certainly is the most expensive. The alloys of copper, antimony, and tin, or so called white metal,are bad makeshifts,as well as the so called lead composition bearings of lead and antimony; for it is impossible to give these alloys a hardness approaching that of the revolving axle without rendering them brittle. If an alloy is used sufficiently hard to avoid great wear, these bearings will heat much and are very brittle.

On most of the English, Belgian, German,French, and particularly on American railroads, white metal, and especially lead composition, bearings are little used, and this with good reason; for what would become, for instance, of a white metal bearing on an American railroad, where the bearings are subjected not only to heavy loads, but where they have to travel thousands of miles on rails belonging to other companies, and therefore are not much looked after.

Gun metal bearings, alloys of tin and copper, are not often homogeneous, with exception of the alloy of 17 to 18 per cent of copper, which is the most trustworthy alloy of tin and copper. In alloys containing a lower percentage of tin, the latter segregates in the form of tin spots, when the alloy cools slowly. All other compositions in use for bearings, such as 12 to 17 per cent of tin and 88 to 83 per cent of copper, do not make homogeneous bearings, unless they are cast in chill molds, which in practice is impossible. This heterogeneity of gun metal bearings is dangerous, as it produces gripping, and thereby a rapid wear. This specific quality of gun metal bearings (to grip) is theoretically easily explained: In cooling, the softer metal (composed of from 7 to 10 per cent of tin and 93 to 90 per cent of copper), being the less fusible, sets first, forming the skeleton of the bearing; later, the very hard and brittle alloy,containing 17 to 18 per cent of tin and 83 to 82 per cent of copper, sets and fills the pores of the softer skeleton. The particles of the harder alloy are easily torn away by the axle if the bearing is not sufficiently lubricated,and these tear the skeleton composed of the softer alloy; this I have frequently observed at rolling mills where the bearings were not sufficiently lubricated, and where particles in the form of small flakes peel off.

A good bearing which answers all purposes must not be homogeneous, but must consist of a strong and tough skeleton, the hardness of which nearly equals that of the axle, in order to resist shocks without deformation, and the pores of this skeleton must be filled with the soft metal or alloy.

The nearer the hardness of the skelton approaches the hardness of the axle, the better the bearing will resist the pressure or shocks; and the softer the metal filling the pores, the better the bearing is in every respect. Such bearings are now made by melting two or more alloys of different hardness and fusibility together, in such proportions that necessarily a separation into two alloys of definite composition takes place in cooling.

Phosphor-bronze bearings consist of a uniform skeleton of very tough phosphor bronze, the hardness of which may be easily regulated to equal the hardness of the axle, while the pores are filled with a soft alloy of lead and tin.

Such a phosphor bronze bearing may therefore be considered as having its wearing surface composed of a great number of small bearings of very soft metal encased in the tough and strong metal which equals the hardness of the axle; on the planed bearing surface this molecular disposition cannot be detected by the naked eye, but, if examined with a magnifying glass, the truth of the above will at once be seen. Another practical proof can be given by exposing such bearings to a dull red heat, when the soft alloy will sweat out, and the hard, spongy, skeleton-like mass remains.

In this consist the great advantages of phosphor-bronze bearings,which is proved wherever tested; for while the axle partly runs on a very soft metal and thus obviates heating, even if not sufficiently lubricated, the harder part of the bearing, its skeleton, does not allow of wear taking place; and as the hardness is arranged to equal the hardness of the axle, wear is reduced to its very minimum.—*Dr. Charles Kunzel*

Use of Iron Instead of Lead Shot in the Rinsing of Bottles.

Lead shot, where so used, often leaves carbonate of lead on the internal surface, and this is apt to be dissolved in the wine or other liquids afterward introduced, with poisonous results; and particles of the shot are sometimes inadvertently left in the bottle. M. Fordos states that clippings of iron wire are a better means of rinsing. They are easily had, and the cleaning is rapid and complete. The iron is attacked by the oxygen of the air, but the ferruginous compound does not attach to the sides of the bottle, and is easily removed in washing. Besides, a little oxidized iron is not injurious to health. M. Fordos further found that the slight traces of iron left had no apparent effect on the color of red wines; it had on white wines but very little; and he thinks it might be better to use clippings of tin for the latter.

Fast Steaming.

One of the finest and fastest steamboats on the Hudson river is the Mary Powell. Recently she made the distance from New York to Piermont, 28 miles, in one hour, while the actual running time to Poughkeepsie, 74½ miles, was 3h. 19m., or at the average rate of 22⅓ miles per hour. Boiler pressure, 37 lbs. The Powell is fitted with the ordinary single vertical cylinder, walking beam engine.

