

**Steel Under the Microscope.**

An experienced steel maker can estimate very closely the precise quality, chemical composition, tensile and compressive strength, and even the mode of treatment which a steel has undergone, by looking at its fracture. The appearance of the crystalline texture which is more or less discernible by the naked eye, and the method in which the reflected light gives certain variations of luster, are the scanty yet very important indications from which, by a series of guesses as to probabilities, an opinion may be formed which has every chance of being correct. This being the case, it seems very obvious that, by the assistance of the microscope, we should be capable of observing the texture of steel and iron fractures more correctly and more minutely, and a smaller amount of experience or nicety of observation should be sufficient—should enable us to form a correct opinion of the qualities of any given sample of steel. This is the case, and to such an extent that it is most astonishing how metallurgists could have neglected the use of the microscope to such an extent as it generally has been. We have already drawn attention in this journal to the interesting researches made by M. Schott, the manager of Count Stöhlberg's foundry at Eisenburg, upon the appearance of liquid and solidifying cast iron under the microscope, and we can quote the experience of this metallurgist as to the advantages to be obtained from microscopic observation of various kinds of steel. M. Schott, at his visit to the Paris Exhibition, made some most remarkable "guesses," as some steel-makers would call his conclusions, with regard to the qualities and method of manufacture of many hundreds of steel samples exhibited there, and of which he, in many cases, had no other knowledge than that which he could gather through the aid of a small pocket microscope, made of two pieces of rock crystal, formed into a very powerful single lens. A pocket microscope of this kind ought to be the companion of every man interested in steel manufacture. Lenses of the usual kind, even if piled up in sets of three or four, are entirely insufficient. The lens must be of a very small focus, and properly achromatic. A little practice is sufficient to enable the user to "see" through this lens; but it is, of course, not quite so easy to learn the meaning of what is thus seen, and to estimate from the appearance the quality of the steel inspected.

M. Schott has established for himself a kind of theory which, we believe, will be useful to those of our readers who desire to use the microscope in their researches upon the qualities of steel. M. Schott contends that each crystal of iron is an octahedron, or rather, a double pyramid raised upon a flat square base. The heights of the pyramids in proportion to their bases are not the same in different kinds of steel, and the pyramids become flatter and flatter as the proportion of carbon decreases. Consequently, in cast iron and in the crudest kinds of hard steel, the crystals approach more to the cubical form from which the octahedron proper is derived, and the opposite extreme, or the shaft wrought iron, has its pyramids flattened down to parallel surfaces or leaves, which, in the arrangement, produce what we call the fiber of the iron. Between these limits, all variations of heights of pyramids can be observed in the different kinds of steel in which these crystals are arranged more or less regularly and uniformly, according to the quality and mode of manufacture. The highest quality of steel has all its crystals in parallel positions, each crystal filling the interspaces formed by the angular sides of its neighbors. The crystals stand with their axes in the direction of the pressure or percussive force exerted upon them in working, and consequently the fracture shows the side or sharp corners of all the parallel crystals. In reality good steel under the microscope shows large groups of fine crystals like the points of needles, all arranged in the same direction, and parallel to each other. If held against the light in a particular direction, each point reflects the light completely, and a series of parallel brilliant streaks are shown all over the surface. Now, the exact parallelism of the pointed ends or of the streaks of light is one of the most decisive tests for a good quality of steel, and this is not visible quite so frequently as might be generally imagined. On the contrary, a great majority of steel fractures show crystals arranged in parallel groups or bundles, as before described, but clustered together in several distinct crystalline layers, which are not parallel to each other. The consequence is that the needle-points, visible under the microscope, appear to cross each other at certain places, or at least they point in such directions that, if elongated, these lines would cross each other at a short distance in front of the fractured surface. Wherever the crossing actually takes place, a ridge or line is generally visible to the naked eye, and the color of the two parts of the fractured surface which contain the different groups is different, since the light which falls upon one group at the proper angle for reflection will be in such a position with regard to the other group as to throw the points of the crystals into the shade. The one part of the surface, therefore, will appear bright or silvery white, while the other will look dark or grey in color. As usual, inferior specimens are more instructive than the best qualities, because there the peculiarities and faults come out most strikingly. We have seen a piece of a Bessemer steel block from a spoiled charge, in which the crystalline structure of the spiegeleisen was seen in some spaces, particularly at the edges of the air-bubbles, perfectly distinguished from the coarse-grained crystals of the mass of steel all round. This mass, moreover, contained groups of very different character within itself. In a specimen of steel or iron, made by another process, we could discover clearly defined crystals of pyrites, indicating the existence of sulphur in an unexpectedly tangible manner. Repeated melting, heating, or hammering of steel has, in general, the effect of reducing the sizes of crystals, and also of laying them more parallel. Still there seems to be a differ-

ence between the treatment which gives parallelism and that which causes the reduction of sizes in the crystals. The former seems to be principally due to the action of the heat, and repeated melting is the great panacea in this respect. The small-sized crystals, or what is called fine-grain, can be obtained by mere mechanical operations. In fact, hammering at a dull, red heat, or even quite cold, is known to produce the effect of making the grain of steel extremely fine. This is a property, however, which is lost by reheating, and at a sufficiently elevated temperature, steel seems to crystallize in large grains, which remain if it is allowed to cool slowly and undisturbed by mechanical action.—*Engineering.*

