

render its use desirable for certain special classes of work. We present in this issue cuts of a heavy mortar, whose recoil cylinders are designed to be operated by compressed air. The design was worked out by Mr. H. A. Spiller, of Boston, Mass., to whom we are indebted for the particulars.

The carriage consists of a lower and upper racer bed, the upper circular bed supporting the two cheeks of the carriage, which are secured in position by a cross key 3 inch by 1 inch and eighteen 1.5 inch bolts in each cheek. These cheeks are provided with trunnion bearings with caps 30 inches in diameter and 6.5 inch face, for the reception of the trunnions formed on plates connecting in pairs the recoil cylinders.

The four recoil cylinders, 8.5 inches in diameter, are arranged in pairs on each side. They are connected by plates 2.5 inches thick and are provided with horizontal ways 7 inches wide on the sliding face between the cylinders and frames, having crossheads in which the outer ends of the hollow piston rods are secured, and they also carry trunnion bearings for the reception of the trunnions of the mortar. At each end of the lower recoil cylinders is a 1.5 inch pipe connected to same for equalizing the pressure. The hollow piston rods, four in number, 4.5 inches in diameter, extend rearward from lugs on the sliding frame through especially prepared packed glands in the heads of the recoil cylinders, and they are provided with conical valve rods, 2 inches in diameter at the large end,

whereby a portion of the air below the piston is admitted to the space above the chambered heads. When the gun is fired, the recoil is taken up by means of the cushion of compressed air, and the arrangement allows a sufficient amount to pass to the forward ends of the cylinders to nearly form an equilibrium of pressure on both sides of the pistons, thereby taking up the counter recoil and forming a positive elastic cushion by which the dead weight of the gun is supported. On these recoil cylinders cast in pairs, and on the opposite side of the 2.5 inch plate from the recoil cylinders, is cast a trunnion 30 inches in diameter which supports the plates and the two cylinders. This trunnion fits into the side cheeks mentioned above, which the mortar and recoil mechanism swings on. At the right hand side, and in the center of this trunnion, there is a gage connection and a charging pipe which may connect with a portable or fixed receiver, charged with a suitable pressure to give 750 pounds initial pressure in the recoil cylinders; as the area of the four hollow piston rods must be depended upon to lift the mortar into battery at its highest elevation, this said pressure must not be lower than 650 pounds.

During its recent test by the government the carriage showed itself to be certain and regular in its action, and its service was attended by no accident or drawback of any description. A knowledge of its merits for practical use in our sea coast fortifications can, however, only be obtained by comparing it with similar

carriages which have been tested by the government. These are the carriages already adopted for service, a large number of which are now mounted in their batteries, and the Gordon mortar carriage. Either of the latter, so far as its practical manipulation for loading, elevating and traversing is concerned, differs in no essential particular from the pneumatic carriage which is the subject of this report; the comparison is therefore reduced to a consideration of the relative merits of oil and compressed air in controlling the recoil. An extended experience during many years in firing hundreds of rounds in all possible conditions of temperature and weather has shown that the former method involves the simplest possible appliances, which are easily kept in order and ready for action without strain on any part of the system except at the instant of firing. The care of the carriage and its manipulation in service require no skilled labor and involve operations easily understood by the average artillery soldier. At a test of the rapidity of fire it may be mentioned that ten rounds were fired in 22 minutes 20 seconds.

AN explosion occurred on Saturday afternoon, December 12, in the Moabit quarter of Berlin, in the house of the scientist George Isaac, who was experimenting with the manufacture of acetylene gas. Isaac and three assistants were killed. It is stated that Emperor William had intended to visit Herr Isaac's laboratory, as his experiments had attracted the emperor's attention.

