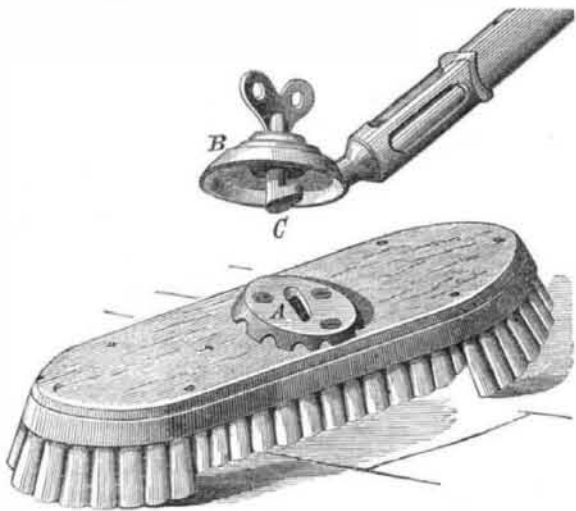


**HOOD'S ADJUSTABLE BRUSH HANDLE.**

Here is an invention which is just in time for spring house-cleaning, for which reason, together with that of its handiness, we have no doubt but that it will meet with general approval, especially from our lady readers, who are looking forward with no cheerful anticipations to that serious yearly



undertaking. It is a handle easily attached to any scrubbing brush, and so adjusted that it will enable the user to do her work standing up, and with much greater facility and ease than when kneeling on the floor.

A, in the engraving, is a conical plate secured by screws to the back of the brush. It has an aperture in the center, around which and on the under side of the plate an inclined plane is formed. A similar conical plate, B, is provided with a tapering socket to hold the handle, and fits over plate, A. The two plates are firmly clamped together by a key bolt, C, which, passing through plate, A, engages against the inclined underneath portion when turned. The upper flat surface of plate, A, and the under surface of plate, B, do not come in contact, the bearing being had between the outer inclined portions, and thus rendered firm and strong. Plate, A, is made higher on one side, thus causing the handle to assume an angle, more or less acute, with the back of the brush, according to the position in which it may be most convenient to use the latter.

The brush may be placed nearly on a line with the handle, so as to facilitate working alongside the baseboard or near doors and windows.

Patented October 20, 1874. For further particulars regarding agencies for the introduction of the invention, address the patentees, Messrs. Hood and Joseph, Indianapolis, Ind.

**ELDRIDGE'S SELF-ACTING KEY FASTENER.**

The object of this invention is to provide a self-acting key fastener that will secure the key in a door lock on the inside of a room against turning, by burglars, with nippers and other instruments, from the outside.

The accompanying engraving represents a keyhole plate secured to the door, and to this, at the lower end, a movable arm, A, is pivoted. The arm is made concavo convex at the pivot end to contain a circular spring which operates it, one



end of the spring being secured to the plate and the other to the arm. A slot is formed on the upper end of the arm, to receive the shank of the key, which is filed square to fit the same; so that when the arm is closed by the spring, the key cannot be turned in the slot. The guide, C, and the shoulder on the arm form a stop, while the notch, D, passing under the guide, serves as a lock for the arm against outside pressure.

This little invention, we are informed, meets with much favor among Chicago architects. It has been patented by Mr. D. D. Eldridge, of 208 La Salle street, Chicago, Ill., from whom the manufacturing rights for the Eastern and Southern States may be obtained on reasonable terms.

Just So.

Snow's *Pathfinder and Railway Guide* (Boston) says, and we think truthfully, that, for a catalogue of all the most important inventions of the day, with scientific notes and explanations, the SCIENTIFIC AMERICAN has no compe-

ditor in this country; and it should have none, for it entirely fills the field of scientific information and research. Its pages contain information of interest to the most thoughtless reader; and it is difficult for the most unscientific mind to lay down a copy without scanning its excellent illustrations and explanations.