**Ice in Deep Mines.**

The main entrance to the pits at Dannemora, Persberg, one of the oldest and most celebrated of the Swedish iron mines, is a natural opening or abyss, of so large a circumference as to require some fifteen minutes to walk around its mouth. A scaffold is erected out so as to overhang this abyss, upon which the hoisting machinery is placed. The observer can look down into this frightful abyss upward of 500 feet, to which point the light of day extends, and beyond which all is shrouded in darkness, save when feebly illuminated by the dim lights of the miners. One of the most remarkable facts connected with this mine is the large quantity of ice which is always present there. Professor Von Leonhard, in his "Popular Lectures on Geology," says: "The deeper you go the more the ice increases. And in order to remove it from the pits it must be raised up in buckets. At some places the ice is 90 feet thick; it forms real glaciers, which are never diminished by any change of external temperature. This fact, however, should not be regarded as contradictory to another, which will hereafter be illustrated, and which is that pits become warmer in proportion to their depth. The phenomenon at Persberg, as we shall see, can be explained on natural principles. When the visitor has reached the bottom he is conducted by his guide into vaulted chambers, through immense regions of ice. Many of these vaults are so large that fifty men can conveniently work in them at the same time." This occurrence of ice in deep mines is not an isolated fact. Ice is found in the pits of Ehrenfriedensdorf, in Saxony. Leopold Von Buch tells us that formerly, in Norway, mining was prosecuted above the region of eternal snow. Wood, for the timbering, could not be had there, and its want was supplied by filling up a drift with water, and allowing it to freeze; passages were then cut through the ice as they were needed, the balance of the ice being left in lieu of wood for timbers. It is also well known, says the *Mining and Scientific Press*, that the ancient Peruvians obtained ores on the Cordilleras, in places elevated above the perpetual snow line. The mines of Rauris, in upper Austria, lie entirely within the glacier region, and most of the shafts open in eternal ice, clear as crystal; the miners' huts are surrounded with ice. On what is known as Gold Mountain one of the shafts is sunk 100 feet through pure glacier ice. A gold mine in the deep valley of the Alps, near Salzberg, is the highest in Europe which is now worked. There are two tunnels near this mine entirely surrounded with glacier ice. The miners of this region undergo great hardships from exposures, and to avalanches, which often sweep them to destruction while going to and fro to their work, or while reposing in their cabins on the hill sides. It is stated by one authority that there is a locality deep within one of the iron mines of Dannemora, already noted, where the mass of ice is 120 yards thick.—*Mechanics' Magazine.*

**NEW PUBLICATIONS.**

**WHEELER'S HOMES FOR THE PEOPLE.** Geo. E. Woodward, 191 Broadway, N. Y. Price \$3.

This is one of a series of new works on architecture, just from the press of Mr. Woodward, who makes it a specialty to publish this class of literature. Gervase Wheeler, author of the work under consideration, had his manuscript ready for the press some years ago, but unfortunately the building where the work was in preparation was consumed by fire and the work of many weary months was lost. But what was his loss was the public gain, for there have been many improvements in architecture since the author's calamity, which he has introduced into the volume before us. The work is embellished with one hundred engravings of villas, cottages, and country houses of every order of architecture, with plans and estimates of cost.

**WHEELER'S RURAL HOMES.**

The author of "Homes for the People" has also published through Woodward, 191 Broadway, a similar but less comprehensive work entitled "Rural Homes," in which he not only illustrates plans of a number of cheap cottages, but also gives engravings of a variety of rustic furniture suitable for summer houses and lawns, such as settees, chairs, flower stands, etc. The author also gives hints as to the best mode of plumbing and heating country houses; also a form for drawing a specification, and contract between the landlord and builder. Price \$2.

**WOODWARD'S RURAL ART.** Geo. E. Woodward, Author and Publisher, 191 Broadway, N. Y. Price \$1.50.

The volume before us is No. 2 of Mr. Woodward's annual, on the subject of architecture and rural art. It is not unlike Wheeler's works, noticed above, in its general character. Mr. Woodward designs to issue a work of this kind every year, adding all the new features and fashions in the construction and finish of country houses. Either of the above works will be found useful to builders or persons about to erect or furnish country houses.

