Science Familiarly Illustrated.

Apprentice's Work.

One of our correspondents desires us to speak in this department of the manner in which mechanics apprentices should employ their time in order to derive the greatest amount of benefit from the term of their novitiate. We do not like to be harping upon facts known to all, nor to re-state old truisms which have been iterated and reiterated over and over, but we cannot refrain from drawing somewhat from experience as well as observation and endeavoring to incite a proper degree of ambition, in apprentices and young men.

The apprentice should determine on becoming a first-class workman. There can be no insurmountable difficulty in the way of this. He has only to apply himself to perfect himself by practice in what he has learned by precept. If an apprentice desires to attain a proper and honorable position in his chosen vocation he should endeavor to employ his leisure time in studies or practice, which will advance him, or tend to advance him to the point he desires to reach. If he is contented with getting through his day's work with the approbation of his employer, and looks for no other commendation, he will generally find himself at the close of his apprenticeship merely an ordinary workman and nothing more.

There are books to be read, treatises to be studied, problems to be solved which may occupy his evenings, giving him at the same time practical and theoretical information invaluable in his after career. But without trenching on this proper department of his education there are many processes and manipulations used in the shop, which can be successfully reached and acquired only by persistent practice. In the machinist's business, for instance, it requires a long practice to draw a file straight. In spite of his own judgment and in contradiction to the testimony of the straight edge, the apprentice will swing instead of drawing his file, producing a convex instead of a level surface. Only practice can overcome the combination of habit and want of judgment in such a case. We know an apprentice who employed his leisure noonings and before working hours in the morning in practicing with the file. The result was that he became a first class filer. We saw, the other day, a shoe knife as it came from the anvil. It was one taken at random from a day's work of over one hundred, forged from the bar by a smith. Examined under the microscope not a mark could be seen on its planished surface to denote that only the ordinary hammer and anvil were employed in its production. Its surface was almost like that of finished gun work after being blued. This workman, for his superior skill, obtains twice as much for his work as ordinary workmen. To be sure, he has attained his present perfection by long practice, but close attention and the exercise of good judgment were also necessary

The joiner's apprentice should never be satisfied until he can grind and set a plane iron so it will cut clean, and not scrape; until he can drive a finishing nail home and not leave the mark of the hammer. The machinist's apprentice should be determined to be able to grind and set a tool properly in the lathe or planer to do good work, to draw a file straight and keep it from scratching. So we might mention plenty of instances, but our only object is to show the necessity of the-old-time axiom: Whatever is worth doing at all is worth doing well.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Warming and Ventilating Farm Houses.

MESSRS. EDITORS:—As your journal claims to aid the farmer as well as the mechanic, I venture to suggest the above subject to your attention, hoping that you or some of your correspondents can throw some light upon the subject.

Fuel is getting scarce and high, coal is taking the place of wood, and air-tight stoves are now all the vogue, especially with us farmers of moderate circumstances, who cannot afford the kitchen range, together with the furnace in the cellar, and other expensive arrangements for the first-class houses of the merchant, manufacturer, etc.

We want some arrangement whereby we can warm economically and healthfully one or two rooms in addition to our kitchen; a sitting room, library or family room. As the parlor is but occasionally used, it is not of so much account. As before intimated, the coal or wood air-tight stove is now used for this purpose, with scarcely any provision for ventilation. The supply of oxygen to support the combustion in these stoves, is obtained entirely from the room, and what remains is breathed over and over again, much rarified by the heat of the stove, and sometimes filled with gases from it. The only fresh supply must gain access through the crevices of the doors and windows without any warming and in just the condition to give colds to the inhabitants of such an atmosphere if they chance to be exposed directly to one of these currents.

When the open fireplace was used, there was an ample escape of the foul gases through the open flue caused by the current produced by the fire, but this carried off much the larger part of the heat also and is too expensive.

It appears to me that the method of passing a current of fresh air which has been previously heated through the room is the most perfect and is the best, provided it can be done economically.

We of course expect to keep a fire in our cooking stove or range in our kitchen, and if this stove or range could be also made to serve the purpose of a furnace as above alluded to, and a current of warm air could be carried from it to an adjacent room on the same floor (farmers' kitchens are not down stairs) it would be what is wanted. Then the escape of foul air from the room in question could be easily provided for either through an open fireplace or an opening in the chimney near the top of the room or even through the same crevices around the doors and windows which before let the cold air in.