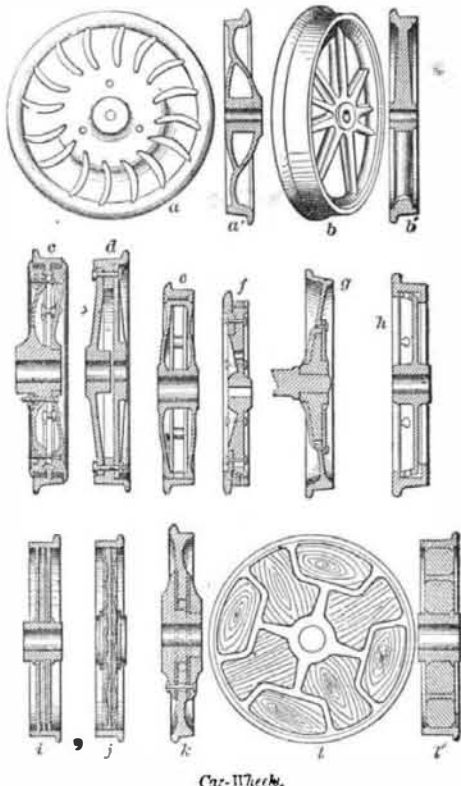
**Dissolution of Hydrogen in Metals.**

In previous researches on the metallic alloys formed by hydrogen, MM. L. Troost and P. Hautefeuille indicated the characters which distinguish these definite combinations from the solutions of hydrogen in metals. Potassium, sodium, and palladium combine with hydrogen, while a considerable number of other metals merely dissolve this gas. Iron, nickel, cobalt, and manganese offer striking analogies in the manner in which they behave with hydrogen at different temperatures. The facility with which they absorb or give off hydrogen gas depends greatly on their physical condition. An ingot of pure nickel gave out, in a vacuum, at a red heat, one sixth of its volume of hydrogen. Laminae of nickel, obtained electrolytically, gave out forty times their volume. Pulverulent nickel gave up one hundred times its volume, and remained pyrophoric after the escape of the hydrogen. An ingot of cobalt gave up one tenth of its volume, electrolytic laminae of cobalt thirty-five times their volume, and pyrophoric cobalt powder one hundred times. It also remained pyrophoric after the loss of the hydrogen. Soft iron in ingots gives off one sixth of its volume, and gray cast iron more than the half. Electrolytic laminae of iron gave off 260 volumes. In fine, it may be said that iron, nickel, and cobalt absorb directly hydrogen gas, but it cannot be said that combination ensues, just as has been already shown in the case of lithium and thallium. Finely divided iron has a property which is not shared by nickel or cobalt: it decomposes water slowly at common temperatures, and rapidly at 100°. In this respect iron approximates to manganese.

**CAR WHEELS.**

It has been estimated by good authority that there are no fewer than 1,250,000 car wheels in daily use on the railroads of the United States. Each wheel travels 88.75 miles per

Fig. 1.



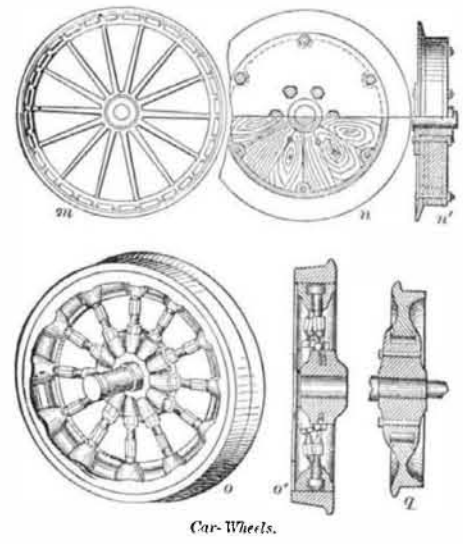
Car-Wheels.

day of 320 days per annum, and its average load is 3 1/4 tons. With this stress, the life of the wheel is about 45,000 miles, or 1.58 years. On trains running at express speeds, the average life does not exceed 10 months' service, while wheels under tender trucks have a life of 18 months. A freight wheel, it is stated, often lasts over 3 years. Assuming the average life of car wheels under all kinds of service to be 5 years, the total number of wheels worn out annually in the United States may be placed at not less than 250,000. Allowing an average cost of \$18 per wheel, and calculating about one half for the value of the old wheel, the annual loss may be stated at two and a quarter millions of dollars.

