material. Too many instances of the change by these causes of a fibrous texture to a crystalline structure are well authenticated to leave any doubt upon the subject. Not only do railway axles made of the toughest wrought iron invariably show a crystalline character when fractured, but even the axles of public carriages, subjected only to the jar of stone paved streets, present a similar appearance when broken. Whether this effect is often produced in iron rails, at least as laid in this country, where we allow "give" or spring and use wooden sleepers, we cannot say; every break we have ever seen appearing to be due to an original defect in the rail or to the inferiority of material. Still every forger knows that it is comparatively easy to make the toughest steel brittle by cold hammering. While an iron rail might retain its fibrous character until so worn on the face as to require replacement, the Bessemer steel rail might, from its superior resistance to wear, even if not from its inferior resistance to the crystallizing process, be in an unsafe condition internally while presenting a fair external appearance.

Under these circumstances it would seem that good management and discretion require that the substitution of steel for iron rails should be at present limited, and they be placed at such points on the road that while they could be exposed to the most thorough trials of frequent and heavy trains they could be examined daily and their condition be constantly known. The superiority of Bessemer steel over wrought iron in tensile strength, weight for weight, as it comes from the manufactory may not be a matter of doubt; indeed all experiments seem to prove it beyond a peradventure, but the life of Bessemer rails and the changes they may undergo while being used on the road are to be ascertained only by time.

We think, however, that the *Engineer* goes too far in asserting that for other purposes Bessemer steel has failed to meet the expectations of its advocates. According to trials made at Manchester, Woolwich Arsenal, and the statements of such authorities as Fairbairn, Templeton, Scott Russell, and others, Bessemer steel has proved superior to the best cast steel and toughest wrought iron in tensile strength, the Bessemer requiring a breaking weight of 162,970 pounds, while Sheffield cast steel, ranking next in tenacity, broke with 130,000, and Swedish iron with 72,000. Thus it would seem that for permanent structures as bridges, buildings, ships, etc., not subjected to concussion and where lightness is a favorable if not a necessary quality, Bessemer steel deserves a foremost place in engineering material.

LOCOMOTIVE ENGINEERS---THEIR RESPONSIBILITIES AND ESTIMATION.

It may be doubted if any class of mechanics are so inadequately appreciated as locomotive engineers. Few others have responsibilities equal to theirs and none have more arduous and dangerous duties. The terms of their qualifications for the positions they hold are rigidly exacting. Generally they must serve a novitiate in the locomotive building or repair shop, and then a year—perhaps more—in the position of fireman or "greaser" before a machine is entrusted to their care. They are expected to have gained a sufficient practical knowledge of the locomotive engine, not only to run it and keep it in order, but to make at least temporary repairs in an emergency.

It might be supposed, under these circumstances, that their work would be appreciated by the public generally, or at least by their employers; yet it is seldom we hear of any recognition of their services, and presentations of merit by railroad companies to engineers are so few that it is difficult to recall an instance. Yet recorded occurrences of rare heroism on the part of locomotive engineers show that they are a noble class of men, and many cases of heroic self sacrifice have occurred which have never been publicly noticed. Instances of engineers sticking to the foot-board and throttle even in the plain and immediate view of almost certain death are not unknown; choosing rather to achieve a posthumous reputation for courage than to retain a life saved at the expense of honor.

The employment of the locomotive engineer is one of continually recurring perils. He stands as Uriah in the "fore front of the battle;" if there is danger ahead he is the first to see it and must be the first to meet it. If death comes to any it must come probably to him. And frequently he is without any warning as to what danger may be before him, and without signal or guide to avert it. In the darkest nights, when the fog may be "cut with a knife," he must drive his unpitying steed, over tressel work, bridge, and culvert, either of which may have been undermined by torrents or storms or burned by sparks from the locomotive of a preceding train, even if the evil passions of men have not combined to provide the means for a catastrophe. Miles away from the habitations of men, he may have no assurance that kindly hearts will prompt to timely warning. He cannot rest, cannot relax for a moment the vigilance which is the price of safety for himself as well as the hundreds of human lives behind him. Overlooking his fireman, noting the hight of the water in his boiler and the pressure of the steam, keeping his eyes directed ahead and his hand on the throttle valve or reversing lever, he must be continually wide awake and watchful while on the road. Such labor is exhausting; it affects the mental as well as the physical powers.