PARASITES.—It is common to note that each species of animal has its own parasites, which can exist only upon creatures which have more or less kinship with their host. Thus the *ascarix mystax*, which torments the domestic cat, is found in all species of *felis*, while the fox, so closely resembling the wolf or the dog, is never troubled with the *tænia senata*, common in the last mentioned animal.

THE VIBRATIONS OF SOLIDS OPTICALLY STUDIED.

Professor Ogden N. Rood, of Columbia College, communicates to the *American Journal of Science and Arts* a new method of ascertaining whether two tuning forks, for example, are in unison, or to determine the difference in the number of vibrations executed by them in a second. A short piece of fine steel wire is attached to each of the forks, and the latter are supported as shown in Fig. 1. The forks

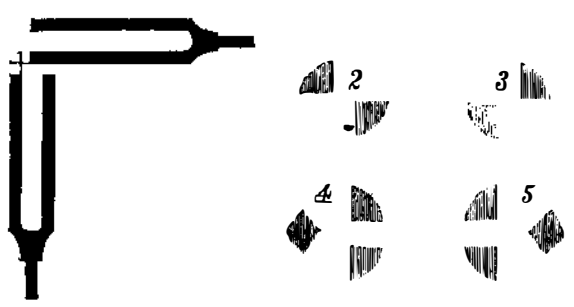

Fig. 1.

are now set in vibration, and the intersection of the wires viewed against a bright background with the aid of a small telescope. When the difference in phase is 0, an appearance like Fig. 2 is produced, which changes to Fig. 3 when the difference in phase has increased to one half a complete vibration. If the forks differ by an interval of an octave, an almost equally distinct figure will be produced, as is seen in Figs. 4 and 5, which represent the characteristic appearances in this case. Somewhat less distinct and more complicated figures are given by the quint, the duodecimo, and the double octave.

It is easy with this method to bring a vibrating string into unison with a given tuning fork, or to adjust it so that the interval shall be a quint, octave, twelfth,or double octave, above or below. It is also easy to ascertain the number of vibrations made by a string in a given case, by the aid of a bridge and a properly selected fork making a known number of vibrations, the string being shortened till it furnishes one of the above mentioned figures, and executes hence a known number of vibrations, after which the number of vibrations made by its whole length can readily be calculated by a well known law.

To bring two cords into unison, or to produce one of the above mentioned intervals, a cork cut at an angle of 45° is placed between the strings on themonochord,and, supported at this angle,is a small piece of looking glass of good quality. The reflected and vertical image of the farther string was then seen in the telescope crossed by the horizontal image of the nearer string; and the mirror being turned so as to reflect,at the same time,light from the sky, all the conditions were fulfilled.

Rods or bars, supported at one extremity or at two nodes, and provided with fine terminal wires, can by this method be brought into unison, or have one of the above mentioned intervals established between them. A preferable mode, however, is to study them in connection with the monochord and a tuning fork. The entire string of the monochord is first brought into unison with a tuning fork, or some definite interval established; the cord and rod or bar are then combined at right angles, and the bridge moved till unison is again effected, when it is possible to calculate the number of vibrations actually executed by the bar or plate. If the fine wire is attached to one side of a bell, the number of vibrations executed by the bell can readily be obtained with the monochord in the manner already indicated.

Vibrating membranes can readily be studied in this way by attaching to them a small piece of fine wire bent with two right angles, and using them in connection with the monochord or a tuning fork.

The more important of these figures may be easily rendered visible to a large audience. Wires about a milimeter thick are attached to two tuning forks placed in front of a magic lantern; an image is formed on the screen with the aid of a lens of about 0·315 inch focal length; the figures are then well shown, along with certain of their details not particularly mentioned in this article.

Great Expositions.

A correspondent of the New York *Tribune* writes from Vienna that the loss of the Austrian government, in its outlays on the recent Great Exposition of 1873, was nine millions of dollars. We have heretofore chronicled the recent suspension of the series of annual World's Expositions, which were inaugurated by the Exhibition Commission in London, and intended to continue until 1876. The losses were so heavy that the Commission was obliged to discontinue them. In view of facts like these, the American people may congratulate themselves that Congress, at its last session, refused to authorize the squandering of public money on the Centennial Exhibition at Philadelphia. The truth is that this Great Exposition business has "played out." It has ceased to be an attraction for the masses, and is chiefly useful for the advertising purposes of enterprizing dealers.