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER.—Lewis M. Barlow, Donaldsonville, La. To prevent the formation of scale in the shell, and to facilitate the discharge of impurities accumulating in the mud drum, this inventor has devised a boiler in which a stand pipe leads from the bottom of the boiler shell to the mud drum, near one end of the shell, while a feed pipe discharges into the other end of the shell, near its bottom, in a direction toward the stand pipe. In the drum are nipples leading from near its bottom to a transverse pipe extending through one end of the drum to the outside, by means of which, on the opening of a valve, the impurities in the drum are discharged.

Railway Appliances.

CAR FENDER.—Mariano Sparmo and Louis Russo, New York City. This is a fender which may be readily moved from one end of the car to the other, and is light, strong and durable. It is made in sections, and may be folded upon itself when not needed, but when brought in contact with a person or object while in folded position, the sections are released, and forward spring-controlled sections move automatically into position to pick up a person or object in the way of a moving car, transferring such obstacles from a point close to the ground to the fender, which is of basket form. The forward part of the fender on receiving a weight, has rolling connection with the ground, and, in striking a slight projection, rises sufficiently to pass over it without injury.

STREET CAR GONGS.—Thomas Kelly, New Orleans, La. This invention is for an improved device for automatically actuating car gongs while the car is in motion, the motorman sounding the gong as desired when the car is at a standstill. A lever is vibrated by a projection on the car axle, the lever being connected with a striker and the latter being also connected with a foot piece under the control of the motorman, while a spring yieldingly connects the several parts.

Electrical.

ELECTRIC RAILWAY.—Andrew C. O'Connor, Lynn, Mass. According to this improvement, positive and negative conductors are carried overhead on insulated supports, whereby the current is conveyed from the power station to and from the car motor without employing the ground as a conductor. Poles on opposite sides of the track support cross bars carrying the conductors, and insulated swinging arms having rollers at their lower ends are connected at their upper ends with the conductors. Supports on the top of the car carry two conducting bars adapted to engage the rollers carried by the hanging arms, the bars being insulated from each other and connected with the motor of the car. As the car moves along the bars make contact with the rollers in advance before dropping the pair already engaged at the rear.

Mechanical.

COUNTERSHAFT AND BELT TIGHTENER.—Engene C. Weston, Gallatin, Mo. According to this improvement, an independent shaft mounted in hanger bearings has rigidly connected hanger arms which support a countershaft on which are two fixed pulleys, the first shaft also carrying a rigidly connected arm on which is a segmental gear engaged by a worm on a vertical shaft supported by one of the prime hangers, there being a hand wheel on the lower end of the vertical shaft. Belt guides are arranged in connection with the pulleys on the countershaft, and the countershaft and its parts are carried upward or downward, to tighten the belts or throw the countershaft out of action, by turning the hand wheel on the vertical shaft carrying the worm. The improvement dispenses with loose pulleys and is designed to effect great saving in the wear and tear of belts.

Miscellaneous.

CLEANING SHIPS' BOTTOMS.—Charles P. Turner, New York City. A scouring brush designed to facilitate doing this work rapidly and effectively has been devised by this inventor. It comprises a casing made in sections, designed to adapt itself to the shape of the hull, and containing a flexible shaft carrying at its outer end a revolving brush, the outermost section of the

casing being connected with a rope passed around the hull on the opposite side, by means of which the brush can be drawn down along the outside of the hull and held in contact with it. The shaft is revolved by a crank or other power transmitting device provided with casters adapted to travel on the deck of the vessel.

PRODUCING ORNAMENTAL SURFACES.

—Rafael J. Chavez and Charles C. Herman, Pana, Ill. For ornamenting in a selected color glass, wood, paper, metal, etc., these inventors have devised an apparatus comprising a number of furnaces, each having a burner, above which is a wire netting supporting a pigment, a hydrocarbon supply pipe discharging into the furnace above the netting. Pipes connect the furnaces with a mixing chamber above, and a receptacle connected with a mixing chamber is provided with means for supporting the material to be ornamented. When the apparatus is in operation a colored heated gas is produced in each furnace, by the burning pigments, in connection with oils and turpentine supplied from a tank, the gases passing into a chamber and settling on articles where not covered by a stencil or pattern.