The jars and jolts of the locomotive are believed to tend greatly to the impairment of the engineer's health. The violence and extent of these shocks can be understood only by those who have ridden the iron horse. The passengers in the upholstered cars conceive but a faint idea of the movements of the locomotive from the easy swinging of the cars. At times the whole machine, with its tuns of moving weight, appears to leap from the track; it jerks from side to side of the road as if a sentient organism in spasms, and shakes the engineer and fireman in every fiber of their bodies. With all this the engineer must not allow his attention to be diverted from his duty. He gets to learn the present condition of his machine even by the noise it makes as it echoes through cuts or tunnels or spins hummingly along the open track. If a single thing is wrong his educated ear detects in the darkest night what his obscured sight fails to discover.

The perpetual strain upon the mind—the sense of never mitigated responsibility—and the continual facing of possible death or disaster more or less affects the mental character of the locomotive engineer. He partakes of the character of his machine—of which he becomes insensibly a part—and is sometimes rough, perhaps, in manner, always ready, and blunt in his communications with others. But from his position and the demands of his office he seldom speaks—never converses—when on the engine. Thus he becomes in time taciturn, in manner, although not in reality. This brusqueness and reticence if not a part of his duty becomes a part of his character, and even if time permits, he seldom allows himself to unbend in social life. With such responsibilities as he bears levity soon becomes gravity, and light heartedness, seriousness.

It is not too much to say that the locomotive engineer, rather than the conductor, is the real manager of a train. The latter mingles with the passengers, and being ostensibly what his title imports, he receives the credit for a favorable issue out of a threatened danger, which more properly, in many cases, belongs to that isolated individual, the locomotive engineer.

OFFICIAL REPORT OF PATENTS AND CLAIMS

Issued by the United States Patent Office,

FOR THE WEEK ENDING DECEMBER 24, 1867.

Reported Officially for the Scientific American

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72,439.—TRACK-CLEARER.—Ernesto Abbiati (assignor to himself and John N. Longhi), New York city.

I claim, 1st, The application to a track and street cleaner, of oscillating wings, H H, operated by means of crank shafts, E E, to which planetary motion is imparted, substantially as herein shown and described, and for the purpose specified.

2d, The oscillating wings, H, when arranged upon and operating in combination with a revolving disk, D, all made and operating substantially as herein shown and described.

3d, The track cleaner, when consisting of the revolving disk, D, carrying the oscillating wings, H, in combination with the brushes, I I, all made and operating substantially as and for the purpose specified.

72,440.—MORTAR MILL.—Alfred A. Anderson, Galesburg, Ill.

I claim a mortar-mixing machine, consisting of the case, A, provided with a hopper, B, detachable end piece, A', and the gear wheels, b c, arranged to operate a grinding or mixing cylinder placed within the hopper, the whole constructed and mounted on a carriage, substantially as described.

72,441.—CAR COUPLING.—Cyrus P. Bachelder, Franklin, N. H., assignor to himself, Daniel Barnard, and Stephen Kenrick.

I claim the apparatus for raising links, consisting of the cross bar, a, with its handles, a', and brackets, b, in combination with the rods, d, spiral springs, h, and cross piece, c, all operating substantially as and for the purpose described.

72,442.—DEVICE FOR ATTACHING POSTAGE AND REVENUE STAMPS, ETC.—Charles H. Bacon, Springfield, Ohio.

I claim the case, A, having knives, G, with inclined edges projecting from its interior faces, in combination with the follower, B, substantially as and for the purpose set forth.

72,443.—CARPENTERS' PLANE.—L. Bailey, Boston, Mass.

I claim the auxiliary point of impact between the cap and the thin plane iron, at the point or portion thereof where the thin steel tends to buckle under the pressure of the cap upon the projecting edge of the plane iron, substantially in the manner described.

72,444.—EXTENSION LADDER.—Hosea Barns, Somers, Wis.

I claim the hooks, D, attached to the side pieces, a, of the sections or lengths, B C, when the latter are connected together by the rounds, c, passing through oblong slots, d, in the side pieces, a, and the lower ends of the latter are provided with notches, h, to fit over rounds, e, all arranged in the manner substantially as shown and described.

72,445.—TRUSS.—John Randolph Blake, and John Lewis Jarrell, Dyer Station, Tenn.

We claim, 1st, The pads, when applied to the under strap of a body belt, substantially as and for the purpose described.