**HASWELL'S ENGINEERS' AND MECHANICS' POCKET BOOK.** New York: Harper Brothers.

Mr. Haswell has long been known as one of our most experienced and reliable civil engineers. His Pocket Book is regarded as one of the standard works, for ready reference, in all that relates to engineering. For some time past the author has been engaged in enlarging and revising the matter contained in previous editions, and the result is now before the public. From about 300 pages he has enlarged the book to 650 closely printed pages, and we venture to say that no work of the kind has ever been produced which contained so much information upon the various branches of engineering, condensed into so small a space. The principal tables, rules, estimates, calculations, etc., employed in the mechanic arts, architecture, railroading, civil engineering, steam navigation, are given in the most convenient and intelligible form. Mr. Haswell's new book ought to be in the possession of every engineer and mechanic in the country.

**MANUFACTURING, MINING, AND RAILROAD ITEMS.**

Philadelphia claims to be the greatest manufacturing city in the world, except London. In 1866 the factories there produced over two hundred million of dollars worth of staple goods.

Turkey has projected three lines of railway, the first from Constantinople to Belgrade; the second from Enos, a short distance west of Constantinople, to Varna on the Black Sea; the third from Enos to Usknp in Northern Macedonia. The contract for them has been awarded, and the means will be furnished by English, French, and Belgian capitalists.

The gold yield for the country for the present year is about as follows: Montana \$12,000,000; Idaho \$6,000,000; Oregon \$2,000,000; Colorado \$5,000,000; Nevada \$19,000,000; California \$25,000,000, and miscellaneous \$5,000,000. Total \$74,000,000.

The common 60-seat American railway passenger car costs from \$4,000 to \$5,000 each, while the English style of railway coach introduced on a few of our roads cost about \$14,000. There is a wide difference too, in the weight, in favor of the American car. The interest on the greater cost, and the hauling of the extra weight of the English car must be paid for by those who value exclusiveness sufficiently to use them. In cases where the English coach have been introduced here, they have not proved a profitable investment, and there is very little prospect of their being widely adopted.

The coal deposits of Russian America are pronounced valueless, the mineral being found only in small contorted seams. Iron is found in worthless beds of clay, and far up on the Konkon, gold may be obtained but under such circumstances that it is also valueless, being only workable two months in the year. Stains of copper have been found on rocks near Norton Bay, but no ledge or seam.

There is a stone quarried in Cornwall, Eng., called the Polyphant stone, which can be cut by a hand saw with ease when first mined, but in time becomes exceedingly hard. It occurs of a neutral grey color, and also of a green with red spots and is admired by architects for its chromatic effects.

The New York and New Haven railroad have just introduced a new system of warming their passenger cars, by means of hot water circulating through pipes placed under each seat. By following this plan all the heat is economized and thus keeping the feet of the passengers warm, the whole body experiences an agreeable sense of comfort. We hope to see other roads adopt in this excellent mode of warming cars.

A train of thirty cars was loaded with railroad iron at the Cambria iron works, Johnstown, Pa., last week, the destination of which is a point on the Pacific Railroad over five hundred miles west of Omaha, Nebraska. The distance to be traversed is fifteen hundred miles, considerably more than half way "across the continent," and all this distance is to be traversed without transshipment of the iron.

The number of Bessemer steel converters now established in Europe, numbers 115, which are capable of producing half a million of tons per annum. England with fifty-two converters turns out weekly 6,000 tons. Prussia with twenty-two converters is the next greatest producer, 1,460 tons weekly. Next comes France with twelve converters and 880 tons; Austria, fourteen converters, and 650 tons; Sweden fifteen converters, and 530 tons. The Bessemer process is worked at one locality only in Belgium, and Italy has two establishments, with a very small yield.

South America does not propose to be outdone on the trans-continental question by its northern compeer. A project is on foot to extend the Valparaiso and Santiago railroad across the Andes to Buenos Ayres. A German engineer, Otto Von Armen, has surveyed the route, a company has been formed, the government has been applied to for a charter and grant of land on both sides of the track upon which they propose to establish German colonies, although liberal inducements will be held out to all other nationalities to settle there. As an instance showing how railroading pays in South America, it is stated that the road from Santiago to Valparaiso has earned during the past year the sum of \$910,241, being quite an increase over the previous year.

The experimental elevated railroad in Greenwich street this city has been completed for quarter of a mile from the Battery. At the last meeting of the stockholders the engineer's exhibit of present and probable future cost, having been inspected it was unanimously resolved to proceed with the extension of the road one quarter mile further, to Cortlandt street, preparatory to its inspection by the State commissioners, as required by law.

