RECENTLY PATENTED INVENTIONS.

Agricultural.

CULTIVATOR. — William F. Berry, Blanchard, Iowa. This is a machine which can be readily adapted for cultivating corn or potatoes, or plowing in wheat or small grain, the cultivator blades being adjustable to one side of the shaft or the other, to control the throwing of the dirt either way.

CHECK ROWER. — George L. Banks, Fall River, Kansas. This is a check rowing attachment for planters, which may be expeditiously reversed from side to side, and readily manipulated, the invention covering a novel construction and combination of parts designed to afford a simple and very effective device.

SEED GRADER.—William Minnigh, Bradleytown, Pa. This invention covers a novel construction and combination of parts in a simple and durable apparatus designed to effectually remove the larger cockle from wheat, and sort and grade the sound grain, the device having a casing and fan with longitudinally adjustable sorting chamber having a series of compartments, and other peculiar features.

STALK PULLER.—George W. Rogers, Baltimore, Md. This is a device having an extracting wheel mounted in a suitable frame, whereby, when the apparatus is driven over the rows, it will effectually clear the ground of all stalks of cotton or corn, and leave the field in proper condition for the plowing and sowing of another crop.

TRACTION WHEEL.—Le Roy O. Drew, Carthage, Dakota Ter. This is a wheel adapted to mowing machines, reapers, and other vehicles, and is made with an endless chain consisting of a series of pivoted links, each provided with parallel track plates, supported upon a frame, one link after another passing down on to the ground in front as the machine is drawn forward.

HOE.—Robert McCullough Brown, Fort Gaines, Ga. This invention covers an improvement in hand hoes to be used in cultivating gardens, and has a blade whose cutting edge is curved downward, while its shank extends rearward in the same plane with the blade, whereby it is adapted to take into the soil when the hoe is drawn forward and ride over the soil when the hoe is pushed backward.

HAY OR GRAIN FORK.—William H. Lander, Pendleton, Oregon. This fork has a cross head with pivoted clutch hooks, and a trip block above provided with a hook catch and trigger with trigger rope, with other ropes, for loading hay or grain upon a stack or wagon, or into the upper story of a barn, by means of a derrick.

Mechanical.

MINING DRILL.—William H. Jenkins, Philadelphia, Pa. Combined with a drill rod having a lifting pin is a novel form of operating cam, with other novel features, making a drill of great capacity, with mechanism for operating it of such character as to adapt the drill to all classes and conditions of rock, in which it is readily adjustable, the invention being an improvement on a former patented invention of the same inventor.

SHARPENING GIN SAWS.—William Behan and Paul Friensehner, Texarkana, Ark. This invention provides a feeding device for the teeth independent of the filing devices covered in a patent formerly issued to the same inventors, whereby the teeth of saws of varying diameters will be properly fed to give regular and uniform size to each tooth without reference to the number of teeth in the saw.

FURNACE. — Fradelshon Harris, St. Louis, Mo. This furnace is constructed with a water-containing vessel arranged adjacent to the fire chamber, in connection with an air blast adapted to force the vapors into the fire, whereby hot air with water vapor will be decomposed by the heat in the furnace, setting free hydrogen gas to render the carbon of the fuel more available in combination with oxygen.

SEWING MACHINE.—James B. Ivey, Macon, Ga. The machine has a frame adapted to support a reciprocating carriage provided with a fixed jaw and a movable jaw, a treadle or operating device, and other novel mechanism, the saw being designed principally for use in cross-cutting wood billets for chopping to make kindling wood.

WRENCH.—Charles H. Kennedy, Greenburg, N. Y. This invention provides a tool more particularly adapted for use by telegraph and other line wire men, which, while being compact as a small wrench, will also serve as a pair of nippers and a wire-cutting tool.

MOULDING.—Edward Reddy, Little Falls, N. Y. This invention covers an apparatus for making moulds consisting of inner and top and bottom frames adapted to be placed together, in combination with plates to hold the patterns and to be held between the frames for forming the mould, and to be removed from the frames for drawing the patterns.