C. H. C. suggests that telegraph companies plant trees on which to hang their wires. "In most sections of the country, the tree first planted would cost but little more than a pole, and after two or three years in growth would be a permanent pole which not rot at the bottom or need resetting, and would be seldom struck by lightning. Having many times seen from three to a dozen poles, in a row, shivered by a charge of electricity running along the wires, the above question arose in my mind."

Pittsburgh Manufacturers for 1873.

Some weeks since, the Pittsburgh *Dispatch* of this city published a list of sales of houses in Pittsburgh doing a business of over $50,000 a year. The list was very imperfect; but as it is so difficult to get statistics in Pittsburgh we have compiled from this list, which was copied from the assessor's list, the items relating to our iron, steel, copper, and glass industries, believing that, imperfect as they are, they will be of value. We do not give the totals of each industry, as this would by no means give the volume of business. We would also say that none of the Allegheny manufacturers are included in this.

In the entire list there are but two houses outside of those connected with the industries given below that did a business of over $1,000,000. As will be seen, three houses in the iron or steel business did above this sum, namely: Jones & Laughlins, J. Painter & Sons, and Hussey, Wells & Co.

IRON.

Graff, Bennett & Co	$914,700	Lloyd & Black	$540,400
J Painter & Sons	1,439,600	Zug & Co	704,690
Chess, Smyth & Co	625,400	Shoenberger & Co	740,000
Jones & Laughlins	2,750,000	Wm. Clark & Co	431 900
Brown & Co.*	793,500	McKnight, Duncan & Co	527,200
Everson, Graff & Macrum	425,000	Dilworth, Porter & Co	393,000

* Including steel.

STEEL.

Singer, Nimick & Co	$879,000	Park, Bro. & Co	$468,500
Anderson & Woods	917,300	Pittsburgh Steel Casting Co	87,500
Hussey, Wells & Co	1,150,000	Miller, Barr & Parkin	589,000

GLASS.

Bryce, Walker & Co	$166,000	Thos Wightman & Co	$300 000
Campbell, Jones & Co	72,300	Dithridge & Co	152,600
McKee Bros.	230,500	Glass, Nelley & Co	451,400
S McKee & Co	188,000	Crystal Glass Co	92,600
R C. Schmertz & Co	112,200	Atterbury & Co	168,800
Duff & Campbell	104,500	Adams & Co	121 800
Excelsior Flint Glass Co	125,900	Bakewell, Pears & Co	150 000
Keystone Flint Glass Co	103.100	Challoner, Hoglan & Co	168.100
Knox, Kun & Co	67,700	Geo. Duncan & Sons	98.500
Jas. B. Lyon & Co	149,400	King, Son & Co	166,300
Wm. McCully & Co	486,100	Dorrington Bros	81,800
Wolfe, Howard & Co	100,000		

MISCELLANEOUS.

Brenneman & Wallack, boilers	$ 53,200
A. Hartupee & Co., engines, etc	326 000
Wm. Miller, forgs	140,900
W. G. Price, Sr., foundery	68,600
N. Snyder & Co., boilers	108.800
W. P. Townsend & Co., rivets	185.000
A. Bradley & Co, stoves	74,200
De Haven & Sons, stoves	76,000
Evans, Dalzell & Co., pipes	624 000
W. Graff & Co., pipes	178,400
Jacobus & Nimick Manufacturing Co., novelty goods	173,100
Park & Co., copper	189.300
Graff, Hugus & Co., stoves	150,000
C. G. Hussey & Co., copper	595,000
Mitchell, Stevenson & Co., stoves	175 000
Marshall Bros., machinery	56,000
Bissell & Co., stoves	113,000
A. Garrison & Co., founders	279 600
John B. Herron & Co., stoves	59,400
L. Peterson, Jr. & Co., founders	86 300
Alex. Speer & Sons, plows	150.500
Jos Marshall & Co., founders	140,000
Dickson, Marshall & Co., founders	78,600
A. French & Co., springs	366,600
McConway, Torley & Co., malleable iron	68,000
Totten & Co., founders	321.100
Schaal, Hoeveler & Co., boilers	93,200
Klein, Logan & Co., tools	60,800
Lewis & Rossiter, founders	90,000

—*American Manufacturer & Iron World*, Pittsburgh.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN GARDEN, a Monthly Illustrated Journal devoted to Garden Art. Edited by James Hogg. Terms $2 a year. Brooklyn, N. Y.: Beach, Son, & Co., 76 Fulton street.

This excellent journal is now in its third year, and the issue for September, 1874, commences a new series. It has been placed under the editorship of Mr. James Hogg, whose renown as a gardener and as a writer on his art, in its many and varied aspects, is widely extended. We predict an extended circulation for this periodical, under the new management.