The Massachusetts State Council, recently by a unanimous vote, annulled the contract made in July with Messrs. Dull, Gowen and White, for completing certain portions of the Hoosac tunnel, including the central shaft. They authorized the commissioners to take possession of all the tools etc., belonging to the State and to make an immediate settlement with the contractors. The reasons for this are that the bids for the contract were much too low and an increase of rates would soon be necessary, and the council are adverse to making any advance in that direction.

**Recent American and Foreign Patents.**

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

**MANUFACTURING BRICKS.**—E. W. Crittenden, Pittsburgh, Pa.—This invention relates to certain new and useful improvements in manufacturing bricks, designed for operating on a large scale, and more especially with a view of dispensing with the hard labor and expensive manipulations hitherto required in the process of brick making. The invention consists, 1st, in an improved means for crushing or pulverizing the clay, and bringing it to a proper elastic state to be molded or compressed into bricks, 2d, in an improved means for molding and compressing the clay into bricks, and 3d, in a novel and improved means for drying the compressed clay, or unburnt bricks to render them suitable for burning in the kiln.

**SAFETY ATTACHMENT FOR WATCH POCKETS.**—Edward Williams, New York City.—The present invention relates to an attachment to watch pockets of wearing apparel, the object of which is to prevent the abstraction or removal of the watch carried in such pocket from the same, without the knowledge or consent of the wearer or owner, thereby obviating all possibility of the watch being stolen when the person wearing it is in a crowd, or otherwise favorably situated for the operations of thieves, pickpockets, etc.; the said safety attachment being of such a nature and construction as to be easily manipulated by the wearer, and to offer no impediment to the free removal of the watch by such person.

**MACHINE FOR HEADING AND SQUARING BOLTS.**—Albert R. Bailey, New Haven, Conn., and Wilson W. Knowles, Plantsville, Conn.—This invention relates to a new and improved machine for heading and squaring bolts, and it consists in a novel arrangement of dies and a header, arranged to operate in such a manner that a square is formed on a bolt, contiguous to its head, of greater thickness than the body or main portion of the bolt, and the head and square formed on the bolt at one operation.

**CORN PLANTER.**—J. M. Sampson, Waynesville, Ill.—This invention relates to a new and improved corn planter, of that class in which the seed distributing device is operated by hand, the device being mounted on wheels, and all so arranged that a very simple, cheap and efficient corn planter is obtained.

**BRUSH HOLDER.**—Joseph Messinger, Springfield, Vt.—This invention relates to a new and improved holder, by which scrub-brushes may be firmly secured to a handle to admit of the brush being used without the necessity of the operator stooping over and working on the knees, as is now universally done. The invention consists in constructing the holder in such a manner that the handle thereof may be turned or adjusted in a position at right angles with the brush, or longitudinally therewith, and the holder at the same time be perfectly simple in construction, and economical to manufacture.

**GATE SPRING.**—W. W. Sutliff, Town Line, Pa.—This invention relates to an improvement in a spring for a gate or door, and consists of a flat, covered, metal spring, hinged at one end to the back of a gate, while the other end is free to catch in one of a series of notches in a block fastened to the post or frame of a gate or door, which spring, by its pressure, keeps the gate closed when it is not forcibly pushed open.

**THRILL COUPLING.**—Silas Rogers, Stamfordville, N. Y.—This invention relates to a new and improved mode of connecting thills to axles, whereby the thills may be readily attached to and detached from the axle, and all rattling of the parts avoided.

**DEVICE FOR CUTTING BOOT AND SHOE HEELS.**—Benj. F. Goddard, Charlestown, Mass.—This invention relates to a new and improved machine for cutting boot and shoe heels, and is designed to save labor and stock in the production of that work. The invention consists of a combination of dies or cutters, of different sizes, arranged in such a manner that they may be manipulated or adjusted so that the several layers of leather composing a heel may be cut out to form a heel approximating to the desired shape, requiring but a trifling amount of trimming in order to finish it.

**TOWELS.**—John Cash, Coventry, England.—This invention relates to an improved method of manufacturing towels to be employed for friction of the surface of the skin of persons after bathing, or similar purposes.

**HAND LOOM.**—T. Henry Tibbles, Kansas City, Mo.—This invention relates to improvements in an ordinary hand loom, and consists in a new device for operating the drivers and throwing the shuttle by the motion of the lay, with one picker staff and a shifting weight, and working the treadles by direct action of the lay, without treadles, through the medium of cam rollers.

**HAND LOOM.**—A. Smith and P. P. Smith, Plymouth, Mo.—This invention relates to improvements in the construction and arrangement of a hand loom, and consists in a device connected with the shuttle drivers in such a manner that the motion of the lay shall operate on the drivers to throw the shuttle, and also a device connecting the treadle shaft with the lay to work the treadle.