Railway Appliances.

CAR COUPLING. — James Mutton, Frisco, Utah Ter. Each link consists of a rectangular shaped bar with an arrow shaped head, the inner end of the link passing over a friction roller and reciprocating between blocks, while a guide plate is secured thereto, the coupling being automatically effected whether an approaching link passes over or above the opposing link.

RAILROAD SWITCH. — John Hunter, Maple Bay, Minn. This is a switch which may be automatically operated by the engineer from the cab of the locomotive, the pivoted switch rails having a rack connecting their free ends, the gear of a rock shaft engaging the rack, and vertically movable plates mounted outside the main rails being connected with the operating shaft for rocking it in opposite directions.

Miscellaneous.

SHUTTER BOWER. — John J. Taylor, Philadelphia, Pa. This invention covers a novel construction and combination of parts in a combined shutter hinge and holder which is readily applicable to ordinary windows and shutters, while it is simple, strong, and efficient.

FIFTH WHEEL.—John M. Giraud, Warwick, Md. This invention provides a broad fifth wheel designed to obviate tilting or rocking from any unequal disposition of the load, and one which will be less exposed to dust, sand, etc., than those of the ordinary construction, while no king bolt is needed, and the device is designed to be very durable.

SOUNDER ATTACHMENT.—George H. Carey and William McArthur, Dollarville, Mich. This is a resonator for telegraph relays, to amplify the sounds of the armature lever, combining with a relay or sounder a box of resonant material supported over the armature lever in position to receive its blows, the resonator being made adjustable to be accommodated to the position of the armature lever.

TRUSS.—Joseph R. Meloney, Bloomer, Wis. This device, while intended for use as a simple and effective truss, is designed to readily yield in conformity to the actions of the body, or the parts with which it is brought into contact, the invention covering various novel features and combinations of parts.

BOSOM PAD.—Edward K. Warren and Joseph H. Ames, Three Oaks, Mich. This is a dress and garment form consisting of a covering or facing of cloth of single thickness, having stitched pocket-like plaits in which are placed elastic ribs made of material that will not corrode, the whole being drawn together and a marginal binder applied to the gathered portions.

SHIRT IRONING TABLE. — James H. Mount, Jamesburg, N. J. This invention provides a shirt ironing board to be permanently or detachably connected with the table, and having yoke and shirt clamping devices, with neck band shaping device, designed to have greater durability, effectiveness, and convenience than ordinarily possessed by devices of this character,

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(337) B. U., Miles City, M. T., writes: Inclosed please find a copy of analysis of the water we are using for our boiler. It is taken out of an artesian well which we dug to a depth of 258 feet. Before doing so, we were using water from driven wells, but on account of coating boiler badly we had to discontinue it. Boiler about two weeks after using artesian water was perfectly clear of all scales and is like new now. To feed boiler we are using a Monitor injector, which has worked very satisfactorily right along, but commenced to trouble, losing water through the overflow, and finally got so bad that we put on a new one, which after two weeks' use commenced the same things, and is now getting worse fast. There is no sign of any sediment on inside of injector, and so I came to the conclusion that the fault must lie in the water. Now, will you have the kindness to tell me how to remedy the evil, if it can be done, or recommend an injector that will work the water we are using? Also please inform us whether the water is apt to have any bad effects on boiler.

	Grains per gal. of 231 cub. in.
Silica	1·36
Peroxide of iron	0·54
Carbonate of lime	2·27
" " magnesia	1·83
Chloride of sodium	2·01
Sulphate of soda	1·80
Carbonate " "	60·40
	70·21

A. There is nothing shown in the analysis of the water that would injure the injector. Examine the water from the well for sand, by settling in a barrel or tank, also examine the inside of injector nozzles for marks of cutting, probably by sand. You may also look for sand in the bottom of the boiler. It takes but little sand to spoil an injector. If sand is found, feed the injector from a settling tank. The boiler should be often blown down to prevent accumulation of solids. The water is harmless in its action upon the boiler.