TITUSVILLE, OIL CITY, AND FRANKLIN DIRECTORY FOR 1874. Compiled by J. H. Lant, Titusville, Pa.

Recent American and Foreign Patents.

Improved Construction of the After Hulls of Yachts, etc.

Empson E. Middleton, Southampton, England.—This invention has for its object to increase the capacity of vessels for carrying cargo or ballast, to enable them to carry more canvas to improve their sailing qualities, and to make them safer in rough weather and in heavy gales of wind. The invention consists in the arrangement of the stern post of yachts and other vessels with its lower end inclined to the rearward at an angle of 45°, more or less, in connection with a corresponding rearward extension of the keel.

Improved Saw Gummer.

Jason W. Mixter, Templeton, Mass.—As gumming machines have been heretofore constructed, the carriage ways are cast on the machine, so that the carriage and cutter cannot be adjusted to alter the direction of the cut; and the cutter being placed upon the end of the shaft, but one journal bearing and but one crank can be used. In the present device, by attaching the carriage and cutter shaft and feed screw to an adjustable "way" frame, the operator is enabled to vary the direction of the cutter so as to cut more toward the center of the saw, if desired. The cutter shaft is supported by an outer bearing on a curved arm. Two cranks may be used instead of one for operating the machine, which may be applied to either straight or circular saws, and without taking the latter from their arbors. The cutter is made detachable, so that it may be changed to adapt it to the diamete or size of the saw.

Improvement in Securing Knob Roses to Doors.

James Kedey, New York city.—This invention consists in supporting the rose plate by a woodenbush arranged within the lock case. The bush is provided with holes, so thata screw from each rose plate may be inserted, or one from each side.

Improved Guide for Setting Lumber.

Peter Berry, Millerstown, Ohio.—The manner of using the device is as follows: A slab is first cut off from the log in the usual way, the head turning up into a horizontal position as the log advances. The head is then adjusted toward the log beyond the plane of the saw to the extent of the thickness of the board or other form of lumber to be cut from the log. Thereafter, each time a cut is made, the log is adjusted on the head blocks its straight side comes in contact with the head, which thus acts as a or gage. When the log is being fed to the saw, it moves in frictional act with the head. The thickness of cut can be quickly and accurately ed by adjusting the shaft in the bearings.

Improved Egg and Fruit Carrier.

Wendelin Weis, St. Paul, Minn.—Vertical metal bands are fastened to the under side of the bottom, and pass through perforations of the same along stiffening straps to suitable hight, being turned into a right angle at the top to form a lug, for binding over the top or cover. The longitudinal side pieces are provided with strengthening pieces, to which vertical bands with top and bottom hooks are fastened. The top hooks of the bands at one side of the carrier are twisted to extend over the cover in longitudinal direction. The cover is firmly bound to the hook ends at the other side by a pivoted wedge piece, carried under the same, securing thereby the rigid connection of all the detachable pieces when the carrier is filled with eggs. A band spring of the cover acts on a recess of the wedge piece, as soon as the same is placed under the hook ends, so that the wedge piece is secured in locked position.

Improved Fastener for Shade Roller Cords.

Mahault De Penhoel, Fort Snelling, Minn.—Two brackets are attached to a window casing to hold a rod, which is secured to one bracket and passes loosely through the other. Upon the rod is placed a short drum, which is secured by a set screw, which also passes through and serves as a pivot for a pulley, around which the cord passes. By this construction, by slightly loosening the thumb screw, the drum may be moved down upon the rod to tighten the cord, may be moved up to loosen it, or may be turned upon said rod to adjust the pulley to the direction in which the cord is desired to work.

Improved Hat Ironing Machine.

Robert E. Brand, Plainfield, N.J.—This invention consists of a hat-block-supporting disk, which is rotated in horizontal or vertical position by being thrown into gear with a driving shaft. A quadrantal guide mechanism and spring clamp carry the disk into vertical position. The top of the hat and brim are finished by the iron in the former position, the side of the hat being finished in the latter. The hat and hat block are then transferred and adjusted to a second rotating disk, with central aperture, cushion, and spring clamps, for finishing the under side of the brim. The finishing ron is made adjustable in any direction, and at different hights on the top of the supporting frame, and readily used on either side, it being detachable with its supporting frame for the exchange of the heating iron.

Improved Tool Post for Lathes.