We present, in Figs. 1 and 2, a few examples of the numerous inventions of this class. *a a'* represent the well known Washburn wheel; *b b'* are perspective and sectional views of a spoked wheel of rather antiquated form; *c* is a Woodbury wheel, which has a compressed annular elastic packing between the cylindrical faces of the body and rim. The body is sectional, having two webs bolted together. Each portion has a flanged rim, the combination of the two forming an annular seat for the tyre. *d* is a wheel cast in three separate pieces, consisting of a rim and two portions, each of which latter has a hub and a web, between which the inner flange of the rim is gripped and bolted. The wheel, *e*, has side plates cast in one piece with the hub and cross pieces, which connect the peripheries of the side plates. The encircling tyre is secured by rivets. In the wheel, *f*, the tyre has pins upon its inner side, which enter slots in the rim of the wheel to hold the tyre from shifting. The flange piece has a shoulder projecting on the inside, that fits in a circular groove in the body of the wheel, to which it is bolted. The wheel, *g*, has a circular recess to receive a collar on the axle, over

which is bolted a covering annular disk. This device is to allow the revolution of one of the wheels upon the axle on curves of the track. *h* is a car wheel constructed in two parts: first, a rim with two flanges forming an inner recess

Fig. 2.



Car-Wheels.

and second, a hub with a web, and a flange upon the same, flaring slightly outward. Slots in this flange permit it to spring past the flange of the rim into the inner recess. *i* and *j* are two forms of wheel, in each of which the cast hub and rim are connected by corrugated wrought metal disks. *k* is the Raddin wheel, in which the entire web and rim are cast in one piece. The hub has binding rings which are bolted together through holes in the web, with interposed packing rings of india rubber to lessen tremor and jar. *l l'* are two views of the Watson wheel, in which the space between the hub and the rim is occupied by a skeleton metallic frame, having openings filled with compressed panels of wood.

In the wheel, *m*, Fig. 2, the wedges of wood are driven between the rim and the tyre, in order to absorb the jarring motion. *n n'* are views of a compound wheel in which segments of wood form a web between the hub and the rim, and are secured by metal plates. *o o'* are views of a wheel in which the hub and rim are of cast iron united by wrought iron spokes, each alternate spoke leaning at an angle from the opposite side of the central circumference of the hub to the central line of the rim. *q* is a wheel somewhat similar to *k*, in which the web of the wheel is enclosed between binding plates, and has a packing between itself and the plates, and also on its inner edge.

Paper, when entering into the composition of car wheels, is tightly pressed in as a packing between the steel tyres and the cast iron hubs, so as to form a compact, strong, and yet somewhat resilient material, which deadens sound and diminishes the force of concussion.

The illustrations are selected from the pages of Mr. E. H. Knight's "Mechanical Dictionary."\*

**HAND SUPPORT FOR SHEEP SHEARS.**

As the sheep-shearing season is now close at hand, a novel arrangement of a support for the hand while holding the shears, which we illustrate herewith, will doubtless



prove of timely interest. The object of the device is to enable the operator to have free use of his hand while the muscles of the same are firmly braced, and thus assisted during the fatiguing labor. He is thus enabled to exert greater strength, and may, at the same time, rest the hand without laying down the implement. The attachment consists of straps, of leather, rubber, or other suitable material, which are secured to one of the shears handles. Rings or loops are fastened to the other handle, and through these the straps are passed so as to form a cross over the back of the hand, the ends being secured and the length adjusted by suitable button holes and hooks. As illustrated in the engraving, elastic bands are employed, in which case the straps are riveted or otherwise permanently attached to the handles of the shears.

A caveat for the invention has been prepared by the Scientific American Patent Agency. Further information may be obtained by addressing the inventor, Mr. James L. Smith, P. O. box 290, Tuscola, Ill.

\*Publishers, J. B. Ford & Co., New York city.