(338) A. P. B., Fort Madison, Iowa, writes: We have recently completed an artesian well at our mill here, and would like to know if the water (which rushes out at the surface at the rate of 476 gallons per minute and shows a pressure of 111 pounds per square inch) would be injurious to our boilers, brass fittings, iron and copper piping, etc.? Below I give you an analysis of its contents as furnished by an expert chemist:

	Grains per U. S. gallon.
Organic matter	0·180
Silica	0·390
Aluminum and iron oxide	0·807
Bicarbonate of lime	14·318
" " magnesia	7·817
Sulphate of lime	10·217
" " soda	40·071
Chloride of "	41·329
Total solids	151·129
Chlorine combined	24·940

A. The total solid constituents, amounting to nearly 10 per cent of the solid constituents of sea water, will make it necessary to blow off the boiler often and in larger quantities than when good water is used. There is nothing in the water that is injurious to the boiler. Wherever there are leaks, as about the water gauge, gauge cocks, etc., there an incrustation will form on the outside by evaporation. That will also be harmless, and may need often cleaning.

(339) I. B., Leadville, asks: What is the breaking torsion strain on a wrought iron pipe three and one-half inches outside diameter with metal twenty one-hundredths of an inch thick, and one hundred feet long, fastened at one end and the strain applied at the other end? A. The torsional strength of 3 inch wrought iron pipe, 3½ inches outside diameter, is 1,392 pounds at 5 feet from the center. When coupled in a length of several pieces by welding, a deduction of 5 to 10 per cent should be made in the above figures; when coupled with the ordinary screw couplings, at least 50 per cent should be deducted for the value of the joints.

(340) G. S. writes: I have made a simple electric motor. In running it with battery need I make a new solution every time I run the battery down, and how must I connect the cell? A. The simple plunge battery described in SCIENTIFIC AMERICAN, August 20, 1887, will run the motor very well. A new solution is necessary every time it runs down. Connect the cells in series.

(341) E. L. D. asks: 1. How can I melt and make a moulding of hard rubber, such as combs, handles, etc.? A. You must use unvulcanized India rubber, and vulcanize it after shaping. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249, 251, 252, which we can send you for ten cents each. 2. Is the spark which sometimes flies off from a man's shoe in striking a walk of stone or any hard substance an electric spark, or is it merely the heat generated by friction? A. The spark is a little fragment of burning iron, detached from a nail in the shoe, by striking the stone and becoming ignited by the heat of friction and impact.

(342) F. G. G. asks: 1. Can electricity be obtained in placing a dynamo in a glass inclosure with all atmosphere taken out? A. Yes. The atmosphere has nothing to do with the action of a dynamo. 2. Can a current of electricity and magnetism be sent through fire, or will it destroy same? A. Induction from a magnet or electric wire can act through fire. There is no such thing as a current of magnetism. A current of electricity needs a conductor, and flame is an exceedingly poor one. The static discharge affects a flame by creating draughts of air.

(343) J. M. H. asks for a formula for writing in white ink on blue paper or any other paper. A. Mix Chinese white with gum arabic solution. This will give a solid body ink. Or use oxalic acid, and upon the proper kind of blue paper this will give a very excellent effect by bleaching the paper. Blue paper adapted for the latter can be found upon the market.

(344) J. J. D. writes: The chord of circle being given, with the distance at center of chord to the circumference (versed sine), how can you find the radius of the circle? A. Add the squares of the versed sine and of half the chord, divide the sum by twice the versed sine, and the quotient will be the radius.

(345) A. R. asks: 1. Will benzine weaken a cord of catgut? A. No. 2. Can any oil or substance be used to replace that dissolved by the benzine? A. Olive or sweet almond oil.

(346) M. & A. write: Could you kindly inform us what is put into gelatine used for moulds to prevent the plaster from burning? A. Oil the gelatine with linseed oil. You can also mix the gelatine with one tenth bichromate of potash and then dissolve in an obscurely lighted room. Make your moulds from this and expose to sunlight.