But the question now arises, and it is the one on which I wish most to obtain light, how can this current of a sufficient quantity of warm air be carried from the source of heat in the kitchen to the family room on the same floor. I can suggest no mode in my own mind except to take a pipe from it through which steam or hot water can be carried down into the cellar beneath, protected by inclosing it in a box tube filled with ashes or other poor conductor, to an inclined air passage taking fresh air from the outside of the building, and descend, ing to near the bottom of the cellar, and then again ascending gradually to a register in the family room. The steam or hot water pipe is to enter a little above the lowest point in this passage, and ascend within it to near the register, again descend, and, if desirable, run up and down until the whole amount of heat has passed from it to the air in the passage, which by being heated will rise into the room above. One or more jets of steam or hot water could be emitted from this pipe to give the air a proper amount of moisture.

Whether the above plan can be adopted economically where a supply of water is at hand or whether any other can be suggested I leave with you to decide. S. N. BEERS.

Sandy Hook, Conn., Jan, 28, 1867.

[Wherever there are rooms warmed above the kitchen the pipe should pass through them and be enlarged into a dummy. The air of the kitchen is not materially vitiated by the breathing, but is made offensive by the fumes of cookery and washing. Whenever the cooking and washing is not going on it is reasonable economy to pass the excess of heated air to other apartments. Mr. Beers shows himself to have ingenuity enough to carry out practically his very good theory.—EDS.

The Mint Corrected.

MESSRS. EDITORS:—On page 71 of your journal, current volume, I observe a notice of the new five-cent coin. I had noticed the statement in the "dailies" that the coin was to be 20 millimeters in diameter, and was sorely disappointed on measuring the first one that appeared to find it 20·5 m. in diameter, or 0·8075 inches diameter U. S. standard. This would make the decimeter 4·035 inches. According to Webster it is 3·9368 inches; it also accords very nearly, with two scales in my possession, and by different makers, one of which is no doubt of French origin. The weight I have no means of testing, but hope it is much nearer the truth. The three-cent coin is, by the same scales, 17·8 m., equal to 0·715 inches diameter. Men are rare that will work nearer than the five-cent coin. It surely ought not to be so, especially on coins designed as standards measure, either length or weight.

PROGRESS.

Casting in Green and Dry Sand.

MESSRS. EDITORS:—I saw in one of your back numbers, a statement, made, I think, by an engineer, relative to the oil becoming gummy in steam cylinders. Thus: of a pair of locomotive cylinders that had been treated exactly alike and with the same kind of oil, one worked clean and bright, while its mate became foul, the oil becoming thick and gummy, and caused much trouble.

There are two methods of molding steam cylinders: one is what is known as green-sand molding, and the other method is what is called dry molding. By the first method it is the next thing to impossibility to make a solid casting: the iron when cold is coarse in the order of its crystallization, porous, and generally full of what are called blow-holes, and when heated the oil enters the pores, and the piston in passing to and fro assimilates with the oil in the pores, and soon creates a dirty mess. In a cylinder cast in a dry mold the iron is close in the grain, approaching the nature of steel, wears bright with a polished surface, and the same weight of dry-molded iron is fully one-fourth stronger than the first named. I think one of the cylinders above referred to was cast in a dry mold. F. S.

Expansion of Steam.

MESSRS. EDITORS:—As there seem to be various opinions about expansion please allow me to propose mine as follows: I remember that in answer to a query of one of your correspondents, you demonstrated quite to my satisfaction that there is no loss of power in the steam engine, by the use of the crank. From this it seems necessarily to follow, that a given length of movement gives an equal proportional result at any part of the stroke.

During the discussion of the *Winooski and Algonquin* trial, there was a remark in one of your editorials from which I inferred, that so far as either possesses any advantage above the other, the advantage is in favor of using steam at a high pressure. I also get the impression from the pressure used in that trial by a very high authority among those who have no faith in cut-offs, that 20 lbs. is not too low for fair results.

Now assuming the truth of these propositions if we take an engine of any given size, running with steam at 20 lbs. the work performed, will be the contents of the cylinder in inches, multiplied by the revolutions and rate of pressure, and divided by the unit of power. But according to Bourne, the sum of latent and sensible heat, is the same at all pressures, and proposition No. 2 assumes that 60 lbs. is a more economical pressure than 20 lbs. Let us then raise our pressure to 60 lbs. we shall according to proposition No. 1 have accomplished as much work at one third stroke, as in the former case at full stroke.

If then we exhaust at this point, we have lost nothing, as compared with the other case, and the query arises do those who question the utility of expansion, believe that it would be good economy to exhaust at the point of cutting off, rather than to use the expansive force for the remaining two-thirds of the stroke.