2d, The side straps, H, in combination with the above, substantially as described, for the purpose specified.

72,446.—FLY TRAP.—Almeron Bristol, Constantine, Mich.

I claim, 1st, A bell glass or erect glass cylinder, closed at the top, and having the lower edge turned up inside, to form a trough, as described, and for the purpose specified.

2d, And in combination with the bell glass or cylinder described, the standard, provided with a screw and nuts, to adjust the hight of the glass.

72,447.—TOOL-HOLDER FOR SLIDE REST.—Israel F. Brown, New London, Conn.

I claim the notches, dx, in the tool, in connection with the wire, e, or its equivalent, in the V groove, in the gib or key, substantially as and for the purpose set forth.

72,448.—SKATE.—George Brownlee, Princeton, Ind.

I claim, 1st, The foot rest or support, and runner or blade, of a skate, when transversely divided, substantially as and for the purpose described.

2d, A foot rest or support to the skate, when provided with a driving jaw or jaws, substantially as described, for the purpose specified.

3d, The edge or strip applied to the runner or blade of a skate, substantially as and for the purpose described.

72,449.—DOOR SPRING.—Charles Burnham, Philadelphia, Pa.

I claim, 1st, In combination with a rod or torsion door spring, the screw-threaded cam or worm, G, or an equivalent thereof, as described, engaging with the notched burr or wheel, D, on the end of the said torsion rod, for the purpose of graduating the tension thereof, substantially as described.

2d, In combination with the above, the double socket or receiver, E, for supporting the notched wheel, D, substantially as described.

72,450.—GUIDE FOR WATER WHEELS.—Nathan F. Burnham, York, Pa.

I claim the guide constructed with a bevelled surface, as at y, such bevelled surface forming one side of the entire throat, formed by the respective pairs of guides, substantially in the manner and for the purpose described.

72,451.—WASHING MACHINE.—Jacob B. Byers, Geneseo, Ill.

I claim a washing machine, having the stationary inclined corrugated board, C, and the swinging beaters, D, suspended and pivoted within the box, A, with the inclined bottom, B, all arranged as shown and described.

72,452.—MUSKETO AND FLY NET.—Eben O. Carrington, Philadelphia, Pa.

I claim the polygonal bars, c, with end spring sections, in combination with the tapes or strips, e, and fold, f, as and for the purposes specified.

72,453.—BASIN FAUCET.—James Chambers, Boston, Mass.

I claim the combination as well as the arrangement of the two valves, F G, their seats, h i, the passage, k, the valve chambers, b c, the standard, A, and the stem, E, provided with operative screws, o, as specified.

Also the combination as well as the arrangement of the nozzle, B, the standard, A, the stem, E, its operative screws, o, the valves, F G, their seats h i, and chambers, b c, and the passage, k.

Also the combination of the tube, e, the flange, f, and the two elastic annuli, h i; also their arrangement with respect to the screw joint, a, of the parts, A C, as described.

Also the combination of one of the valves, F G, with its stem, by means whereby one may be adjusted thereon, with reference to the other, for the purpose of terminating the movement of the nozzle, as described.

72,454.—WATER WHEEL.—Rockwell Chapman, Buchanan, Mich.

I claim a water wheel consisting of a radially projecting hub, B, having the buckets, a, formed thereinalternately on opposite sides, each bucket extending half way across the face of B, as shown in Fig. 2, and having the discharge passages formed on the sides by the overlapping plates, l, applied as described.

72,455.—TRAY FOR GAS PURIFIERS.—B. E. Chollar, Leavenworth, Kansas.

I claim, 1st, A purifying tray substantially as shown and described and for the purpose set forth.

2d, The grate bars, a, in combination with the pectinated bars, A, and the binders or clamps, B, substantially as shown and described and for the purpose set forth.

72,456.—DOUBLE CULTIVATOR PLOW.—Philip Coonrod, Keithsburg, Ill.

I claim the cultivator consisting of two separate gangs of plows, G G, each gang constructed of curved iron bars, g g, as described, and adjusted by means of clevis, H, and box, C, both constructed and operating substantially as herein set forth, in combination with axletree, A, constructed as described, boxes, D D, and draft rod, E, substantially as set forth.

72,457.—SHUTTLE.—George Crompton, Worcester, Mass.