LEVEL.—Thomas F. Deck, Swanton, Ohio. This level indicates horizontal and vertical positions, and the angle of deviation when placed out of horizontal position. It comprises a stock having a transverse bore and opposite concentric recesses, bearing plates seated in the bore, one of which has an annular rim engaging with the other plate, and dial plates secured in the recesses. Rollers have journal bearings in the dials and plates, and a weighted shaft having pointers on its ends is journaled on the rollers. There are transparent covers for the dials.

KILN FOR BURNING BRICKS, ETC.—Andrew Thaison, Laredo, Texas. This is an improved kiln designed to enable the operator to control the heat to insure a uniform and equal heating of the articles set in the kiln, and at the same time requiring only a small amount of fuel. It comprises an arched chamber to receive the articles to be burned, opposite furnaces in the sides of the chamber with draught flues above their inner ends, each having branch flues opening at an angle into the arched roof, whereby the products of combustion pass upwardly and sidewise through the material to be burned, there being dampers in each branch flue and a draught flue from the arched roof of the chamber at each end, as well as a draught flue for each corner of the chamber. All draught is upward, and the water smoke readily escapes without injuring the green brick.

SHUTTER OPERATING DEVICE.—Robert H. Ireland, New York City. To facilitate opening and closing doors, shutters, gratings, etc., particularly fire shutters, according to this improvement, a bar is extended across the space closed, two sleeves sliding on the bar, and links of different lengths are each connected at one end to one of the sleeves, both links being coupled at their other ends to the same shutter, there being means for holding the sleeves against movement on the bar. The device also acts as a lock to hold the shutters in closed and open positions.

SLEIGH KNEE.—Herman and Henry Wesle, Medford, Wis. In order that the body of the sleigh may have lateral play on the knee to a limited extent, these inventors have devised a simple and inexpensive construction, applicable to any sleigh runner. The knee comprises an upper or body portion and side flanges, with a lug at each side of the center and a clamp adapted for attachment to the body of the sleigh and located on the upper central portion of the knee to have lateral movement between the lugs. The clamp has side flanges to engage the side flanges of the knee, and guide devices connected with the flanges of the clamp are controlled by stop devices on the flanges of the knee.

PENCIL SHARPENER.—Constant E. Conz, New York City. This is a device designed to remain permanently on the pencil, which, as it becomes dull, is fed toward the knife of the sharpener to renew its point, the knife being so located on the sharpener that the knife and its support form a rest for the fingers of the hand grasping the pencil. It consists of a conically tipped tube around which is a spiral slot, a sleeve traveling on the tube, while a set screw enters an opening in the sleeve and slot and projects into the pencil. The tube is also designed to protect any portion of the lead that is exposed and not actually used, thus preventing breakage.

AUXILIARY BROOM HANDLE.

—Loy B. Young, Newport, Ark. To facilitate the advantageous use of a broom in cleaning ceilings, walls, etc., this inventor has devised a ready means of attaching an auxiliary handle to the ordinary handle to lengthen the latter. It consists of a clamp having semicircular bearings adapted to engage the broom handle and opposite bearings to engage a stick forming the extension handle, a thumb screw tightening the parts to firmly draw the handle and stick together.

ASH SIFTER.—John W. Fee, Chicago, Ill. This sifter has a suitable casing, in the bottom of which is a receptacle to receive the ashes, and the top being closed by a cover, while near the top is a removable cylindrical receptacle, which may be taken to the stove to receive the ashes, and which also constitutes a sifter when in place in the casing, being revolved by a crank handle extending out at one side. The cinders remain in the cylinder after the ashes are sifted out, which is effected without any escape of dust.