Let them show this, and they have the case, but if they fail they are reduced to the alternative of showing that whatever advantage arises from the expansion of steam from one volume to three is overbalanced by some disadvantages arising from the use of a pressure of 60 lbs. during the first part of the stroke.

If some of your scientific readers will oblige me with a carefully considered answer, he will contribute to the solution of an important question, and will confer a favor upon many beside myself. S. H. W.

Central City, Col.

Scalding Hogs—How Should the Water Be?

Messrs. Editors:—Some two or three months ago I read in the "SCIENTIFIC" an account of the improved slaughter house for supplying the New York market. You say that hogs after being killed are plunged into a vat of boiling water. Is it really so? Are the proprietors or operators at that institution uninformed as to the proper temperature of water for scalding hogs? It had been long thought by me that the proper degree of heat was 160° Fah. and I should have immediately written you on the subject had I not learned from your valuable advice and general writings that careful experiment is the only true means of arriving at a result accurately. When "hog killing" came I tried the experiment on seven hogs using a Wilders Thermometer. The result was that a temperature of from 160° to 170° was found best. Many of your subscribers although mechanics have at least a pig to kill and may be benefitted by knowing how hot to heat the water and thereby be able to do a "good job" at butchering as well as in the shop. M. L. BAXTER.

Batavia, Ill., Jan. 20the, 1867.

Compasses in Iron Ships.

MESSRS. EDITORS:—The error of compasses in iron ships has led to many disasters and caused the destruction of immense amounts of property and the loss of many valuable lives. It seems to me that by very simple means such errors might in most cases be avoided. For this purpose I would suggest that all iron ships be furnished with a permanent magnet of sufficient power and a number of compass cards with unmagnetized needles. A few simple instructions, and easily understood, would teach any one how to charge the needles. In order to correct the ship's compasses, let one of these cards be magnetized aloft and as far from the local attraction of the ship as may be convenient from time to time. The fresh needle would always indicate the magnetic meridien. The expense of the magnet and cards would be comparatively trifling. H.

INTERESTING PATENT OFFICE DECISION—IMPROVEMENTS IN MODE OF SINKING WELLS.

This was an interference declared between the application for a reissue of the patent granted to Byron Mudge in October, 1865, the application of N. W Green for a patent and the patent granted to James Suggett in March, 1864, and, on appeal to the Board of Examiners-in-Chief the decision of the Examiner awarding priority of invention to Suggett and denying Mudge's application for a reissue was overruled and said Mudge allowed his reissue.

Several important questions have arisen in the case. The following abstract from the written opinion of the Examiners-in-Chief will give a very clear idea of the controversey respecting this valuable and interesting discovery.

DESCRIPTION OF THE INVENTION.

Instead of digging and walling up a well in the manner hererofore practiced, a piece of gas pipe, shod with an iron point and pierced with holes near the bottom to admit water, is driven down into the earth, and a pump attached to the top, completes the well. In hard ground, an iron bar is first driven into the ground and withdrawn before the tube is inserted.

By these means there is accomplished in a few hours, perhaps in half an hour, what before was the work of weeks or months, and the very extensive use of which it is susceptible, renders it one of the important improvements of the day.

WHAT GREEN DID—GENERAL SUGGESTIONS DO NOT INVALIDATE A PATENT.

1st. It is said that Green instead of Mudge was the inventor, and that consequently the latter is not entitled to a patent. The testimony on this point is somewhat contradictory, but we think the weight of it sufficiently establishes that the conceptions of Col. Green were quite immature and imperfect, and that he relied upon others to give them a practical form, rather than supposed that he himself had perfected an invention. His idea seems to have been that a hole could be made in the earth by driving an iron bar; that the water would rise in it as in a common well, and could be pumped out by a pump with pipe attached in the ordinary manner, and in this way all the first experiments were made but with temporary and indifferent success.

General suggestions, whether oral or in books, do not invalidate a patent to one who has carried them into practical effect. The Marquis of Worcester's Century of Inventions affords several examples of the application of this principle. The rule as stated in Alden *vs.* Dewey, 1 Storey, 338, and Pitts *vs.* Hale, 2 Blatch, 234, is that the suggestions to invalidate a patent must be so full and complete as to have enabled the patentee to construct the device without further invention. Tested by this rule, we do not think that the suggestions to Mudge should deprive him of a patent. Green is entitled to the merit of the first conception but he had not perfected a practical mode of carrying it into effect, and it probably would have died with him without benefit or advantage to the public, but for the subsequent experiments and inventions of Mudge. A very different question would have been presented had Green himself been engaged in experimenting upon and maturing his conception, and others had appropriated his ideas without his consent.