**SNOW PLOW.**—James S. Zane, Pleasant Plains, Ill.—This invention relates to an improvement in the construction of snow plows for railroads, and consists in inclined planes which are mounted on a truck and rise from the bed of the road to an elevated double mold board, which is hinged and so arranged in combination with machinery that it may be raised and lowered as required.

**WINDOW JACK.**—S. P. Loomis, Philadelphia, Pa.—This invention relates to an improvement in the construction and arrangement of a window jack or platform support for house painters.

**BURGLAR ALARM.**—D. B. Skelly, Lockport, N. Y.—This invention consists in an arrangement of springs which, when set or strained, are held in position by a small wire or thread, but when the wire or thread is broken or loosened the springs are liberated, which liberation or recoil gives the alarm by ringing a bell and discharging a pistol, and at the same time it ignites a match and lights a lamp.

**CENTER BOARD.**—Felix Doming, Penataquit, N. Y.—This invention has for its object to improve the construction of center boards, and make them more effective in operation.

**DRILLING MACHINE.**—George Downing, Schuylerville, N. Y.—This invention has for its object to furnish an improved drilling machine, simple in construction, easy to be operated, which can be so adjusted that the full force of the blow may be effective, whether drilling a shallow or deep hole, and which will drill vertical or inclined holes with equal facility.

**BROADCAST SEEDING MACHINE.**—Augustus Weltman, West Union, Iowa.—This invention relates to a new and improved broadcast seeding machine, and it consists in means employed to prevent the choking of the harness and also in means to insure a proper distribution of the seed and the sowing of the same in a perfect manner.

**PADDLE WHEEL.**—E. F. Bostrom, Newnan, Ga.—This invention relates to a new and improved paddle wheel designed for both river and sea steamers and has for its object a more efficient action than hitherto of the buckets or float boards against the water and the perfect operation of the buckets or float boards at varying depths of immersion.

**HAIR PICKING MACHINE.**—Franklin Frey, Liberty, Ill.—This invention relates to a new and useful improvement in the construction of a machine for picking or breaking up the matted knots of hair used for mixing with mortar to plaster houses.

**AIR CHAMBER.**—Richard H. Hilton, Newbern, N. C.—This invention relates to a new and improved method of constructing air chambers for pumps and other purposes where it is desired that a steady and uniform current of liquid or fluid should be discharged and the invention consists in arranging a strainer and ball valve in the chamber and also a sand trap or sediment chamber therein.

**COMBINED HORSE BLOCK AND HITCHING POST.**—George W. Preston, Corning, N. Y.—This invention which relates to a combined horse block and hitching post consists essentially in combining in one device made of cast iron or other suitable material a horse block and hitching post.

**COMBINED SHRINKING AND PUNCHING MACHINE.**—C. V. Statler, Woodhull, Ill.—This invention relates to a new and improved method of shrinking and punching wagon tires and other articles.

**FORMING AND CUTTING WIRE.**—J. Wasson, Elyria, Ohio.—This invention consists in the arrangement of a hollow circular guide and in feeding rollers which are driven by gears and in a cutting knife which may be operated by the foot whereby wire for tinners' use and for other purposes may be formed, measured off, and cut with great celerity.

**CHAIR BOTTOM.**—C. W. Royse, Peterborough, N. H.—This invention relates to an improvement in chair bottoms and consists in securing the overlapping ends of the network to the frame by means of wire staples.

**DEVICE FOR BENDING TIRES.**—Dennis Wetzel, Springfield, Mo.—This invention relates to an improved device for bending tires for wheels. It consists of a double-rimmed wheel to suit tires of different sizes.

**MANUFACTURE OF WHITE LEAD.**—Isaac M. Gattman, New York city.—The nature of this invention consists in manufacturing white lead by a new and improved process whereby the metal is wholly converted without waste, into white lead of great purity of color and perfect opacity in a very short time compared with the ordinary and most approved process by corrosion of the metallic lead known as the Dutch method.

**BULLET MACHINE.**—W. Spillman, Marion Station, Miss.—This invention relates to improved devices for forming bullets or minie balls and consists in revolving disks or rollers having one or more eccentric grooves cut in the face of their peripheries in combination with cams and impinging rollers or stationary dies so constructed and arranged as to compress and shape cylindrical sections of lead fed into the machine as to form spherical or conical balls as described.

**COAL SCREEN.**—Edward W. Weston, Providence, Pa.—This invention relates to an improvement in the construction of screens for separating broken anthracite coal and assorting it in different sizes, and other similar purposes.

**DISTILLING SPIRITS OF TURPENTINE.**—David Cashwell, Fayetteville, N. C.—This invention relates to an improvement in distilling spirits of turpentine and consists in an apparatus for applying steam to extract and expel the spirits of turpentine and rosin from crude turpentine and pine wood.

