine. Thus the vibrating arm, the toggle, the toggle joint, and the pin-joints in the Blake machine are dispensed with, and their place supplied by the hydraulic arrangements we have described.

What is so employed in the appellant's machine is the obvious and exact equivalent of what is so dispensed with in the Blake machine. The liability of the packed joints to leakage is a serious objection to such use of water. Any considerable leakage would stop the machine. It could not be used while that condition existed. Constant care and vigilance are necessary in such cases to prevent the frequent occurrence of this evil. Water does not escape from a safety valve with the same celerity or effect as steam.

The Blake machine has a decided advantage in the greater simplicity and cheapness of its equivalents.

It is difficult to resist the conclusion that the change had no motive or purpose but evasion.

If there be no extraneous obstruction, the vibratory motion will be exactly the same in both cases. If there be such obstruction, the safety valve in the appellant's machine might possibly be brought into use with good effect. But if this were so, the valve would be only an addition and an improvement of the machine. The valve, therefore, is, in any view, quite immaterial to the inquiry we are pursuing.

Where an original machine and an improvement upon it are both patented, neither patentee can use what does not belong to him without the requisite authority from the owner. The appellants have embodied all the ideas of Blake's invention in their machine, the valve which supplemented it, whether good or bad, is outside of the case, and cannot effect the result.

We think the infringement is clearly made out. It remains to consider the question of damages. A few remarks upon that subject will be sufficient.

The proof is meager and indefinite. The infringers made but four machines. No license fee charged by the complainant is shown. The burden of proof rests upon him. Damages must be proved; they are not to be presumed. The complainant made a profit of forty dollars an inch on the width of the jaws of the numerous machines he had sold.

But inventions covered by other patents were embraced in those machines. It was not shown how much of the profit was due to those other patents, nor how much of it was manufacturer's profit. The complainant was, therefore, entitled only to nominal damages. This the court gave him. It was all the state of the evidence warranted. It would have been error to give more.

The decree of the circuit court is affirmed. The costs of each appeal are adjudged against the party taking such appeal.

United States Circuit Court—District of Massachusetts.

PATENT LAMP.—CHARLES E. ASHCROFT vs. WILLIAM HOLLINGS.

[In equity.—Before Shepley, J.—Decided April 13, 1877.]

The patent for a lamp, can, or barrel, packed in part with an absorbent or finely granulated material, and over them a body of wire gauze or perforated thin plate, either rolled up like paper scrolls or put flat together like book leaves, is not infringed by the use of a lamp containing cotton covered with a layer of asbestos or porous fireproof cement, and covered with one thickness of wire gauze.

The invention patented to Wm. Beschke, August 14, 1866, includes as a necessary ingredient wire gauze or perforated thin plate in the form of scrolls or of layers like the leaves of a book.

OPINION OF THE COURT.

Shepley, J.:

The defense in this case is based upon the alleged want of novelty in the invention described in the letters patent granted to William Beschke and others, August 14, 1866, No. 57,345, "for an improved method of using explosive fluids for the production of light and heat," and also upon a denial of any infringement of the Beschke patent. The question of infringement depends upon the construction to be given to the Beschke patent.

In view of the state of the art at the date of the patent, as well as upon what is clearly described in his specification and claimed in his claims, it appears to be clear that the invention of Beschke is described and claimed as consisting in a lamp, or can, or barrel, packed in part with an absorbent or finely granulated material (excluding sand and including sawdust, cotton, beads, shot, gravel, asbestos, and their equivalents), and over them "a body of wire gauze or perforated thin plate, either rolled up like paper scrolls or put flat together like book leaves."

The defendant sells a lamp for heating purposes, manufactured under letters patent issued to Thomas W. Houchin, May 4, 1875, called Houchin's patent pocket cook stove. The lamp is made of metal, and is filled with cotton covered with a layer of asbestos, or of porous fireproof cement of which asbestos is an ingredient. The upper opening is covered with one thickness of wire gauze. There is no tube as distinguished from the body of the lamp, and there is no "body of wire gauze or perforated thin plate, either rolled up like paper scrolls or put flat together like book leaves."