MUDGE NOT ANTICIPATED BY A PRIOR USE—"LOST ARTS" ARGUMENTS ADVANCED.

2d. It is also objected that Mudge was anticipated in his invention by Stephen A. Hunter. It appears that the latter, in the summer of 1851, inserted a copper pipe into the ground about 10 feet, and drew water from it to supply a steam boiler by a pump attached to the top. It was worked down into the ground by means of a pointed iron rod inserted within it. It operated successfully until the following spring, when the pump and pipe were removed to make room for another building that was erected on the same spot. Nothing more was done by Hunter in relation to the matter until he made application for a patent in 1865. His success does not appear to have been such as to induce him to follow up his first trial with any further experiments, or to make any attempt to mature his invention. It was abandoned and apparently forgotten for more than ten years before Mudge commenced his experiments, and would probably have never been brought to light again but for the labor and success of others. If it is not to be regarded as an abandoned experiment, we think that it will at least come within the case of Gaylor *vs*, Wilder, 10 Howe, 596, where such a prior use was held not to invalidate a patent.

WHAT SUGGETT DID—RIGHTS OF ONE WHO CARRIES OUT MERE CONCEPTIONS

3d. In October, 1861, Suggett was employed by Mudge to assist him in making two wells with the double tubes. In the following year he (Suggett) made some wells in the same way, and in September he made a successful well with a single tube of gas pipe, with shoe, holes and pump, as described in his patent. And it appears that he had some time previously reflected upon the subject of dispensing with the digging of wells and obtaining water by pipes. In the following month, October, Mudge, having returned from the army, made a successful well by using the same pipe and fixtures that he had prepared the fall before for the use of the regiment. It thus appears that Mudge was the first to construct, if not to use, the apparatus in question.

An application for a patent by one who has been employed to assist another in experimenting upon and perfecting his invention, is always regarded with much suspicion and disfavor.

The conceptions of the inventor usually receive much modification and and change of form, as experiment and reflection disclose the necessity of it.

He is authorized to employ the skill and experience of others to aid him. They necessarily become possessed of his views and plans, and to allow them to become the patentees of essential features of the invention would render their employment dangerous and retard the progress of improvements.

Under all the circumstances we think that as between the two, the priority of invention must be accorded to Mudge.

SERIOUS OBJECTION TO MUDGE CASE—MORE THAN TWO YEARS DELAY—QUESTION FOR A JURY.

4th. The most serious objection to the reissue is that Mudge has abandoned his right to a patent by a delay of more than two years to make his application for it after the invention has been introduced into public use. In the fall of 1862, and in the spring and summer of 1863, both Mudge and Suggett made several wells in the way specified in the application, and they have been in successful an public use up to the present time, and Mudge delayed to make his application until August, 1865. This, as a general rule, would be conclusive against him. But he alleges in answer that, although his devices were effectual in the gravelly soil of Cortland village, he could not thence infer that their operations would be in other soils and under different circumstances. That it also required time to test the durability and permanent success of his method. That in many cases he had failed, and in quick sand and clayey soils, other modifications are required which have not yet been fully matured; and that the uses of his device previous to his application were necessary experiments to perfect the invention and make it generally useful.

The question thus presented can be much more properly investigated and determined by a court of law than by us, and the only way in which it can be presented to such court is by the allowance of the applicant's claim. The unusual difficulties and complication of the case, and the great merit of the applicant, to whom the public are much indebted for a valuable improvement, have induced us to give this direction to the case.

Recent American and Foreign Patents.

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

THE SHAW AND JUSTICE HAMMER.—We have published illustrations with descriptions of this hammer and the advertisement of the manufacturers is to be found on another page. A few days ago we had an opportunity to witness its operation. It was a 100-pound hammer set up at the Morgan Iron Works, this city. In three minutes an ingot of six inch square wrought iron was drawn down to two inches, although the heat was not a perfect one. The experiment was witnessed by a number of practical men, who expressed themselves well satisfied with the operation of the hammer. It appears to be an excellent auxiliary to the work of the forger and is rapidly coming into favor.

DEVICE FOR ROASTING CORN AND OTHER SUBSTANCES.—N. L. Whitney Effingham, Ill.—This invention has for its object to furnish an improved apparatus for roasting coffee, and similar uses, which shall brown the article roasted evenly and thoroughly, and shall at the same time prevent the aromatic flavor of the coffee from being dissipated by the heat.