(347) F. W. B. asks: I have a Julien storage battery consisting of 3 cells of 6 volts electro motive force; what is the strongest incandescent light that could be operated by it? A. About three candle power. Ask for a six volt lamp.

(348) C. E. W. asks if there is any fulminating or deflagrating substance which can be ignited by the passage of a spark from a frictional electric machine. A. With proper connections gunpowder or fulminating mercury can be ignited by the static discharge.

(349) J. O. N. writes: The cigar lighter consisting of two small nickel plated cylinders, through one a wick runs, which is ignited by the application of a chemical drawn from the other cylinder, has possibly attracted your attention. What is the substance that effects the ignition? A. We have no analysis of the substance, but believe it to be an amalgam of sodium and mercury. The wick, from the accumulation of caustic soda, is supposed to be always damp enough to ignite the sodium.

(350) H. H. F. asks: How may a battery of the cheapest, simplest kind be made and maintained that is capable of shocking a person to the extent that ordinary people generally care to stand? A. Use an induction coil, such as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 569.

(351) G. D. asks what is the most expansive metal suitable for an incubator regulator. A. Of solid metals, zinc. For heat regulator, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 629 and others.

(352) H. M. P. writes: Can you give me a receipt for bleaching human hair, removed from the head, which will leave it a pure white, without injuring its strength? A. Binoxide of hydrogen is used for the purpose, but artificially bleached hair is invariably of inferior quality.

(353) A. F. W. asks (1) how to put about forty 16 candle power lamps (incandescent) into a circuit so that one lamp can be shut off without interfering with the rest of them. A. If you work from a storage battery, arrange your lamps in parallel, and no further regulation is needed. If you use a dynamo, you should have a self-regulating one. For dynamo construction we refer you to Hering's "Principles of Dynamo Electric Machines," which we can send by mail for $2.50. 2. Also can you tell me in what book or periodical I will find an explanation of the way of wiring a house or building of any kind for incandescent lighting? A. We refer you to SCIENTIFIC AMERICAN SUPPLEMENT, No. 603. 3. What kind and how many cells of battery will it take to run five 16 candle power incandescent lamps about four hours out of twenty-four to the best advantage? A. Use 25 cells of storage battery or 50 cells of quart Bunsen battery with 50 volt lamps. 4. Does the SUPPLEMENT give any information on the storage batteries and how they are made? A. Many storage batteries are described in the SUPPLEMENT.

(354) H. M. T.—You will find very complete tables of planetary elements in "Astronomy for High Schools and Colleges," by Newcomb and Holden, $2.50, which we can mail for the price. From its tables we give you the orbital velocity in miles per second of each of the planets:

Mercury	29·55
Venus	21·61
Earth	18·38
Mars	14·99
Jupiter	8·06
Saturn	5·95
Uranus	4·20
Neptune	3·36

(355) J. V. D. asks: What would be the horse power represented by the tide raising a scow (say 100 ft. by 300 ft. bottom measurement, vertical sides) twelve feet high in five hours? A. If you load your scow so as to displace its area for one foot in depth, its lifting power will be equal to the weight of the water displaced, which is $100' \times 300' \times 62$ lb. $\times 10$ feet, available tide = 19,200,000 lb. for 5 hours' duration. This product divided by the minutes in five hours gives the value of the power for one minute, which is the unit of time for horse power. Thus:

$\frac{19,200,000}{300 \text{ mins.}} = 64,000$ and $\frac{64,000}{33,000} = 1{\cdot}94$ horse power, or nearly two horse power, without deducting the friction of machinery for operating the power. We allow 10 ft. travel, because the scow must draw two feet for the full power in rising and just touch the water in falling to make the full power available. This system is expensive for the machinery required for the small power. A far more efficient system is to impound a large volume of water and use a submerged turbine for utilizing the power, allowing the water to flush each way at the turn of the tide.