Wherever in the Beschke patent wire gauze or perforated thin plate is alluded to, it is in the form of a scroll or of layers, like the leaves of a book, and after constantly repeating this description throughout the patent, and never using the words without some description of a scroll or layers, except in one instance, and then "wire gauze combined and shaped as mentioned," the patentee adds, "I disclaim also the simple use of mere wire gauze or perforated thin plate not rolled up like paper scrolls or put flat together like book leaves." The wire gauze or perforated thin plate, described in the claim of the Beschke patent, must be construed as referring to wire gauze or perforated thin plate rolled up like paper scrolls, or put flat together like book leaves, as described in the specification, and upon this construction of the claim in the patent the defendant does not infringe.

Bill dismissed with costs.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED CAR AXLE BOX.

Edward L. Colman, Vandalia, Mo.—This relates to an improved car axle box, with anti-friction and self-oiling devices; and consists of the journal revolving in an elongated box, which is made of a top and bottom section, secured by bolted face and back plates. A number of friction rollers pass around the journal and around a guide channel below the same, taking up the oil by a bottom inlet from the outer box.

IMPROVED BRICK MACHINE.

Thomas McNicholas, Memphis, Mo., assignor to himself and Thompson Walker, of same place.—The moulds are similar to hand moulds, except that they have notches formed in their bottoms to receive springs attached to the bottoms of the channels in which said moulds slide, to hold them in place exactly beneath the discharge holes in the bottom of the mud box, and prevent them from being drawn back by the withdrawal of the pushers. The drive wheel causes pushers to bring the moulds beneath the discharge holes of the mud box, when the scrapers are in proper position to force out the clay, so that there may be no loss of time, and so that there may be no break in the passage of clay into said moulds to form imperfect or scamed brick.

IMPROVED LIFTING TONGS.

John T. Campbell, Rockville, Ind.—This is an improved device for lifting, carrying, dragging, or otherwise handling logs, timber, lumber, railroad ties, stone, etc., which is so constructed that it may be readily adjusted, as the character of the work to be done may require. It consists in a lifting tongs in which the handles are connected with the shanks of the jaws with an adjustable and reversible joint.

IMPROVED HAIR SPRING STUD FOR WATCHES.

Francis M. Martin, Cambridge, Ill., assignor to himself and John A. Hart, of same place.—This is an improved hair spring stud for the balance wheel of watches, by which the hair spring may be shortened or lengthened with great facility, and adjusted higher or lower, so as to be placed at a perfect level above the balance. The stud fastens to the hair spring without changing the same at the least at that point, so that it retains equal strength all around and moves in perfect isochronism. The invention consists of a stud, composed of a fixed and movable jaw, projecting downwardly, and clamped to the hair spring by a screw with tapering or eccentric head. The jaws are made to fit the curvature of the outer coil of the spring, so as to clamp the same without bending it out of its true shape.

IMPROVED CAR COUPLING.

Edward B. Middleton, Charleston, S. C.—When the cars are brought together, the projecting end of a hook enters the mouth of the opposite drawhead, strikes the beveled portion of a catch, raises the latter, together with its rod, and engages with the shoulder of a recess, thus completing the "lock" automatically. The parts are held so engaged so long as required by the gravity of the catch block.

IMPROVED RAILROAD TIE.

Alexander H. Campbell, Liberty, Ind.—This invention consists of a metallic cross tie of double T-shaped cross section, of which the bottom flange is cut out at the center. The tie is provided with sockets having bottom wedges for wooden filling blocks, retained by a central key driven down upon the wedge.

IMPROVED CUT-OFF OR VALVE FOR PUMPS.