VALVE COCK.—Thomas Barber and John Barber, Brooklyn, N. Y.—This invention consists in so constructing and arranging the parts of a valve to be used for steam water or gas, that no packing shall be required to keep it tight when it is in use.

NECK YOKE TRUNDLE.—A. H. Cole, Sylvania, Ohio.—This invention has for its object to furnish an apparatus by means of which the breast strap of harness may be preserved from being so quickly worn out by the friction of the neck yoke rings.

AERIAL RAILROAD.—J. A. A. Fontaine, New York City.—This invention relates to a novel application of steam power to a railroad car which is propelled on an elevated track, the weight being diminished or rendered negative by the attachment of a balloon to the said steam car.

WATER WHEEL.—Geo. Arrison, Trenton, N. J.—This invention consists in the arrangement of additional buckets between the ordinary buckets of water wheels, said additional buckets being adjustable by means of set screws in such a manner that by raising or lowering said adjustable buckets or gates, the water spaces of the wheel can be regulated according to the aggregate amount of water passing through the wheel and said water can be used to the best advantage.

CULTIVATOR.—W. F. Clark, Hagamans Mills, N. Y.—This invention consists in a novel and improved construction of the cultivator, whereby the ground will be acted upon in the most efficient manner and the device be under the complete control of the driver.

SOAP.—Justin Ryan, Waukegan, Ill.—This invention relates to a soap compound which is cheap and has superior detergent qualities and which is of such a nature that it hardens in very short time and is fit for use a few hours after it has set.

SAW MILL.—Wm. Yaman, Connersville, Ind.—The nature of this invention consists in constructing a saw mill in such a manner that flat or square pieces may be sawed from the log one at a time until the whole log is worked up.

PLOW ATTACHMENT.—H. B. Smith, Eureka, Ill.—This invention relates to a sulky attachment for plows, and it consists in a novel construction and arrangement of parts, whereby any ordinary plow may, with a very moderate expense, be converted into a sulky plow or have a sulky attachment applied to it and one which will admit of the driver having complete control over the plow.

PADDLE PROPELLER.—Jordan H. Phillips, St. Louis, Mo.—This invention has for its object to furnish an improved apparatus for propelling vessels so constructed and arranged that the paddles shall enter the water without any jar and leave it without lifting any water, the whole power being expended in propelling the vessel.

WINDOW-SASH SUPPORTER.—Benjamin Britten, Galena, Ill.—This invention relates to an improved device for supporting window sashes in the frame and consists in a combination of two levers with a spring attached to a metal case which is let into the window frame horizontally, one supporter for each sash. The supporter for the upper sash has its thumb piece for depressing the catch within the seat of the lower sash, lying flat and flush with the frame so that it presents no obstacle to the movement of the sash up and down.

TEAKETTLE, ETC.—William A. Munn, Milwaukee, Wis.—This invention consists in attaching the spout to the side of the vessel with a double seam.

COMBINED GRAIN SEPARATOR AND STRAW CARRIER.—Alvin T, Dunbar and Archibald McNaught, Alba, Pa.—This invention has for its object to furnish an improved apparatus, durable and simple in construction, for separating the grain from the straw as they come from the threshing machine.

HORSE HAY RAKE.—Orris Pier, Winhall, Vt.—This invention has for its object to improve the construction of Pier's horse hay rake patented September 13, 1859, so that it may better adjust itself to the roughness and inequalities of the ground,

CAST-IRON FENCE POSTS.—Richard Ketcham, South Dansville, N. Y.—This invention has for its object to furnish an improved cast-iron fence post so constructed as to hold the boards or rails of the fence securely without the use of nails.

GATE.—Jerome Hibbard, Prospect Lake, Mich.—This invention has for its object to furnish an improved gate, simple in construction and convenient in operation.

JOINER'S GAGE. George T. Lape, New York City.—This invention relates to joiner's gages for the purpose of rendering them more useful and convenient, and consists in combining two rectangular bars which are tongued and grooved and form a square gage bar on which a head block moves by rack and pinion in such manner as to admit of the nicest measurements on a graduated scale between the head block and the marking point. The double gage bars are also made to slide upon each other so as to separate two marking points to any required distance for gageing a mortise or any similar work with two parallel lines.