(356) S. B. M. asks if there is a motor of any kind in use or manufactured which will run 2,300 revolutions per minute and develop 30 horse power. A. We know of none. The velocity is too great for a practical motive power of any kind. A dynamo may run up to 1,500 revolutions per minute, and develop 30 H. P., without heating journals, with care. Rotary engines of the Avery type have run at 1,000 to 1,200 revolutions per minute, developing 30 to 40 horse power. Turbines are made to run 1,500 revolutions per minute, developing 30 or more horse power, with pressure of 100 feet waterhead. Water motors of the hurdy-gurdy type may have very high speed under great pressures from the jet nozzle, possibly reaching the figures that you name.

(357) C. E. M. asks: I intend to put a keel condenser on a small steam launch. Can I proportion my independent feed pump so as to give a vacuum without an air pump, and if so, how perfect if all joints are tight? A. You cannot obtain a vacuum with an ordinary feed pump. Possibly a partial vacuum of 3 to 4 lb. may be obtained under favorable arrangement, provided the condenser is large enough.

(358) J. K. F. says: Please inform me, through your Notes and Queries, the largest gun made, where and by whom made, the weight of gun and projectile, caliber, the weight of charge of powder, and the greatest distance the projectile has been thrown. A. The largest gun was made by Krupp, weighs 118 tons, is 45 feet long, 16 inch bore, rifled, and throws a projectile of nearly one ton, eight miles, with a charge of 600 lb. prismatic powder. Others of still larger dimensions are in course of manufacture. The greatest range claimed is 12 miles, from a 9 inch gun in England, with an elevation of 37°.

(359) C. E. says: The State of California is about to enact a law requiring all engineers to procure a license. I have been a mechanical engineer for nearly twenty-five years, yet probably could not answer the theoretical questions necessary for me to pass the examination. Will you please inform me what books to procure in order to post myself? A. You will find the desired information in "Questions and Answers for Engineers," by Roper, which we can send you by mail for $3.

(360) R. S. B. asks for information on the following queries: 1. A short and simple formula for ascertaining capacity of cisterns. A. For capacity of cisterns, square the diameter in feet and decimals; multiply the product by 0·7854, which gives the area in cubic feet for one foot in depth; multiply this product by the depth in feet and decimals, and the last product by 7½ for the number of gallons. 2. Dimensions of 100 barrel cistern. A. A 100 barrel cistern should be 8 feet diameter, and 8 feet deep from the spring of the arch. 3. Formula for ascertaining area of ellipse. A. For the area of an ellipse, multiply the diameters together, and the product by 0·7854. 4. It is stated that the cruiser Vesuvius, which has shown a speed of 21·65 knots, is the fleetest vessel in our navy. Is not the Stiletto the fleetest? A. The Stiletto is the fleetest vessel, but does not rank as a war vessel. She is only 90 feet on the water line, and displaces but 28 tons. She is used as a dispatch boat. 5. Is the table on inclosed slip, giving method of ascertaining number of gallons in cistern, and which is copied from a mathematical work, correct and reliable? A. The table is correct to a fraction of a gallon.

(361) C. V. H. asks: 1. How the Leclanche disk battery is made, giving proportion of the ingredients? A. The porous cup is filled with a mixture of graphite and clean sifted binoxide of manganese in about equal parts. The carbon prism is embedded in this mixture. 2. Suppose a rubber cell be used, and the cell sealed, is there anything in the rubber that would interfere with the proper working of the battery? A. No; but gas may be given off in the reactions in the cell, for which in some combinations an outlet should be provided.

(362) E. M. La B. asks (1) how pocket batteries are made, such as are used in connection with the small incandescent scarf pin lamps? A. While a carbon zinc couple with bichromate exciting fluid would give good results, a metal plate—silver or platinum—is generally used for the negative electrode, to save room. Then as exciting fluid a mixture of sulphate of mercury and water may be used. 2. Also how many cells of simple plunge battery will it take to run one two-candle power incandescent lamp? A. Three or four cells.

Enquiries to be Answered.

The following enquiries have been sent in by some of our subscribers, and doubtless others of our readers will take pleasure in answering them. The *number* of the enquiry should head the reply.