Thomas Conner, Chicopee, and Edward Bonner, Worcester, Mass.—The post is fitted to work up and down without lateral play in a socketed stand, and has a vertical rack in one side, in which an endless worm works, said worm being arranged in bearings attached to the socketed stand, so as to be firmly secured against endwise motion, and so that the worm works through a slot in the stand into the rack.

Improved Fire Place Grate.

John Bawden, Freehold, N. J., assignor to himself and G. Combs, of same place.—By a relative construction in three parts, this gra e may be packed and transported in a small compass, while it may be put together and set up in the fire place with little trouble or expense.

Improved Breech-Loading Fire Arm.

Albert Karutz, Brooklyn, N.Y.—The barrel screws to a receiver at the place for receiving the shell. On the receiver is a casing tube, to which the handle may connect. This tube is capable of sliding on the receiver, and is connected by screws with a crosshead, which is employed to force the needle back to set it for firing the spring. The said crosshead works forward and backward in a mortise, in a tube within a receiver, pushing the needle back by its collar, and then, after setting the needle, going forward out of the way of the collar. The receiver has a collar, and on the opposite side a lug, which form a bearing for a sleeve to rest on at its front end, the said sleeve being to lock the inside tube and outside tube in the forward position next to the barrel. At the rear end, said sleeve rests on a sectional collar, forward of lugs on the receiver, and the flange on the front end of the outside tube, which match so as to form a continuous collar when the parts are put together. The sleeve has a flange at the middle of the inside, which is notched so as to pass the lugs of the receiver and lock together with them by turning behind them after so passing beyond them. When the needle is to be set, the sleeve is turned so as to allow screws to pull out of notches, but not so as to allow the sleeve to unlock with the lugs; but when the cartridge chamber is to be opened, the sleeve is turned so as to escape from the lugs and be pulled back with the tube. A spring catch is arranged to arrest the sleeve in the different positions to which it is turned for thus releasing the tube, and also for holding it in the ocking position.

Improved Corn Planter.

George H. Hume, Paola, Kan.—A wave wheel on the main shaft actuates sliding piece, which is thereby carried alternately from right to left, causing the dropping of the seed from the seed boxes in the usual manner. A lever is controlled by the attendant, so that, when the same is thrown forward, a roller is carried back, lowering runners and marking the furrows for the seed. Another roller, brought forward, raises the runners above the ground, for turning the planter from one row into the next, and for going to or from the place of work. To each end of the shaft are firmly applied rotating arms, which strike with their inclined end lugs the pivoted marker rods at both ends of a cross piece. Each lug strikes a rod simultaneously with the dropping of the seed from the adjoining seed box. The rods are carried back into horizontal position after being pressed down by band springs. The end of each marker rod is provided with a check, which leaves an impression on the surface of the ground after each stroke. By suitable devices for throwing the mechanism into or out of gear, the seed-dropping and row-making operation is interrupted and resumed at the will of the attendant.

Improved Gun Lock.

James Madison Grisham, Towash, Tex.—One end of the main spring is nserted in a hole in the rear end of the lock plate, and has a point formed upon it, which projects to serve as a dowel pin for receiving the rear end of the said lock plate in place.

Improved Compound for Dental Impressions.

Benjamin H. Teague, Aiken, and Horace Parker, Edgefield, S. C.—This nvention is a compound for taking dental impressions, consisting of plaster of Paris, gold mine sand, sulphate of potash, and carmine, or other coloring matter, mixed in proper proportions. It hardens quickly, and may be removed sooner than plaster from the mouth of the patient, allowing also, on account of its friability, the breaking away of parts of the impression and their accurate replacing, so that a perfect cast of the mouth is obtained.

Improved Hinge.

Moses L. Poirier, Green Bay, Wis.—This invention consists in a peculiar onstruction for securing the cap piece of the pintle, so that it must be urned on the latter before it can be removed. The inclined lower edge of he connecting plate of the sleeve on the gate passes along the curved edge of a lower socket part on opening the gate, and slides back thereon by the weight of the same till it arrives at the lowermost point. The gate thereby self-closing, whether thrown open in either direction, as the ymmetrically inclined socket edge carries the same back toward the cener point and retains it therein.

Improved Temporary Binder.

James Bennet, St. John's, Canada.—This invention consists in a file which opens and closes upon the principle of the parallel ruler. Pins are attached to the bed piece, so as to stand firm and rigid. Recesses are made in the bed to admit disks under a metallic strip, and disks are placed on top of the strip. Screw threads are cut on the pins, and the disks serve as screw nuts, into the center of which the pins are screwed, one disk nut being below and one above the strip for each pin. The screw threads are cut the whole length of the pins, and the roughened surface thus produced prevents the papers from too easily slipping up when the clamp is raised. Mortises through the clamp receive the pins when the clamp is pressed down in filing. When the clamp is raised for filing, bars serve as guides for the edge of the paper, so that the back edges of the papers filed present an even and uniform appearance.