Job Mansir, Richmond, Me.—This is a cut-off for the suction pipe of a pump, which is capable of making connection with either of two branch pipes, or both, as may be desired.

IMPROVED PIPE-CUTTING MACHINE.

Nehemiah Watson, Arcadia, R. I.—This invention consists, essentially, of a revolving circular saw, capable of cutting iron, and of a clamp for grasping the pipe and holding the machine in place during the forward feeding and cutting of the saw.

IMPROVED FLYING MACHINE.

Frank Barnett, Keokuk, Iowa.—This consists of a kite or horizontal sail provided with a boat or basket for passengers, which is placed on wheels, and is provided with propeller wheels for moving the apparatus, and with a device for guiding.

IMPROVED PITMAN CONNECTION.

Joseph Warren Blood, Minneapolis, Minn.—This is an improved pitman connection for that class of mowing and reaping machines that have a hinged finger bar and tilting device. It is so constructed as to admit of the different movements which occur while in operation without binding.

IMPROVED CIRCULATING DEVICE FOR STEAM BOILER.

Henry S. Coleman, Chelmsford, Eng.—This consists in the employment in a boiler of circulating tubes suspended within the tubes connecting the two shells of the boiler. The said circulating tubes are straight vertical tubes of about half the sectional area of the outer tubes, and extend upward a short distance into the upper shell, and downward to the bottom. They are so supported as to be readily removable out of the way for cleaning the boiler, and for this purpose a rotating shaft is mounted, to which in the upper shell all the tubes are connected, so that they may be raised simultaneously. The tubes are also constructed in two parts, one sliding within the other.

IMPROVED WINDMILL.

William Ap Williams, Cambria, Wis.—The object here is to diminish the friction in the working parts of the mill, and thus enable it to be run with a lighter wind than would otherwise be possible. The construction is such that the leverage is the same when lowering and when raising the pump rod.

IMPROVED BARK MILL.

William F. Mosser, Allentown, Pa.—This is an improved mill for grinding bark, provided with a safety device to prevent breakage should a foreign substance get into it. The breaker serves as a coupling, and is of such strength as to drive the runner under ordinary circumstances; but should any hard substance get into the mill, the collar will break and thus prevent the mill from being injured.

IMPROVED TURBINE WATER WHEEL.

Nathan H. Gould, Oakfield Centre, Mich.—This is an improvement in the class of water wheels having guides for directing the water against the buckets. The desk or surface of the throat plate is flat and smooth, so that little impediment is offered to the free passage of the water through the outlet holes, and the guides are so constructed as to aid materially in directing the water at right angles against the buckets of the wheel.

IMPROVED BOOT AND SHOE SOLE TRIMMING MACHINE.

William E. Forster and Willard C. Tolles, Nashua, N. H.—This consists of a revolving cutter in combination with a feed table and adjustable gauge. The cutting knife is keyed to the shaft in such a manner as to be readily taken off for sharpening, and projects about the thickness of the sole or heel above the table on which the boot or shoe rests. The table is provided at the front part with a straight or concave throat plate, on which the sole or heel of the shoe rests when being exposed to the action of the knife. The shoe is run along the gauge, which bears against the upper of the shoe, the heel or sole being turned on the throat plate and trimmed off by the cutter.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED ICE CREAM FREEZER.

John Salter, Baltimore, Md.—This invention relates to an improvement upon that form of ice cream freezer having a stationary scraper in a revolving cylinder, which scraper is held stationary by its connection with a top plate, while the cylinder is revolved through a horizontal shaft with a bevel wheel that engages with corresponding beveled teeth on the top or cover of the cylinder. The improvement consists mainly in making the horizontal drive shaft hinged or jointed, and fixing its outer extremity in an outside independent bearing, so that the inner portion of the shaft with its bevel wheel and the top plate of the freezer may be together lifted off the tub and supported away from the same whenever it is desired to remove the cylinder or inspect its contents.