**The Newly Elected Honorary Members of the Iron and Steel Institute.**

The annual general meeting of the Iron and Steel Institute of Great Britain recently took place in London. Acting upon the authority vested in them at the last general meeting, the Council have elected the following gentlemen as honorary members: Professor Peter Tunner, Leoben, Austria; Professor R. Akerman, Sweden; Professor Grüner; Dr. Percy, London; Mr. Peter Cooper, New York; Mr. H. Schneider, Creusot; Mr. F. Krupp, Essen. The total number of honorary members, including the King of the Belgians, who was elected last year, is now eight.

The president, I. Lowthian Bell, Esq. said: "Most of you, I dare say, are familiar with the names and possibly also with the achievements of those gentlemen who have gained for themselves this distinction; but in the event of there being any here present to whom the names of those gentlemen are not familiar, perhaps it would be acceptable that I should mention the ground upon which we have accepted them. The first name on the list is that of my friend, Professor Peter Tunner, of Leoben, Austria. I have had the honor of personal acquaintance and, I may say, of personal friendship with this distinguished foreign metallurgist during the last five-and-thirty years, and can safely say, in practical acquaintance with every portion of the metallurgy of iron, it is impossible to imagine any one more proficient, or any one who takes a greater interest in the development and progress of our science.

The next name is that of Professor R. Akerman, of Sweden. Sweden, as you all know, is a classic country in the metallurgy of iron, and I am glad, and I am confident in the assertion, that the great repute of that very ancient country in the manufacture of iron is very well sustained by the exertions, by the knowledge, and by the learning of Professor Akerman, and the same may be said of Professor Grüner, of the *École des Mines* in Paris. There is no subject connected with the progress of our art which does not receive the immediate attention of my friend Professor Grüner; but, in addition to that, I may say he has distinguished himself in the archives of scientific research in France, by his original investigations, many of which are of great value in connection with the smelting and subsequent treatment of iron.

Then comes the name of a gentleman, familiar, I am certain, to every one who has ever read a word upon the subject of the manufacture of iron in this country; I mean that of my friend Dr. Percy, of the School of Mines in Jermyn Street. If he had rendered no other assistance to iron manufacture than simply to have collated and extracted, from works written in almost every foreign language, an account of that which had been done in other countries as well as that which had been done in our own, I am quite sure that Dr. Percy would have entitled himself to this distinction at our hands; but in addition to that, the doctor has also distinguished himself by several very important investigations in connection with this chair.

The next name is that of my venerable friend Mr. Peter Cooper, of New York. I cannot pretend that, in the processes or the practice of making iron, he has done much to distinguish himself in America, but he has been connected for many years in the manufacture of iron with his son, Mr. Cooper, and with his distinguished son-in-law, the Hon. Mr. Hewett; but in addition to these recommendations, Mr. Peter Cooper has, with a singleness of purpose which cannot be too much admired, devoted a sum which would have been considered enormous even in this country, for the advancement of Science, by founding the Cooper Institute in New York, in which young persons are instructed in every branch of art and science; and if it were only to evince the appreciation which we have for efforts in that direction, I am of opinion that the Institute, in conferring this honor upon Mr. Cooper, honors itself by so doing.

The next name is that of Mr. H. Schneider, of Creusot. Most of you are aware that the social position of Mr. Schneider was sufficiently great some few years ago to cause his selection to fill the very responsible office of President of the Legislative Council of the Government in a neighboring country; but with this, of course, we have nothing to do. What recommends Mr. Schneider to our notice is not his social position, but the manner in which he has identified himself, to my own certain knowledge, for the last forty years with the advancement of the art of making iron in a neighboring country. The works with which Mr. Schneider is connected were founded by Messrs. Wilkinson and Manby. I forget the circumstances which led to the transference of those works to my friend Mr. Schneider; but suffice it to say that, under his direction and under his skilful management, they have grown to be, as many members here can testify, one of the most important establishments of that country.

The last name on the list is that of Mr. Krupp, of Essen. If we measure a man's merit by the extent of the operations he directs, and the rapidity with which those operations are carried into effect, I do not know that we could find a more signal instance of progression than that of Mr. Krupp, and we have thought it proper to recommend that Mr. Krupp, be added to the list of our honorary members."