Improved Adding Machine.

Charles C. Moore and Jacob B. Moore, New York city.—This is an improved adding machine, so constructed as to carry accurately whatever number of wheels be used, bringing each wheel exactly to the required point and leaving it there, and which shall have no lost motion from the imperfection of gearing teeth. In a plate a number of counting wheels are arranged, in which, near the circumference, is formed a circle of ten holes, to receive the point of an instrument for turning said wheels. In the face of the wheels, just within the circle of holes, and concentric therewith, is formed a circle of numbers, consisting of the nine digits and the cipher. Upon the faces of the wheels is formed a second circle of numbers, consisting of the nine digits and the cipher, and so arranged that each number of the inner circle may be the complement of the number of the outer circle. The wheels are so covered that only one number of each circle will be seen at a time, and these will always be the complements of each other, so that the number seen through one hole will always indicate through the space of how many holes the wheels will have to be turned to bring the wheels to the 0 point. In using the machine, the instrument is inserted in the hole of the wheel opposite the digit of the scale that represents the number to be added, and is moved around to the right until it strikes a stop. The units, tens, hundreds, etc., are added by turning the proper wheels. In turning either of the wheels, as each ten of the column of figures being added is reached, the next wheel is turned one space, the carrying being thus done automatically. The wheels are kept from being jarred out of place, or accidentally turned forward or back, by springs. Upon the under side of the main plate are attached ratchet wheels, to a tooth of each of which is pivoted a push rod, of such a length and in such a position that, when the figure of the scale shows through the notch, the forward end of the said push rod may rest against a tooth of the next ratchet wheel, ready to move it one tooth when the first ratchet wheel is again moved. By this construction, as soon as a push rod has pushed the next ratchet wheel through the space of one tooth, it drops away from said wheel, and, as its own ratchet wheel continues to move forward, its movements are so guided as to keep it away from the teeth of the next ratchet wheel until it is time for it again to operate said next wheel, when it moves forward, moves the said wheel one tooth, and again drops away

Improved Explosive Compound.

Charles A. Browne and Isaac S. Browne, North Adams, Mass.—This invention relates to a new priming compound, which is exploded by a current of electricity or the electric spark, when properly secured in an interruption of the electric current. It consists of the mixture of fulminate of mercury with pulverized antimony in various proportions, with an addition of antimonic sulphide or other ingredients, if desired, for producing a greater or less degree of electric conductivity of the priming.

Improvement in Indexing.

Walter Knight, San Andreas, Cal.—The object of this invention is to furnish for bookkeepers, accountants, and others, a neat case for keeping the index of books therein, it being so arranged on the desk that it indicates, without loss of time, the page of the party in the book, and expedites work thereby. The device consists of a case with open top and front part, which carries in side grooves suitable frames with the index tables of the names slid therein, said frames being raised by means of levers and keys, exposing thereby the index table required.

Improved Water Elevator for Wells.

William Mason, Providence, R. I.—In the inner part of the well spout is pivoted the outer end of a bent arm, the inner end of which projects sufficiently to catch upon the edge of the bucket as it rises above the spout and till it discharges the water automatically into said spout. Upon the lower side of the inner end of the arm is pivoted a small friction wheel which, should the bucket rise so that the arm catches upon the edge, near one end of the bail, may roll along said edge to a position midway between the ends of the said bail, so as to discharge the water properly into the spout.

Improved Ordnance and Methods of Constructing the Same.