IMPROVED FILTERING APPARATUS.

James Gainey, Augusta, Ga.—It consists of an adjustable plunger, to effect the compression of the filtering material in adapting the device to filter under varying degrees of pressures, in combination with the means for passing the water through the filtering chamber in the opposite direction to cleanse the filter without reversing the position of the same. It also further consists in locating an expansible spring directly in the filtering material, so that when the pressure of the plunger is relieved the movement of the spring in expanding loosens up the filtering material to adapt it to be thoroughly cleansed by the passage of the water through it. The apparatus is designed to be used in both double and single form, and is adapted to all kinds of filtration, but more especially to the filtering of water for household purposes.

IMPROVED LADLE FOR METAL FOUNDING.

William Fawcett, Omaha, Neb.—In the manufacture of car wheels, iron of high specific gravity has to be used in order to procure the necessary depth of chill. In wheel foundries a large ladle holding from five to ten tons of molten metal is placed in front of cupola and allowed to run full before pouring off. During the time of melting and casting, the hard, dense, and close metal will settle to the bottom by its own gravity, while all impure and light metal will rise to the surface. The wheel cast with metal from the top cannot have the proper chill, while those cast from the bottom iron are so hard and brittle as to be unsafe to be placed under a passenger car. By drawing the metal first from or near the bottom, a uniform chill is procured all through the heat, and to this end the invention consists in constructing the ladle with a vertical conduit in the side thereof which opens into the bottom of the ladle, so that as the latter is tilted the purer and denser metal at the bottom of the ladle passes up said conduit and discharges first into the mould, leaving behind the lighter metal and the scoria floating in the top of the ladle.

IMPROVED SAFETY POCKET.

Frederick Wendt, Utica, N. Y.—This consists of a pocket having a small interior pocket of the inner top part, in connection with a top flap, fitting into the small pocket, so as to close or open the main pocket.

IMPROVED ROWLOCK.

William Spelman, Portland, Me.—This rowlock is so constructed as to diminish the friction between the oar and lock. It is made square, with its corners cut off, and there is an opening in its rear upper corner for the blade of the oar to be passed through. It is journaled to a block which is suitably pivoted to the gunwale.

IMPROVED HOP DRYER.

Samuel R. Templeton, John C. Templeton, and Joseph H. Templeton, Brownsville, Oregon.—This is an improvement in the class of drying apparatus in which a furnace and fan blower are combined, the one to impart heat and the other to impel the heated air through or in contact with the substance to be dried. The hops to be dried are placed upon a cloth, laid upon racks in layers of any desired thickness, so that the hot air may be forced up through them, expelling the moisture and drying the hops quickly.

IMPROVED REAR SIGHT FOR FIREARMS.

Charles F. Robbins, Brooklyn, N. Y.—This is a gauge for adjusting the rear sights of rifles from a zero point to the maximum of windage, at either right or left hand.

IMPROVED VERMIN TRAP.

Jean M. A. Berger, Charleston, S. C.—This consists of a frame or base of willowware, provided with boards having proper interstices attached to cross strips in close proximity to the willow frame. The trap is placed in position either at the head or foot end of the bed, or between the mattress and slats, or between bedstead and bedding, or at any other place where the insects are apt to congregate. The bugs, roaches, or other vermin are attracted by the large number of recesses and cavities of the trap, and are fond of hiding in the same.

IMPROVED CIGAR CUTTER.

H. Friedrich Schultze, Philadelphia, Pa.—This is an improved device for cutting off the points of cigars by the use of one hand only, the tips being dropped into a storage receptacle. It consists of a storage receptacle having a swinging and guided lid, with gauge holes for the points of the cigars, and resting on a spring cutting-knife, that passes below the gauge holes and cuts off the points by pressure on the lid.

IMPROVED FOUNTAIN PEN.