(363) G. W. writes: Will you please inform me through Notes and Queries of the SCIENTIFIC AMERICAN what the rule is in regard to the size or area of smoke stacks for stationary boilers (using natural draught)? I frequently have work of this kind to make, and I think there is a rule in proportion to the area of grate, but do not know what it is.

(364) M. S. O'K. says: We would like your opinion in regard to the following: Does the piston of an engine in theory come to a stop after completing its stroke, or does it immediately start in the opposite direction? It is controlled by the crank pin, which is in continuous motion. We can easily understand that it stops going in one direction, but the question is, does it pause or does it immediately take the opposite direction? In practice, of course, the lost motion of the parts would allow it to pause, but theoretically does it?

(365) S. S. S. asks: Would you kindly inform me through the columns of your paper what are the ingredients of the composition used for making bass-relief signs, used for advertising purposes mostly?

(366) G. T. asks: Will you please find space in your valuable paper to inform me what good, if any, a dome is to a steam boiler?

(367) J. P. W. asks: On a street cable railway one mile long, grade level, the rope (1¼ diameter, weighing 2½ lb. per ft.) was at a speed of 880 ft. per minute; on the incoming rope are nine cars at equal distances, the same number on the outgoing rope, weight of each car and passengers 14,500 lb. What is the pulling strain upon the rope?

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the numbers therein given:

(172) A. D. C.—Safety Valve, etc.—For method of computing safety valve, see answers to enquiries, No. 60, January 26. For removing paint, use strong caustic potash solution in water.

(175) C. S. B.—Air Brakes.—The principles involved in the construction of various air or vacuum brakes are illustrated and described in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 392, 523, 642, which we mail at 10 cents each.

(177) G. H. A.—Clean and Whiten Piano Keys.—Wipe the keys occasionally with a solution of alum. Coal tar varnish is much used for sheet iron, or for a fine varnish thin the japan varnish of the trade with turpentine.

(178) H. M.—Dyeing Clothing.—See a book on the "Dyeing of Fabrics" by Hummel, $2.00 mailed. For eye glasses use dark blue or smoke color.

(180) W. B. D.—Cleaning Shells.—The only safe way is to file, scrape or cut off the outside coat. For cutting, use a chisel or a draw knife, holding the shell with a strap looped through holes in a bench. The acid process is sometimes used where the bright parts can be protected with wax, but it is uncertain in the hands of amateurs. Use oxide of tin to polish.

(181) O. K. — Bicycle Enamel. — Hard baking japan, as sold by the varnish makers, is used for bicycles. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 316, for description of japanning and manufacture of japans.

(182) Student. — Phosphorized Oil is made by dissolving six-tenths of one per cent of phosphorus in cod liver oil. It is called phosphorole, used in phthisis. Consult the Pharmacopœia.

(183) W. J. S.—Green on Pickled Gold.—You will find a variety of receipts in the "Goldsmith's Hand Book," which we can send by mail for $1.20.

(184) C. V. A.—Telescopic Camera.—You do not state the kind of object glass, achromatic or plain, and as you say that the eye piece is a single lens, we are led to suppose that the object glass is also single. With such a telescope we fear that you will have little satisfaction in photographic work. You need an achromatic object glass of excellent definition with a low power Huyghenian eye piece. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 399, for illustrated forms of eye pieces, and Nos. 581, 582, 583 for a series of papers on astronomical telescopes and their object glasses.

(186) E. F. C.—You will be able to do much in the way of theoretical knowledge of electricity and the methods of practical adaptation to light and power. The experience required will be more readily attained in practice after your book studies. Read "Electric Lighting," by Du Moncel, $1.25, and "Electric Motors," by Du Moncel, $3.00, both of which we can mail at the price.

(187) W. S. B.—Fresh Water for Ocean Steamers.—Ocean steamers have surface condensers for utilizing the whole exhaust by condensation and return to the boilers, the deficiency being supplied from the sea. They are also supplied with condensing apparatus for supply of fresh water from steam, direct from the boilers, which with the fresh water carried in tanks make the equipment complete for ship's use.