I claim, in combination with the bobbin spindle, the spring, f, and strut, k, arranged to operate substantially as set forth.

Also the hinge latch plate, l, the spring, s, and the stop pin, t, when combined and arranged together, and relatively to the bobbin spindle, substantially as set forth.

72,458.—STEAM ENGINE GLOBE VALVE.—Alfred Crossley, Brooklyn, N. Y.

I claim, 1st, The chamber, c, in the upper part of the bonnet, E, above the screw thread by which the valve stem is raised and lowered, so that the smooth upper part of the valve stem will not come in contact with the screw thread in the bonnet, substantially as herein described.

2d, The arrangement of the packing, F, bonnet, E, and its recess, c, whereby to exclude water or steam from the screw thread in the interior of the bonnet, substantially as herein shown and described.

72,459.—BURGLAR ALARM.—Benj. F. Cunningham and Jeff. F. Cunningham, Flora, Ill.

We claim the arrangement of lever wire, D, in combination with wire, E, for the purpose herein specified.

72,460.—ARTIFICIAL FUEL.—Aaron M. Daniels, Hartford, Conn., assignor to himself and Benjamin Benett.

I claim a compound for artificial fuel substantially as described.

72,461.—ANIMAL TRAP.—W. H. Davis (assignor to Joseph Harlan), Lexington, Ind.

I claim, 1st, The crank shaft, C, operated by the spring, d, or its equivalent, in combination with the trap door, B, substantially as above set forth and described.

2d, The bars, G, in combination with the trap door, B, substantially as specified.

3d, The trigger, F, substantially as described, in combination with crank shaft, C, and trap door, B, substantially as above set forth and described.

72,462.—HARNESS SNAP.—Wm. F. Davison, Oliver A. Bates, Samuel M. Wilson, and Alva P. Russell, Janesville, Wis.

We claim, 1st, Ring, b, when constructed with a gain or flattened portion to receive and to be operated by spring, c, substantially as and for the purposes described.

2d, Hook, a, ring, b, and spring, c, when all constructed, connected together, and used substantially as and for the purposes described.

72,463.—SCREW DRIVER.—Otis Dean (assignor to Dr. R. W. Young), Richmond, Va.

I claim, 1st, A screw driver capable of being varied in length substantially in the manner set forth.

2d, Also the combination of the notched blade, B, and locking spring, C, constructed and arranged to operate as and for the purpose specified.

72,464.—TOOL FOR OPENING CANS.—Geo. A. Dickson, Woodcock Township, Pa.

I claim the cutting tool, constructed as shown at fig. 3, when the same is in combination with the cylinder, D, and the India-rubber packing, B C C, and the collar, E E, constructed as described, for the purposes set forth.

72,465.—MACHINE FOR BORING ROCKS.—Frederick Bernard Doering, London, Eng.

1 claim, 1st, Constructing engines or machinery for boring or working in rock or other mineral, in which the pistons of the small cylinders are operated by motive fluid, distributed by the main cylinder, without having been previously utilized in the main cylinder, as herein described.

2d, Constructing engines or machinery for boring or working in rocks, or other mineral, in which the main cylinder itself distributes the motive fluid at distinct portions of the stroke to other cylinders, as in the arrangements herein described.

3d, Constructing engines or machinery for boring or working in rock or other mineral, in which the piston of the main cylinder, with the tool, has the required rotary motion imparted to it by a twisted bar, or equivalent, in combination with other parts, as herein described.

72,466.—STAND FOR ROCK-DRILLING ENGINE.—Frederick Bernard Doering, London, Eng.

I claim, 1st, The combination of parts, substantially as herein described, and shown, in such manner that the bearing pieces for wedges or other fixing arrangements may have more than one point of support, and the carriage be therefore prevented turning round the carrying column, as shown in the drawings annexed.

2d, The combination of parts, in frames or stands, for boring or cutting engines, of a pivoted saddle or bow, with collars, columns and arms, with their clamping arrangements and moving gear for allowing the engine to be moved into any required position, substantially as and for the purpose herein described, and shown in the figures.

3d, The combination, with frames or stands for boring engines, of reservoirs and a tank for water, having the necessary inlets and outlets, substantially as and for the purpose herein described, and shown in figs. 1 and 8.

4th, The combination of parts of frames or stands, to be employed in sinking vertical shafts, substantially as herein described with reference to figs. 6 and 7.