**HAND LOOM.**—H. M. Cooper, Lindley, Mo.—This invention relates to improvements in the construction of hand looms and consists in an arrangement of mechanism in connection with the lay or batten by the motion of which back and forth all the operations of the loom are performed, the whole structure being simple, easily regulated and kept in order, while the working of the loom is positive and effective in every part for weaving fine or coarse cloth.

**WINDOW FASTENING.**—Benson Mayo, Chatham, Mass.—This invention relates to an improved fastening for window blinds and consists in a device which catches and holds the blinds either open or closed alike.

**DOOR AND GATE SPRING.**—Enos Stimson, Montpelier, Vt.—This invention relates to a door and gate spring for holding a door or gate either open or closed, as desired.

**TOILET TABLE OR STAND.**—F. Kopper, New York city.—The present invention relates to improvements in a toilet table or stand, which consists in so constructing the stand that it can be folded up into a compact shape when not in use, and when to be used brought to the proper form to receive and support a foot bath or a wash bowl, or any other toilet article, or to be used for any of the ordinary purposes of the toilet.

**TRY SQUARE.**—J. E. Cowdery, Wheatland, Iowa.—This invention relates to an improvement in try squares, and consists in a blade held to a cross piece by a pivot and furnished with a finger pointing to a graduated scale.

**IRONING TABLE.**—Albert A. Chittenden, Boston, Mass.—This invention relates to an improved ironing table, and consists of a table or skirt board supported at one end upon a rail secured to the wall and setting under a bracket.

**WOOD TYPE CABINET OR CASE.**—Charles Aldrich, Marshalltown, Iowa.—By the present invention a cabinet or case for wood type is provided, which in its construction is simple, and in its operation convenient and most practicable, and one in which the type can be kept entirely free of dust or dirt.

**TRACE BUCKLE.**—A. E. Bailey and H. Nichols, Middleville, N. Y.—The buckle embraced in the present invention is extremely simple in its construction and arrangement, and in use most efficient and practicable.

**HOOK FOR HOLDBACK STRAPS.**—Wm. A. Bagley, Ansonia, Conn.—The hold-back hook embraced in the present invention is constructed in two parts or sections, one of which is fixed to the shaft and the other arranged to swing therein, so as to open or close the same, it being made with a spring so as to fasten itself to the fixed part when brought over the same.

**SNOW HORSESHOE.**—Ervin Carman, Schoolcraft, Mich.—This invention relates to an improvement in snow horseshoes, and consists of a spring placed beneath the hoof with a rubber between it and the hoof.

**SHOW STAND.**—John G. Oonk, Owensville, Ohio.—The present invention relates to an improved stand for the storing and showing of goods, etc., in stores, which consists in providing the stand or closet with a series of rollers on which the goods are wound and from which they can be unwound for being shown, etc.

**HOSE GUARD.**—David P. Lewis, Huntsville, Ala.—The present invention relates to a guard for the hose of fire engines when laid across a street having railroad tracks, in cases of fires, the object of which is to allow the running of the cars and at the same time afford no obstruction to the free passage of the water through the hose.

**CHIMNEY.**—Jos. F. Stafford, North Granville, N. Y.—The object of this invention is to prevent buildings being set on fire from burning out of the chimney. The invention consists in the employment of a damper located in the chimney near the top, and operated by means of a lever attached thereto, which is readily operated by a mere child.

**STEP LADDER.**—M. E. Abbott, Bethlehem, Pa.—This invention relates to a new and improved method of constructing step ladders, whereby they are rendered adjustable and so formed that the braces may be folded up in a small space.

**BOW INSTRUMENTS.**—George Gemünder, New York city.—This invention relates to a new manner of arranging the sound posts in violins, violincellos, base violins, tenor violins, or other bow instruments, so that a greater equality of sounds may be produced, and so that the tones may be propagated with more clearness, power, and distinctness than they could on instruments in which the ordinary sound posts are used.

**ROTARY SWING.**—J. N. Ferrester, Bridgeport, Conn.—This invention relates to a new rotary swing, which is so arranged that the seats revolve both around a horizontal and a vertical axle; whereby a very agreeable motion is obtained, and whereby all sense of giddiness, generally created by the simple revolution around a horizontal axis is completely overcome or avoided.

**HEAD BLOCK FOR SAW MILLS.**—Charles H. Brookbank, Connersville, Ind.—This invention consists in the construction and arrangement of the parts by which the screw-shafts on which the head blocks slide, are operated, so that they are only revolved in one direction while the log is to be fed, the same being headed by a vertical lever, the lower end of which is pivoted to the carriage while its upper portion is connected with a horizontal sliding bar.

**PUMP FOR COMPRESSING AIR.**—Onofrio Abruzzo, Harlem, N. Y.—This invention relates to a new arrangement for compressing air, in such a manner that the air can be compressed to an indefinite degree by hand or by any small power.