STEAM BOILERS.—J. Wyatt Ried, New York City.—This invention consists in constructing a steam boiler in such a manner that a greatly increased steam generating surface shall be obtained without materially increasing the size or interfering with the most compact form of boiler,

PNEUMATIC SEWERAGE.—Charles T, Lierneer, Frankfort on-the-Main.—The object of this invention is to empty privies and their pipes at any moment by connecting them with an air-tight reservoir sunk in the street by means of pipes which are provided with stop cock in such a manner that when all the stop cocks are closed the air can be exhausted from said reservoir and by opening one of the stop cocks after the other, the contents of the several privies are sucked into said reservoir without the least inconvenience from the emission of a bad odor.

CALIPERS AND DIVIDERS.—Andrew V. D. Westervelt, New Brunswick, N. J.—This invention consists in attaching a worm and worm wheel to a pair of calipers, dividers or compasses, for the purpose of opening and closing the legs and graduating them exactly in making measurements of either internal or external work.

CLOTHES LINE AND FASTENER.—Albert D. Rust, Vernon, Mich.—This invention consists in forming the line of wire in a series of links which allow it to be folded up in small compass for packing away and transporting, and in connection therewith a wire fastener or holder so constructed that any number required may be hung on the wire line and all remain suspended permanently in a yard unaffected by the weather.

SELF-ADJUSTING SCRAPER.—Ira Munson, Wayne, Mich.—This invention has for its object to furnish a self-adjusting scraper so constructed that the team can be driven and the scraper operated by one man, thus dispensing with the services of the one or two additional men required when an ordinary scraper is used.

DEVICE FOR STIRRING, HEATING AND COOLING LARD, ETC.—Giles B. Williams, New York City.—This invention relates to a device for stirring lard, during the process of heating and cooling and also for stirring and agitating various liquids and it consists in the employment of a horizontal screw placed in the lard receptacle and arranged in such a manner as to keep the lard in constant motion. The invention also consists in using in connection with the screw a double-walled lard receptacle through which hot or cold water or steam may be passed for the purpose of heating and cooling the lard.

WASHING MACHINE.—Milo J. Parsons, Hillsdale, Mich.—This invention consists in the combination and arrangement of the crowned springs, flat springs or bars and standards, by means of which the rollers are suspended and held up against the stationary revolving cylinder in such a way that they can adjust themselves to the varying thickness of the clothes passing between them and the said cylinder.

CORN HARVESTER.—August Moravek, Rosnyo, Hungary.—This invention relates to a machine for harvesting maize or Indian corn, and it consists in a cutting device, endless elevating apron, and a discharging platform, all arranged and applied to a wagon, so as to operate in a perfect manner.

FOOT REST FOR HORSES.—John E. Tucker, Montfort, Wis.—This invention is designed for a rest or block, on which to place a horse's foot whilst dressing the hoof, clenching the nails, etc., in horse shoeing.

FASTENER.—P. Rosenblatt, Greenville, Tenn.—This invention relates to a fastener for doors and windows which is exceedingly cheap to manufacture, simple in construction, and very efficient and reliable in operation.

GATE FASTENING.—James D. Bourne, Dewitt, Iowa.—The object of this invention is to provide a fastening for a gate, which can be readily operated, so as to free the gate by a person either walking or riding on horseback, and which, when performing its function as a fastener, will hold the gate secure against its being opened by any kind of cattle or stock, or by the action of the wind.

CULTIVATOR PLOW.—G. W. Hatfield, Holton, Ind.—This invention relates to the construction of a cultivator plow, whereby the implement is rendered capable of being adapted to various kinds of work, and by a very simple adjustment of parts.

ATTACHING THILLS AND DRAFT POLES TO AXLES.—David Dalzell, South Egremont, Mass.—This invention relates to a thill and pole coupling of that class in which the connection is made directly to the iron axle, and not to the wooden bed thereof. The invention has for its object the avoidance of wear and tear, and the consequent rattling of the parts composing the coupling, the exclusion of dust from the internal parts, the impossibility of a casual disconnection, and a perfect lubricating of the same at all times.

PNEUMATIC BRAKE FOR RAILROAD CARS.—Charles R. Peddle, Terre Haute, Ind.—This invention relates to a means for operating the brakes of railroad cars by compressed air forced into the air cylinders underneath the cars by the locomotive, without any essential modification of the working parts of the latter, a valve and air pipe being simply connected to the steam chest of the steam cylinder. The object of the invention is to obtain a simple and economical means for operating instantaneously the brakes of all the cars of a train, and placing the brakes under the complete control of the engineer.