72,467.—HEAD REST.—A. Dunlap, Clyde, Ohio.

I claim the section, A, consisting of the wire frame, C, and cushion, D, as arranged in combination with sections, B B', when constructed with sleeves or sockets, F, and cushions, E and H, in the manner and for the purposes substantially as set forth.

72,468.—LATHE TOOL HOLDER.—Jacob Edson, Boston, Mass.

I claim the arrangement of the clamp-holding projection, a, and the clamp, B, with the shank, A, and one or two cutters, C C', applied thereto, as specified.

Also, the holder shank, A, as made with the auxiliary projection, d, arranged with it and its clamp projection, as specified.

Also, the holder, as made with one or more notched or toothed grooves constructed in its head or front end to receive one or more tools or cutters held against such notches, as explained.

Also, the arrangement and combination of the two separate cutters or tools with the single holder and its clamp, as specified.

Also, the holder, as made with each of its grooves curved longitudinally, as and for the purpose above specified.

Also, the yoke of the clamp, as formed with the cap or cover, to extend over the projection, a, and that part of the screw of such clamp which extends within the projection receiving recess of the clamp.

72,469.—FENCE.—Augustin Ellis and Oliver Albertson, Salem, Ind.

We claim the obliquely projecting bars or bases, D, attached to the panels, A A, substantially in the manner as and for the purpose set forth.

72,470.—ANIMAL TRAP.—Augustin Ellis and Oliver Albertson, Salem, Ind.

We claim, 1st, The combination of the lids, D E, to the bait-box, A, tilting platform, I, wicket door, M, between said bait-box and the chamber, B, lever-stop, N, bar, P, lever, S, rod, T, crank-arms, I, crank-shaft, H, spring, J, and bait-hook and frame, U V, substantially as described for the purpose specified.

2d, The wicket door or doors to the communicating passage, C, provided with a flange piece or strip, or its equivalent, substantially as described for the purpose specified.

72,471.—FRUIT DRYER.—M. W. Florer, Bracken County, Ky.

I claim the box or chest, C, fruit holder, B, and pipe, E, when used in connection with the ordinary farmer's or cooking kettle for generating steam, substantially as and for the purpose described.

72,472.—SEED PLANTER.—Jos. K. Frautz, Goodville, Pa.

I claim, 1st, The plow blades, B2, and covering shares, F2, adjusted by means of the thumb screws, D2, in the beams, E2, and uprights, C2, secured to the carrying beams, Z, and by the lever, I2, attached to the cross rod, H2, at the rear of the machine, as herein described for the purpose specified.

2d, The brush, U, in the hopper, L, adjusted by means of the thumb screw, W, and guide posts, V, as herein described for the purpose specified.

3d, The hand lever, Y, and lever, I2, in combination with the shaft, F, for throwing the pinion, E, in and out of gear with the crown wheel, D, as herein described for the purpose specified.

72,473.—RAIL FENCE.—Ambrose Frayer, Ripley, Ohio.

I claim the herein described fence, when constructed and arranged in the manner substantially as described, consisting of the side braces, F, so arranged that the yoke, E, embraces their upper ends, thereby holding them securely in connection with the posts, C, at the same time binding said posts together, whereby the rails are supported and kept in position between said post and upon the sills, B.

72,474.—APPARATUS FOR VENTILATING MILLSTONES.—Williston K. Fuller, Modena, Ill.

I claim the millstone, G, provided with the scroll wing, A, and tube, B, so arranged that the tube will pass down the eye of the stone a certain portion of its length, and through the corner at an angle, so as to open on the face of the stone a short distance from the eye, constructed and operating substantially as herein indicated.

72,475.—CHURN.—J. C. Gaston, Cincinnati, Ohio.

I claim the construction and arrangement of two perforated dasher heads, secured one above the other to the dasher handle, and having an equal number of perforations, and so placed that the perforations in one head shall be opposite the solid part of the other, substantially as and for the purpose described.

Also, in combination with the above, providing the cover with the air tube, c, with a semi-cylindrical shaped cap, e, as and for the purpose set forth.

72,476.—TIRE BENDING AND SHRINKING MACHINE.—Jacob Gettemy, Donegal, Pa.

I claim, 1st, The device for operating the rollers, E E, so that they may be moved in the desired direction, said device consisting of the crank shaft, C, in combination with the connecting rods, e e, sliding frames, D D, and grooved