Percival M. Parsons, Blackheath, Eng.—These improvements in ordnance relate, first, to the mode of manufacturing the inner tube of the gun, whereby the fibers of the metal are arranged spirally, and the capacity of resistance to strains greatly increased. The ingot of steel is first cast as usual. It is then drawn down, by hammering or otherwise, until it approaches the finished size. The ingot is then brought to a suitable heat in a furnace, and is twisted a sufficient number of times, which is accomplished by fixing one end in a box attached to an axle, which is made to revolve in suitable bearings, while the other end is griped and held stationary in fixed jaws, or turned in the opposite direction. It is then rehammered, and, if necessary, the operations may be repeated. The improvement also relates to the method of constructing steel lining tubes for guns, intended for insertion into smooth bore cast iron guns for the purpose of converting them into rifled guns, or into a cast iron casting for the purpose of making new guns. A number of separate hoops of convenient width, formed by hammering or rolling or by both operations, are combined in such a manner that the diameter of the ring is increased during the operation, and the metal is thereby extended or drawn out circumferentially, and the fibers and any lines of weakness developed by flaws in the original casting are placed in a circumferential direction. The inner tube having been turned to the requisite size, a sufficient number of these rings bored to the requisite size are forced on its breech end side by side, to form the rëenforce tube. These are then turned, leaving bands at their edges of slightly larger diameter than the intermediate portion between them. Another series of rings of the requisite size, in relation to the first series, are bored out, with an annular recess in each corresponding to a pair of bands of two adjacent rings of the first series; this second series of rings are then expanded by heat, and placed over the first series in such a position that they will break joint with them, and so that the bands or fillets formed on the edges of the first series will fit into the annular recesses formed in the second series, by which means the rings will be connected longitudinally, and form in effect a continuous tube, and may be treated as such to impart longitudinal strength to the inner tube. The improvements relate likewise to the form of the breech end of the lining tube and the interior of the cast iron casing into which it is fitted, and the general combination of the parts in guns of this description. In guns hitherto constructed on this system, the breech end of the lining tube, where the rëenforce occurs, and the recess made in the breech end of the casing to receive it, have been made conical, which form requires special machinery to bore out the casing, and offers difficulties to the proper fitting of the tube. The breech end of the tube is made cylindrical, and reduced in diameter in steps toward the muzzle, as required, and the interior of the casing is made in a corresponding form. The tube is inserted into the cast iron casing at the breech end, and is secured by a breech screw, in combination with which a nut is screwed to the end of the inner tube let into a recess bored out of the muzze end of the cast iron casing.

Improved Bolt for Middlings Purifiers.

Joseph W. Wilson, Warsaw, Ill.—By this invention, middlings purifiers that use a flat screen are provided with a bolt, so constructed as to keep the screen cloth clean, and the middlings thoroughly agitated, increasing the capacity of the bolt or screen, and enabling a much finer screen cloth to be used.

Improved Car Coupling.

Gabriel Thomas, Reno, Nev.—A small plate is attached near the lower end to the back of the coupling pin. A spiral spring is placed in a recess behind the pin, which bears downward on the plate with a constant pressure, and reacts against a shoulder to throw the pin downward. A vertical bracket spring is attached to the under side of the drawhead, extending up through the link opening, with its end under the plate, so that it will naturally support the pin when the latter is raised. When the cars come in contact with each other, the end of the link strikes this spring, and pushes it from the plate, and the pin is forced down through the link. For uncoupling the cars, the pin is raised by means of a bell crank which connects with a rod which extends laterally to the side of the car. This rod has a series of ratchet teeth which catch on a plate through which the rod passes by which means the pin may be held up without the supporting spring. A similarly arranged rod extends to the top of the car.

Improvement in Refining Sugar.

A. H. William Schrader, Hoboken, N. J.—This invention consists in subjecting raw sugar when suitably moistened to the action of a very high degree of pressure acting from above on its surface, so that the compressed air percolates between the granules of the sugar and effects the bleaching and purging of the sugar previous to its dissolution. The invention consists, further, in the dissolution of the sugar in the same tank under the admission of steam and water for the purpose of repeating and completing the purification, or drawing it off for passing through the filtering and discoloring operations to be returned and purged completely, and finally dried.

Improved Steam Radiator.

James McCarthy, New York city.—The base of the radiator is made hollow, and on its upper side are formed openings, which form sockets to receive the ends of the tubes. The head of the radiator is also hollow, and receives the upper ends of the tubes. Rods pass through the tubes, enter the cavity of the head, and have eyes to receive other rods, which are passed through them. By this arrangement the rods and their supporting rods will not impede the passage of steam through the tubes. The washers in the tube sockets are hollow rings open upon their inner side, and are spun up out of ring plates of sheet metal. The washers thus constructed will yield sufficiently to pack the ends of the tubes steam-tight. With this construction the steam will circulate quickly and uniformly through all parts of the radiator, so that the radiator will heat up evenly in all its parts.

Improved Seal Lock.

John S. Lorimer, Detroit, Mich.—An inner removable plate is fastened to the back plate by a screw. A sliding bolt is thrown forward, to engage with the notch of the hasp, by a spring. A small knob on the bolt projects into an orifice of the inner plate. The seal plate is made preferably of glass, upon the back side of which is the railroad label. This slides in through a slit in the edge of the lock, and covers the inner plate, and consequently the knob of the bolt. The hasp is not hinged, but slides in and out, a shoulder on a long leg preventing its being entirely separated from the lock. When the hasp is down, the long leg entirely closes the slit, and effectually confines the plate, so that the seal plate must be broken before the lock can be unlocked.