Henry N. Hamilton, White Plains, N. Y.—This fountain pen is so constructed that it may receive and hold enough ink to write one or more pages of manuscript. It also may be adjusted to let down the ink more or less freely, and it may be carried in the pocket, if desired.

IMPROVED ENGRAVING MACHINE TABLE.

Augustus E. Ellinwood, Garretttsville, O.—This is a table for holding the patterns or forms used in engraving machines by means of a elastic lip, secured in a groove in the table, which receives one of the edges of the pattern, and a longitudinal slot that receives a lip formed on the other edge of the pattern.

IMPROVED SHOTBAG AND CHARGER.

Thomas J. Jolly, Etna, Mo.—By this shotbag and charger any given quantity of shot may be uniformly and quickly taken out from the bag for the purpose of loading shotguns. The bag has a perforated bottom and a sliding pivoted plate, with a downward extending tube, having a bottom flange, interior charger, and plug fitting into the bottom hole to close the same and lift the charger.

IMPROVED BOOT OR SHOE.

Thomas J. Greenwood, Warren, Ill., assignor to himself and Thomas D. Thornton, of same place.—This is an improved seamless-back shoe. It has a quarter, which is cut of one piece of leather, along a center line and symmetrical curved side lines, and with holes near the highest point of the instep, to produce front sections and back tongue. The front sections are spread or sprung forward, and a top quarter of corresponding shape is placed between the same and stitched to the edge of the quarter. In this manner a shoe with seamless back is produced that may be made with any style of top quarter or vamp.

NEW TEXTILE INVENTION.

IMPROVED STOP MOTION FOR LOOMS.

Fred. Christen, Homestead, Iowa.—The object of this invention is to provide a simple and effective weft stopping device for fancy looms using two or more colors of thread. It consists in a novel arrangement of fingers, between which the filling passes as it runs out of the shuttle, one series of which, on the breaking of the filling threads, moves so as to actuate a stopping device. The improvement is designed for that class of looms that weaves fabrics from threads of several colors, which are introduced into the warp in succession; and it is intended for stopping the loom or the pattern-forming mechanism of the same.

NEW AGRICULTURAL INVENTIONS.

IMPROVED STUBBLE GUARD FOR PLOWS.

Benjamin F. Phillips, Lowden, Iowa, assignor to Nicodemus Henry, of same place.—This is an improved device for clearing a plow of stubble, weeds, and other trash. By it the plow can be cleared by the plowman while standing erect in his place, and without stopping the team. It is a pivoted bar, attached to the beam, having pronged ends which rest on the mouldboard. It is operated by a suitable lever.

IMPROVED CULTIVATOR.

John Rhodes Tilley, Demerara, British Guiana, South America.—The new features include means to enable the plows to be raised from and lowered to the ground, and adjusted to work at any desired depth in the ground. Also devices whereby the cutting knives are given a slow rearward motion beside that caused by the forward progress of the machine.

IMPROVED STRAW CUTTER.

Eric M. Hesselbom, Riceford, Minn.—This machine for cutting straw and hay for feed for stock is so constructed that the straw or hay will not be fed forward when the knives are cutting. It may be readily adjusted to cut the feed coarse or fine.

IMPROVED SULKY PLOW.

Albert A. Fowler, Plano, Tex.—This invention relates to the construction and arrangement of parts whereby the tongue and connected devices may be adjusted laterally according to the number of plows employed at one time, or according to their respective positions when used; also, whereby the plow beams are held rigidly parallel, although adapted for adjustment laterally and allowed free vertical movement.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED METHOD OF FORMING BLANKS FOR BOOTJACKS.

Henry A. Brown, Toledo, O.—This consists of taking a continuous strip of wood of suitable length, and of the width and thickness of the main piece of the common bootjack, and cutting the same alternately at suitable oblique angles, so as to produce separate pieces with tapering ends and a thicker intermediate point or seat for the cleat. The tapering ends of the bootjack allow the more convenient packing for shipment.