ATTACHING HARNESS TO VEHICLE SHAFTS.—Frederick Dickerboom, Windom, Minn. A device designed by this inventor is particularly for attaching light tracing harness to the vehicle shafts, whereby the harness need comprise only the bridle and driving reins and the saddle, the attachment being connected with the saddle straps, and a portion of the device being a fixture to the straps, while another portion is made a fixture on the shafts. Attached to the thill is a body with a slot intersected by a bore, while a slotted slide is inwardly spring pressed, a spring pressed bolt stud being movable in the slot of the slide, and a buckle with a stud movable in the slot is engaged by the bolt to prevent the disengagement of the stud with the body.

EVAPORATING PAN.—Leon F. Hauptman, New Orleans, La. This patent is for one of a number of similar inventions by the same inventor, for quickly evaporating moisture from a liquor, and comprises a casing within which is an inclined evaporating plate, on the underside of which is secured a plate forming chamber to receive steam pipes, a wave-like plate being arranged over the evaporating plate, over which a blower forces heated air, while a liquor tank has communication with the upper end of the evaporating plate.

VEHICLE BRAKE.—Vardiman T. Sweeney, Springfield, Ky. This is an improvement on two formerly patented inventions of the same inventor, to simplify brakes adapted to be applied by the team in backing, and providing means for their application by hand as readily as by the team. The mechanism is such that when the vehicle is on an incline and the tongue is free to act, the brakes will be automatically applied, owing to the inclination of the tongue, due to the team in holding back. The invention also provides improved means of suspending the brake beam to take up lost motion, and for the taking up of lost motion in the chains or cables.

VEHICLE WHEEL.—Paris Richardson, Deshler, Neb. This wheel has a divisible hub, and the spokes and sectional felloes are made to press outwardly on the tire and hold it tightly bound on the felly sections. The hub is composed of two sections, one slidable on the other, the sections having parallel flanges receiving between them the inner ends of the spokes, there being a divided ring in the hub whereon the inner ends of the spokes are seated, radial bolts engaging the ring and projecting between the spokes, while clamping plates on the outer ends of the bolts rest on the hub flanges.

CHRISTMAS TREE STAND.—Henry W. Kurtz, New York City. This is a stand in which the body of the tree will be received and held in position on the base of the stand by braces grouped around the tree trunk, effectually preventing the tree from toppling over, while the attachment of the stand to the tree may be readily and quickly effected. The stand consists of base members detachably secured together in cruciform shape, and braces pivotally attached to opposite sides of the members are adapted at their free ends to be secured to the trunk of a tree by means of nails or screws. When the stand is not needed, its parts may be folded and packed in a small space.

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(7070) H. S. P. asks: What is the smallest in weight and size and economy of a plunge battery or batteries that will develop two actual horse power for 10 or 12 hours, and also the solution and metals and proportion, etc.? A. This cannot be done except by using an extravagantly large battery, because a plunge battery runs down very rapidly, the chromic acid attacking the zinc. A battery just sufficient to give 1,500 watts when fresh would at the end of 10 hours run down to perhaps 150 watts. A practical rule is to allow 12 square inches of zinc to 4 watts. The number of cells the battery should contain depends on the voltage. Then in use the battery may consume one-half of the power. The rule given will do for one or two hours probably. If for a long run, make the battery five or ten times as large. A powerful plunge battery is described and illustrated in our SUPPLEMENT, No. 702.

(7071) M. W. C. says: Salts are of two kinds, acid and neutral. The acid salts are those in which only part of the hydrogen in an acid has been replaced by a metal and reacts on acid. Why then is NaHCO₃ basic in quality? Is it called an acid salt as KHSO₄? A. Your first definition is correct and full. The fact that a salt affects test paper does not always show that it is not neutral. The general statement about such a salt as sodium carbonate would be that sodium is of so strong an alkaline reaction that its effect on litmus solution or test paper can only be masked by a strong acid. In other words, the neutrality of a salt is a question of constitution, not of reaction on test paper. NaHCO₃ is an acid salt.