**The Eagle Wing Propeller.**

An interesting report, by Mr. Richard H. Buel, on the Eagle Wing propeller will be found in our inside advertising columns. The results of that engineer's calculations are somewhat approximate, but they serve to show a high degree of efficiency in favor of the screw, inasmuch as he concludes that there is a gain effected of 20 per cent in power, and 22½ per cent in speed, as compared with a "true" screw tested under like circumstances. Further and more elabo-

rate investigations into these facts, especially in the light of fuller data, will soon be made, we are informed, by Judge Patterson, the inventor.

**A SELF-LIGHTING GAS BURNER.**—We have recently been shown a gas burner, which does away with the use of matches, and the dangerous practice of carrying lighted paper. Attached to the burner is a tube containing a slip of paper, on which are dots of fulminating composition. A hammer falls on one of these dots, igniting the fulminate. The hammer is operated by a spring and is controlled by the cock by which the gas is turned. An engraving of this convenient arrangement will be seen on reference to our advertising columns.

**Recent American and Foreign Patents.**

**Improved Steam Trap.**

James M. Meharge, Montreal, Canada, assignor to Richard Patton, of same place.—The invention consists of a hollow vessel balanced on a weighted lever, and connected with the boiler and a water-collecting receiver. A weighted steam valve of the vessel, with cross head at upper end of spindle, produces, by the rising and the falling of the vessel, the closing and opening of the valve, in connection with the stationary fork, so as to admit the steam and force the condensed water through the discharge pipe to the boiler.

**Improved Umbrella Support.**

Richard J. Welles, St. Joseph, Mo.—At the upper end of the stand is a socket which receives a head. The head is made in two parts, one of which is serrated, and is made to engage with the socket by screwing up a nut. A clamp clasp and holds the handle of the umbrella. By lowering the tightening nut the head will be loosened, and may be turned in any direction, and the staff of the umbrella will be released.

**Improved Emery Grinding Machine.**

E. William Gunn, New Woodstock, and George D. Wells and Harrison Wells, Erieville, N. Y.—This emery wheel machine, which is so constructed that the emery wheel may be turned into any position that the form of the work being ground may require without stopping the wheel or checking its speed. It expands and contracts as the band is twisted and straightened, and allows the bands to be readily slackened and tightened as may be required.

**Improved Saw Set.**

Robert J. Granville, Astoria, Oregon.—By this improved saw set the teeth may be alternately set in opposite direction, so that the operation may be finished by passing the instrument once along the saw. An operating main piece, with adjustable clamps and set screws, gives each tooth the exact degree of set required.

**Improved Fastening for Tool Handles.**

William M. Fisk, Lancaster, Pa.—This consists in a fastening bar having a button, to which a cap, having a chambered cavity, is applied and turned about one fourth of a revolution, and thereby fastened. It also consists of a spring in combination with the fastening bar to hold the cap in place.

**Improved Lantern Handle.**

Theodore James, North Adams, Mass.—A small block turns and slides freely upon a wire ring. Through a hole in the block is passed another ring, which is made with a small loop in its middle part, to prevent the block from sliding upon it. The block turns upon a wire bail, so as to enable the lantern to swing or oscillate without changing the position of the first ring. Upon the ends of the wire are formed hooks to hook into the lantern, and thus suspend it.

**Improved Sash Fastener.**

John Singer Wallace, Philadelphia, Pa.—This is an improved device by which the upper sash may be readily pulled down, and both sashes be locked securely, without interfering with the opening, closing, or cleaning of the window. The invention consists in suspending from a metal bracket, at the upper cross piece of the window, a stiff rod, which extends below the double cross piece of the sashes sufficiently far down to be used as a handle for lowering and closing the upper sash. This pendent rod is provided with a spring in the shape of an inverted umbrella spring, which locks over the lower sash. The rod swings like a pendulum in a metallic oblong socket attached to the upper cross piece of the lower sash, and may be taken out of the same through an open front recess, for being removed, while the unobstructed opening and closing of either sash are permitted by a side recess in the rear part of the socket, along which the spring is allowed to slide out.