**WASHING MACHINE.**—W. W. Cox, Carbondale, Ill.—This invention consists in the manner of hanging one of the rollers around which the apron passes, said roller being arranged nearly under the corrugated roller, and is hung in dovetail blocks, which slide in corresponding grooves that are provided in the sideboards of the suds box.

**CAR STARTER AND BRAKE.**—John Wiley, 2d, South Reading Mass.—This invention has for its object to improve the construction of the improved car starter and brake patented by the same inventor, March 12, 1867, and numbered 62,911.

**STEAM BRAKE.**—Eugene Bourson, Brussels, Belgium.—This invention relates to a new apparatus for using the steam from the boilers without loss, in order to regulate the motion of the piston, and the speed of trains on deep grades, and to slacken or stop the progress of a train without resorting to the ordinary brakes. The invention consists in conducting steam directly from the boiler to both ends of the cylinders, so as to form a steam cushion on each side of the piston.

**CORSET.**—A. W. Webster, Ansonia, Conn.—The present invention relates more particularly to the clasps for corsets, and it consists in making the hook portion or part of such clasps of wire, bent into the proper shape therefor, whereby rivets are dispensed with, and a stronger and more reliable, as well as cheaper clasp, produced.

**BRANDING IRON.**—Charles Rundquist, Mankato, Minn.—The present invention consists, among other features, in a novel construction of the holder for the types, also in the form of the shanks of the types, and in the means employed for securing them in the holder.

**MEAT SPIT.**—Paul Fisher, Williamsburgh, N. Y.—This invention has for its object to furnish an improved spit so constructed and arranged as to be more convenient and satisfactory in use than when constructed in the ordinary manner.

**CHIMNEY.**—Bennett J. Goodsell, Pent Water, Mich.—This invention has for its object to furnish an improved chimney so constructed and arranged as to ventilate the room or rooms of the house, act as a spark arrester, and at the same time prevent the wind from blowing or driving the smoke down the chimney.

**RUBBER SHOE.**—J. Weidenman, Hartford, Conn.—This invention has for its object to furnish an improved device for attachment to rubber overshoes, to keep them from slipping down upon or working under the heel of the inner shoe.

**FLOW.**—Jonathan R. Davis, McKay, Ohio.—This invention has for its object to furnish an improved plow so constructed and arranged as to adapt itself to uneven ground, and so as to enable it to work close up to the upper row of plants, upon side hills, and which may be readily adjusted for use as a rigid plow or as a single plow.

**MILL GEARING.**—Joshua C. Cunningham, Oglethorpe, Ga.—This invention relates to the combination and arrangement of the stationary base wheel, the gear or pinion wheels, and the arms upon which they revolve, and the crown wheel, with each other, and with the main or driving shaft.

**COTTON AND HAY PRESS.**—Barnabas B. Alfred, La Grange, Ga.—In this invention a double acting screw operates in combination with two slotted levers, working the follow-block with great power and velocity.

**CONSTRUCTION OF STOVES OR OTHER HEATING APPARATUS FOR WARMING AND VENTILATING BUILDINGS.**—Thomas Whitaker, and Joseph Constantine, Manchester, England.—The object of this invention is to obtain an heating apparatus for air or liquids, which, though comparatively occupying but a small space, presents not only a very large surface to the medium which is to be heated, but exposes also a large surface to the fire and the hot gases, which are compelled to come into contact with all the available heating surface in such a manner that nearly all the heat obtained from the combustion of the fuel is given off to the apparatus, and produces useful effect, instead of escaping for the most part through the chimney, as is usually the case.

**MANUFACTURE OF TRUNKS, VALISES, ETC.**—Samuel S. Ritter, Philadelphia, Pa.—The object of this invention is to manufacture a substantial leather trunk, which shall have no seams at the edges, and which may be made entirely without stitching, for the purpose of economy, strength, and durability.

**SEWING MACHINE.**—Caleb Cadwell, Waukegan, Ill.—This invention is designed to effect improvements in the mechanism for threading and guiding the cloth, regulating the tension, taking up the slack thread, and winding the thread upon the spools; and in the method of retaining the spools upon their axes, and operating the shuttle.

**COOLING GLASS MOLDS.**—J. H. Reighard, Wheeling, West Va.—In this invention the plunger is made hollow, and connected with a hollow piston rod, and is cooled by water injected through the piston rod. The mold is formed of two parts, between which is a narrow space. Into this space water is injected from a reservoir, when the instrument is in use, for the purpose of cooling it.

Answers to Correspondents.

**CORRESPONDENTS** who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address the correspondent by mail.

**SPECIAL NOTE.**—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 50 cents a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

**G. H. S., of Mich.**—A good way to learn to draw sketches of machinery is to copy the engravings published in the *SCIENTIFIC AMERICAN*. Begin with the simplest ones.