HANDLE ATTACHMENT FOR SHOVELS, ETC.—James N. Pease, Panama, N. Y.—This invention consists of a handle constructed and arranged in such a manner that it may be applied to the handle or stale of a shovel, manure fork, hay fork, or other similar implement, and greatly facilitates the manipulation thereof.

SECURING BOXES IN METALLIC HUBS FOR WHEELS.—James B. Stuart, Bunker Hill, Ill.—This invention relates to a mode of securing boxes in metallic hubs for the wheels of carriages and other vehicles, and has for its object the securing of the box in the hub, in such a manner that they may be adjusted concentric with each other, and without any possibility of the box slipping within the hub, and the former rendered capable, if worn by use, of being readily removed from the latter and a new one inserted in its place.

CULTIVATOR AND SEED SOWER.—Thomas L. Whitbeck, Kenosha, Wis.—This invention consists in so combining a seed sower and cultivator, that each may be used separately or both at the same time, as the nature of the work to be done may require. It more particularly consists in the simple, cheap, and novel manner by which the slide in the bottom of the seed box is operated for agitating and regulating the flow of seed to the openings of the discharge cylinder, by the vibration of the tongue or pole by which the machine is drawn.

GAS APPARATUS.—James F. Spence, Williamsburg, N. Y.—This invention consists in the arrangement of a series of S-shaped pipes in the interior of a hollow drum which revolves in the interior of a vessel partially filled with oil, in combination with a suitable oil supply pipe and with a steam pipe, in such a manner that by the action of the steam the oil or volatile hydrocarbon liquid in the vessel is vaporized, and as the drum revolves a mixture of steam and hydrocarbon vapors is blown out through the S-shaped pipes in the upper space of the outer vessel, whence it is conducted through a suitable pipe to the burners.

BURGLAR PROOF LOCK.—Joseph Corbett, Utah Territory.—This invention relates to a burglar proof lock of that class which are provided with annular rotating tumblers combined and arranged in such a manner as to be capable of being adjusted to effect a great number of changes, that is, different manipulations of the knob in order to unlock the lock.

CULTIVATOR.—Thomas Jobe, Clarksville, Ohio.—This invention relates to a cultivator for general purposes, which may be used for plants grown in hills or drills, or used for eradicating weeds and rendering the earth light and pliable preparatory to the sowing of grain.

CLOTHES LINE STAND.—J. E. Elliott, Grand Rapids, Mich.—This invention consists in a novel construction and arrangement of the clothes line stand, whereby when so desired, the said arms can be tilted, for the better and more convenient passing of the line around it, and the hanging of the clothes upon such line.

SAW TEETH.—James E. Emerson, Trenton, N. J.—This invention relates to an improvement on a swage, and consists in a modification of the swage, whereby the implement is adapted for forming and sharpening a tooth, having a cutting edge of peculiar and improved form.

GRAIN DRILL.—Peter Schmitt and Peter Jacob Schmitt, Waterloo, Ill.—This invention relates to the construction and arrangement of the longitudinal shaft, which is placed with the seed box, said shaft being provided with blocks by which the holes in the bottom of the seed box are alternately closed and opened, whereby the feed is made regular and equal, and is not affected by the jars and jolts of the machine. To each of these blocks is secured one or more metal pins, whereby the grain is well stirred and fed to the seed holes, and whereby the latter are also kept clear from obstructions.

PLOW.—William Cooley, Bunker Hill, Wis.—This invention relates to a plow of that class designed for plowing stock ground, and commonly termed "stubble plows." The invention consists in constructing the plow in such a manner that the line of draft will be central and direct, nearly parallel with the land side, so as to insure an easy draft, uniformity in the width of bur row, a complete turning under of stubble, straw, stalks, etc., and the avoidance of the clogging or choking up of the plow.

NURSE STOVE.—L. A. Plumb, Biddeford, Maine.—This invention relates to a portable lamp stove designed more especially for the nursery and for heating substances in a small way. The object of the invention is to obtain a device for the purpose specified by which the benefit of both the light and heat radiated from the lamp may be obtained, and have a more simple, convenient and desirable article for the nursery than those hitherto devised.

SOWING MACHINE.—James G. McGrew, Caledonia, Tenn.—The object of this invention is to construct a machine by which seeds particularly weak may be sown in drills among standing corn so that the corn may be left standing until the spring frosts are over, thereby protecting the young wheat plant from being injured by the winter and spring frosts.

MACHINE FOR THINNING COTTON PLANTS.—Charles A. McCaughan, Mos cow, Tenn.—The object of this invention is to save hand labor, and expedite the work of thinning cotton plants growing in rows to the proper distances apart for hills, as usually cultivated on the plantations in the Southern States.