**Improved Device for Felling Trees.**

Charles C. Curtis, Coos, N. H.—The object of this invention is to provide a device by which the falling of sawn or cut trees in any desired direction may be controlled, and the breaking of the saws prevented. The invention consists of a spiked pole of suitable length, that is applied to the tree and seated on an adjustable inclined piece that is hinged to a base frame, and raised to upset the tree by a suitable braced supporting collar and elevating mechanism.

**Improved Lamp Extinguisher.**

Milan Waterbury, Mason City, Iowa, assignor to himself and William H. Betts, of same place.—Should the lamp be upset, a ball will immediately be dislodged from its seat in a cup; and in falling its weight will draw a chain tight, and thereby pull a lever downward, which in its turn will cause the extinguisher to overlap the top of the wick tube, and thus immediately extinguish the lamp.

**Improved Hitching Device for Straps.**

Christian H. Bausch, Holyoke, Mass.—This invention relates to straps for hitching horses; and consists in a metallic slide or lock, through which the strap passes, and in which it is confined, the lock being adjusted to any desired position on the strap.

**Improved Ash Sifter.**

William Montgomery, Chicago, Ill.—To one side of the sifter are attached the edges of a semi-cylindrical plate, which passes through a hole in the screen, to form a spout, through which stones, slate, cinders, and other rubbish may be dropped into the ash box without raising the sifter.

**Improved Cover for Beds, etc.**

John Foster and William A. Weant, Salisbury, N. C.—The object of this invention is to furnish a convenient screen or cover for beds, cribs, tables, etc., for the purpose of excluding flies, mosquitoes, and other insects; and it consists of a cover of wire or thread netting having a pivoted movable section in combination with hinges which attach the same to the bed frame, and brackets which support the cover when raised integrally from the bed.

**Improved Barrel Croze.**

J. H. Morrison, Portsmouth, N. H.—The invention relates to the joints by which heads are secured in barrels intended to hold liquids, but especially beer. It consists in forming this joint of an arc form, so as to strengthen the edge of head and stave, thus preventing fracture or leakage from internal pressure or external percussion.

**Inclined Guide Wheel for Locomotives and Railway Cars.**

Turner H. Lane, Holly Springs, Miss.—The object of this invention is to increase the security and durability of the rolling stock of railways, by providing a means whereby the car wheels are prevented from leaving the track. It consists in the combination with the car wheel of an inclined guide wheel having a flange that rests against the under side of the top of the rail, the said guide wheel being contained in a detachable supporting frame, and provided with an elastic seat or cushion. The guide wheels may be located either between the wheels of the truck or upon one side, and may be either inside the track or outside.

**Improved Railroad Crosstie.**

Henry Reese, Baltimore, Md.—The object of this invention is to furnish at a minimum cost a practically indestructible and permanent crosstie for railroads, in place of those made of timber, which last but a few months, and whose removal is a source of great and never ending expense to the railroad corporations; and the invention consists in a T-iron crosstie, provided near each end with oppositely facing clips, between and beneath which the rails are placed and firmly fastened by wedges.

**Improved Motive Power.**

Henry Bolton, Brantford, Canada.—This invention relates to certain improvements in motors for driving sewing machines, etc., and it consists in a means for utilizing the power of a magazine spring through a secondary driving spring, the tension of which driving spring is relatively constant, and which said secondary spring is intermittently wound up by the magazine spring as fast as it spends its force, and while it is in operation; the two springs being so relatively constructed and arranged that the constant tension of the secondary spring is less than the weakest tension of the magazine spring at any stage of its operation, so that the magazine spring can always wind up the driving spring.

**Improved Permutation Lock.**

Mott B. Brooks, Brockville, Canada.—This invention relates to certain improvements in permutation locks. It consists in a semi-circular link having one end extended and pivoted in bearings in the case of the lock, and so arranged as to be drawn out and turned upon its pivots. The extended straight portion of the link is provided with a recess with which a transverse spring bolt is made to engage for the purpose of locking the link, and the transverse bolt is also provided with a recess with which a longitudinal bolt is made to engage for the purpose of locking the spring bolt. Upon said longitudinal bolt the permutating devices are arranged, which consist of three numbered rings, a clutch collar, and a disk, whereby an almost unlimited number of combinations may be had, and the device locked or unlocked by both an absolute and a relative key.