Improved Machine or Cutting Clothes Pins.

Henry Mellish, Walpole, N. H., assignor to Wyman Flint and George H. Mellish, Bellows Falls, Vt.—The object of this invention is to rapidly cut bifurcated clothes pins of any kind, but more especially the kind described in letters patent granted to same inventor, dated September 23, 1873, No. 143,024, by the combination of a stationary channel or groove, in which to alternately move and hold the timber, by means of feed wheels and a holding plate, while the pins are being cut. When the feed ceases and the piece of wood is stationary, and the cutters ready to work, this plate is tipped by a cam, which strikes a riband raises a plate, so that its other end presses on the wood in the groove and holds it down, to prevent splitting while it is being cut. This cam is so formed and arranged that the pressure is continued while the cutters are at work, and discontinued when they are withdrawn. For making the openings, the cutters penetrate half way through the piece as the lathe is passed through this machine. The next machine cuts the other side in the same manner, and then the piece of wood is split, which separates and completes the pins. Another cutter cuts into the piece to give the length of the pin. The cuts in the two sides of the pieces are not opposite each other, so that the piece holds together until it is split to separate the pins.

Improved Lamp Cooking Apparatus.

John A. Miller, New Orleans, La.—A common petroleum lamp has its chimney provided with a closely fitting shell of sheet metal, which extends from the neck to the upper rim, and prevents its unequal expansion. The shell also serves to a certain extent to retain the heat in its passage through the chimney. The cooking vessels proper consist of a boiler and several additional vessels, which are fitted into each other and into the boiler, each forming a separate cooking chamber. The boiler is arranged at the bottom with worm-shaped channels, which take up the flame from the chimney and conduct it around the bottom and sides. A convex perforated bottom, loose or false, is placed on the boiler bottom to prevent the articles cooking therein from burning. The vessels are connected by steam tubes, which are arranged at opposite sides to compel the steam to spread under the bottom in passing to the next vessel.

Improved Adjustable Ferrule for Agricultural Implements.

William H. Bowman, London, Ohio.—The ferrule is made of two halves, which fit symmetrically over the handle end. When the handle shrinks, the ferrule is tightened by driving up a band. The band takes hold of the outerside of a tongue simultaneously with the ferrule halves, as it forms, on account of an inclined groove and its inner wedge shape, part of the circumference of the ferrule. The lug locks the tongue securely to the ferrule.

Improved Water Wheel.

Marquis D. Grow, Dubuque, Iowa.—The buckets are made straight and radial, and are formed upon or attached to the body of the wheel. The discharges extend rearward from the lower ends of the buckets, and are curved downward, so as to be convex upon their upper side, as shown. They are surrounded by a band, attached to their outer edges, and the upper edge of which rests against a shoulder formed by the thickening of the case for the chutes, so that the water from said chutes may be discharged directly against the buckets. To the top of the gate is bolted a ring, which fits around the edge of a cap plate in which the shaft revolves. To the cap are pivoted at their angles two elbow levers, the arms of which have short slots formed in them to receive pins attached to the ring. To the other arms of the levers, near their outer ends, are pivoted the ends of a connecting bar, so that the levers may operate together upon the opposite parts of the ring to move the gate. Upon the lower part of the outer side of the gate is formed a flange, upon which rests the outer gate, which has a flange, formed upon the lower part of its outer side, in one part of which are formed teeth, into which is geared a governor, so that the gate may be adjusted automatically to regulate the ingress of the water by the motion of the wheel.

Improved Pocketbook.

Gabriel Jasmagy, Brooklyn, N. Y.—The object of this invention is to improve the pocketbook patented by same inventor under date of April 28, 1874. It consists of a pocketbook, the partitions of which are connected, without stitching, by a lining made of a blank which extends continuously over the same, and is cut with sector-shaped side flaps for forming the side connection of the partitions, and also with the side flaps of the pocketbook. The invention consists, further, in the arrangement of a billbook formed as extension of the partition covering, and folding out of sight into a section of the same.

Improved Beam End Protector.

Norman McLellan, New York city.—The invention relates to a sheet tin casing for the ends of wooden beams as a protection against the influence of dampness or destruction by fire. The casing covers the beam end and so much of the contiguous portion as enters the mortise in the brick or stone wall, and it may also be made of sufficient length to project a short distance from the side of the wall.