**S. W. P., asks,** "Can you supply me with a recipe for making a paste that will be water-proof?" No, We wish we could. Here is a chance for inventors.

**E. H., of Ohio,** asks if it is necessary to extend his exhaust pipe far up the smoke stack to aid his draft. We think it only necessary to introduce the exhaust pipe into the up-take and turn the end upward to produce the desired result.

**J. H. G., of Ky.,** inquires as to the proportions of sand and hydraulic lime to make a cement to harden under water for a foundation on gravel. We can only refer him to Gillmore's "Treatise on Hydraulic Cements" published by D. Van Nostrand, 192 Broadway, New York city, as the qualities of the cements sold in the market, and the sands found in different localities vary greatly.

**J. B. P., of Vt.,** says he has used one of "Douglas' pitcher" spout pumps No. 1, the barrel being two-and-a-half inches and length of stroke four-and-a-half inches. The leading pipe is fifty-six feet in length, the height of the pump from the water in the well twenty-five feet perpendicular. It will not work; neither will a larger size, which I tried. What is the difficulty. Will a smaller pump or larger pipe do the business? Knowing that the Douglas pump is a good one, we can only surmise that there must have been some trouble in the connections, or that the pump, itself, needed some doctoring. Certainly any properly constructed pump the connections of which are perfect ought to lift water twenty-five feet.

**B. G. K., of Md.,** asks for the components of the well-known Babbitt metal. Although there are superior compositions in the market, yet many of our readers may desire information on this subject. To four pounds of pure copper melted, twelve pounds of best tin (Banca is considered as pure as any) are gradually added; then eight pounds of antimony (regulus). After melting, twelve pounds more of tin are added. Powdered charcoal sprinkled over the surface of the metal in the crucible will prevent oxidation. When to be used for lining boxes one pound is sometimes melted with two pounds of tin.

**A. A. W., of N. Y.**—"Which is the strongest, a solid cast-iron shaft, or one with a small hole or of a larger size through the center from end to end, and would the same answer to this question be applicable to a shaft of wrought iron or steel?" In casting iron, or even steel, the outside cools and contracts more rapidly than the interior; consequently a hollow shaft of equal or the same weight is stronger than a solid shaft. Forged shafts of wrought iron and steel are not subject to the same law in the same degree.

Business and Personal.

The charge for insertion under this head is 50 cents a line.

Pattern Letters and Figures for inventors, etc., to put on patterns for castings, are made by Knight Brothers, Seneca Falls, N. Y.

**Wanted**—A second-hand low-pressure engine of about sixty horse-power. Address A. Catchpole, Geneva, N. Y.

The attention of those engaged in the manufacture of Burglar-Proof Safe Locks is called to an advertisement on our last page.

**A Great Bargain.**—The Patent Right of Forman's Combined Steam Baker and Reflecting Roaster, illustrated on page 312, present volume *Scientific American*, will be sold low, either entire or by States and Counties. Address Israel Forman, Fairmont, West Va.

Parties wishing to purchase good second-hand Portable and Stationary Engines, from four to fifteen horse-power, apply to Abram Logan, Tideout, Pa.

**Patent Office Reports.**—Persons desiring Patent Office Reports can be supplied at low prices. Address Samuel C. Jones, Box 773, New York Postoffice.

**Hand Machines or Planes for cutting out Match Splints,** wanted. Send cuts and prices to Packard's Machinery Agency, Milwaukee, Wis.

**S. G. Tufts, Maineville, Ohio,** wishes the address of all parties engaged in making Hames and Plowhandles.

**M. Nial, Troy, N. Y.,** wants address of Toy makers.

**Manufacturers of improved machinery for manufacture of Cotton Batting,** address; with description, T. L. Kinsey, Savannah, Ga.

**Wanted**—a second hand set of Tinners' tools. Address, with full description and price list, H. D. Heath, Candor, Tioga county, N. Y.

**I wish to know where I can obtain Peat put up for shipment.** Peat charcoal would suit me better. C. Browning, Rush Run, Jefferson county, Ohio.

**E. Ware, Bayonne, N. J.,** wishes the address of Threshing Machine Manufacturers, especially at the West.

**Fish Nets.**—Manufacturers of machinery for making these articles will please address J. F. Brown, Lock Box 20, Binghamton, N. Y.

**Parties desiring any kind of new apparatus invented, or drawings, etc.,** made, address with confidence, A. E. W., Inventor and Draughtsman, 114 Fulton st., New York.

**Geo. S. Hurford & Co., Canton, Ohio,** wish to obtain a machine that will make small bolts with a head on both ends, in size from 1 inch long by 3-16 inch thick, up to 8 inches long by 1/2 inch thick.