**Improved Scaffold Clamp.**

William C. Fellows, Toledo, O., assignor to himself and Charles Whittingham, of same place.—The bracket consists of a band which slips over the uprights, with a key fastened therein by a pin. The upper inner edge of the band is serrated to prevent the band from slipping on the upright. Confined by the bolt is an eccentric arm, in a recess of the key. Teeth penetrate the upright and secure the brackets. As the weight of crosstree and scaffold bears on the key, the band is cramped on the upright, the serrated edge penetrates the wood, and the arm, as the load is put upon the scaffold, works eccentrically on the pin, and increases the resistance.

**Improved Process of Manufacturing Cider.**

William H. Gilmore, Shiloh, Ohio.—This invention relates to the manufacture of artificial cider, and it consists in combining, with water, sugar, and tartaric or citric acid, a concentrated cider essence, which is obtained by freezing cider and drawing off the uncongealed alcoholic portions from the center. The said uncongealed alcoholic portions contain in solution all of the essential oils and flavoring essences which, being more volatile than water, are lost in cider concentrated by boiling.

**Improved Tank for Retailing Coal Oil.**

John H. Boardman, Baltimore, Md.—The object of this invention is to provide a case for coal oil barrels for retailing purposes; and it consists in a closed barrel case having one side of the lower part of it extended so as to form, with a portion of the drip tray, a closed dispensing tray with independent movable entrance thereto. The barrel is provided with a siphon and a bar for holding the same in place, and the drip tray has a trough which receives the leakage.

**Improved Bill File.**

Maurice Langhorne, Maysville, Ky.—This invention relates to certain improvements in bill files, and it consists in a sheet metal box having its sides cut away obliquely from the front to the rear for a part of the distance, and horizontally for the balance, so as to leave the front of the box flush with the top of the files, and yet allow the files, when pushed back against a spring, to be placed in such a position as to be readily inspected, the box being provided with a flange cover to protect the files from the damaging influences of weather and dust.

**Improved Scroll Sawing Machine.**

Charles N. Trump and Samuel N. Trump, Wilmington, Del.—A piece of metal is fitted to the shoulder of the arm of the machine by means of a set screw. The saw is driven by power applied by a friction wheel. The boring device is driven by the same friction wheel. A lever is connected with the arm piece, to which an eccentric is attached, which eccentric bears on the pin and throws the friction pulley in contact with the friction wheel. When the lever is thrown back, the pulley is drawn back from the wheel by the driving band of the boring bit. The saw rests against straight faces, so that, when the clamp is drawn up, its whole inner surface bears on and clamps the saw. The boring mandrel is supported on the arm of the saw by means of a bracket.

**Improved Let-off Mechanism for Looms.**

John Turner, of Lonsdale, R. I.—This consists of the yarn beam, geared by a system of reducing gears, and a pair of long cone pulleys and belt, with the cam shaft of the loom, with which there is a long, slowly revolving screw. The last gradually shifts the belt to increase the speed of the yarn beam in the proportion of the reduction of the size of the yarn roll, thus constituting a positive graduated let-off. For varying the delivery, to make the cloth more or less close, wheels of different sizes may be put in the reducing train; for instance, the wheel on the yarn beam, and the one gearing with it, may be removed and others put in their places.

**Improved Car Brake.**

Solon G. Howe, Detroit, Mich., assignor to himself and James W. Cheney, of same place.—This invention consists of double friction cones, which are placed on the axles and carried, by the action of a wedge bail on friction rollers, against corresponding double shells keyed fast to the axles. The friction cones are applied by the wedge bail, and released by spring braces, both being operated by intermediate rods and lever connection from the hand wheels at the ends of the car. The axle is lubricated through perforations in the center pins of the friction rollers, and the cones are secured in their regular position and motion on the axle by a stationary projecting pin of the axle entering annular grooves of the cone hubs. The spring braces are attached to the upper and lower part of each cone, and secured to their lever connecting rods by wedge shaped blocks with binding side ridges, by which the constant strain exerted on the cones, to withdraw them from the shells, is increased.