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."

J. K., of Ill.—Burgh gives as a rule seventeen and a half square inches per horse-power on the piston, and one square inch per horse power area of port. Eight inches area is therefore too small to work sixty nominal horse-power in a cylinder of only fifteen and a half inches. In fact we do not know how that amount of power can be got from such a cylinder. Bourne says the same thing in general terms and gives the following rule to find the area of steam (inlet), or eduction (outlet) ports: Multiply the square of the diameter of the cylinder in inches by the speed of the piston in feet per minute and by the decimal ·032 and divide the product by 140 The quotient is the proper area of the port in square inches. The fact is that engineers err too often on the side of contracting the area of ports. With a proper consideration of the friction of the common slide valve, the more generous the area of ports the easier the engine works. There should be no cramping of the steam either on its inlet or outlet.

Sundry Answers:—W. R.—The English law does not require the working of the patent within any specified period—A. B.—The electric light has been illustrated in back numbers of the SCIENTIFIC AMERICAN.—G. W. L. Grand Rapid Mich, without knowing the position of your piston with reference to your diagram, it is difficult to answer your question definitely. We think however that your trouble is in the position of your eccentric, in other words the setting of your valve.—S. D. P.—If you increase the steam pressure the quantity of steam being the same of course you get more heat. See table of pressure and degrees of heat in our book—E. W. D.—In the same book you will find the rule for calculating horse power of steam engines.

U. S., of Mo.—Any salt water carried up by a waterspout or hurricane will on falling, bring all the salt with it. There is nothing in the sky to separate and keep up the salt. "All that goes up must come down, on your head or on the ground."

C. E. J., will find the information he desires as to the speed of the electric current on page 19 of our work on patents.

F. C. D., of Tenn.—Put tartrate of lead in an iron or glass tube stoppered with clay and subject it to a low red heat for about an hour. The product is a phosphorus which never fails. The contents of the tube while heating must be kept excluded from the air while at the same time opportunity is given for the gases generated to escape.

H. A. M., of N. Y.—It is not easy to find a soap (oleate of soda) and glycerin which will answer well for the bubble experiments. We have had good success in this way: Dissolve castile soap in strong alcohol; let it settle or filter and take the clear solution from which evaporate the alcohol. The solid residue is oleate of soda. To this add half its weight of Price's glycerin and sufficient water to give the proper consistency. The beauty of the experiments if you succeed, will reward you for all your trouble.

D. J. C., of Pa., wants a better draft for a furnace which warms a church. The church is 41x65, chimneys at the side, terminating at the eaves. The furnace in the basement 4 feet under ground level. The number and dimension of chimneys, used and where the furnace pipes enter them are not given. It is possible that the furnace has horizontal flues and that the gases of combustion have too great a space to traverse before reaching the outer atmosphere and thus become cooled and lose their ascensive power.

G. D. M., of Me., asks how are the "water marks" in paper made? Paper is made by the deposition of the pulp in a thin layer on a seive of fine wire. Any device may be woven into the net work and being above the general surface the sheet will be thinner there and transmit the light.

C. C. E., of Wis.—Crayons of all colors for carpenters' use may be obtained at almost any tool store. They will be found to be better than either chalk or charcoal.

J. W., of Ill.—The department in the SCIENTIFIC AMERICAN under the heading "Science Familiarly Illustrated" will from time to time contain among other information useful hints for mechanics' apprentices.

J. W. P., of Ill.—Something more than the diameter of your cylinder is necessary to be known to determine its horse-power capacity. The length of stroke, at least must be given to reach an approximation of the truth.

A. R., of Wis.—Common isinglass melted in water as ordinary glue, with a little alcohol added and applied hot is a good belt cement. We know of none better, although a mixture of shellac varnish and dissolved india-rubber is recommended by some.

T. H. L., of Ohio.—We cannot inform you how the Berlin iron workers produce such delicate castings. It is probably a secret. Castings are made so fine and small that it requires 10,000 to weigh one pound.

J. K. G., of Wis.—We consider a "right hand" horizontal engine to be one the shaft of which projects from the right hand side of the bed when the observer stands at the cylinder end facing the crank. The diagram you send is that of a right hand engine.

W. D. R., of Pa.—The substance you describe is probably a variety of clay. Correspondents who wants our opinion of the nature or quality of mineral and other substances should inclose a sample whenever practicable. 10 grains of a mineral are better in such cases than pages of written description.

Business and Personal.