(188) J. D. B.—Cementing Rubber.—Use rubber cement, which is made by dissolving pure rubber gum in benzine. See SUPPLEMENT, Nos. 249, 251, and 252.

(189) Demagnetizing Watch. — See SCIENTIFIC AMERICAN of October 2, 1886, for illustrated description of the process of demagnetizing watches.

(191) F. L. A. S.—The restoration of cracked oil paintings is the work of an artist. For well defined principles for a belief, see works on mental philosophy.

(196) G. C. H.—The answer to your last question should have been 0·3 or three-tenths of a H. P.

(239) W. M. H.—Firing Red Hot Shot.—The shot is heated red hot in a furnace. A sabot or thick wad made of wood is rammed down over powder. A bundle of damp straw moss or cloth is rammed down to sabot. The shot is then inserted, shoved home, and fired instantly. Not now used, bombs being safer to the gunners and more effective against the enemy.—P. H. L.

(239) W. H. M.—Hot Shot.—In your issue of January 26, query 239, a correspondent asks for the method of firing hot shot. A book prepared by a board of officers for instruction in heavy artillery, for the army of the United States, contains the following instructions for hot-shot firing. The cartridge bags are made of woolen stuff, and the cartridge is inserted choke foremost in a cartridge bag of the next higher caliber and the end folded under. The bags should be examined carefully, and great care should be taken to prevent the powder from spilling or sifting in the bore. The wads are made of clay or hay. Clay wads should consist of pure clay, or fuller's earth, free from sand or gravel, well kneaded, with just enough moisture to work well. They are cylindrical, and one caliber in length. Hay wads should be soaked for ten or fifteen minutes. Before using, the water is pressed out of them. When hay wads are used, vapor may be seen escaping from the vent, on the insertion of the ball, but this is only the effect of the heat of the ball on the water in the wad, so no danger need be apprehended from it. With proper precautions the ball may be permitted to cool in the gun without igniting the charge. The piece, however, should be fired with as little delay as possible, as the vapor diminishes the strength of the powder. In loading, the piece is sponged with great care, and the worm is frequently passed through the bore. As a precaution, a wet sponge should be inserted just before putting in the ball. The muzzle being sufficiently elevated to allow the ball to roll down the bore, the cartridge is inserted, the mouth of the outer bag being foremost, the fold down, and carefully pushed home without breaking it; a dry hay wad is placed in it and rammed once, then a clay or wet hay wad is placed upon it and rammed twice, and finally, if firing at angles of depression, a wad of clay a half caliber in length, or a wet hay wad, is placed on the ball.—L. E. P., Philadelphia.

(239) Hot Shot.—Insert powder cartridge in cannon, cut a sod or turf not less than 4 inches in thickness, fitting the bore of the gun, and ram tightly on cartridge and take aim; on entering red hot ball, roll or push same on the charge and fire immediately. If the aim is downward, add another sod with the ball.—E. S.

(240) Niagara Falls.—1. From the brink to 200 feet back of the Niagara Falls are rapids running over and between bowlders. 2. No level. 3. Velocity of current estimated at 25 miles per hour. 4. Not at the Falls, but at or near Buffalo, where the current is 8 to 9 miles per hour, and sorry to say that the $100,000 premium is a booming humbug.—E. S.

(241) 50 and 75 horse power engine.—If the 50 horse power engine is properly constructed, and more attention is given to the inside than the outside, it ought to do the work satisfactorily. A 75 horse power engine of the same pattern and make as the 50 horse power one would only increase the work of keeping up steam, except it would be of the most economical automatic cut-off make.—E. S.

☞ Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 29, 1889,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Abnominal supporter, B. St. John 396,962
Album, photograph, E. H. Hammann 396,929
Animal shears, V. Petherick 396,832
Armature winding for dynamo-electric machines, E. R. Knowles 396,941
Atomizers, face shield for, S. H. Jennings 396,936
Axle, C. H. Wilson 396,545
Axle box for cable car trucks, J. Stephenson 396,839
Axle nuts, die for making, Firth & Tompkins 396,864
Axle nuts, making, Firth & Tompkins 396,865
Axle, vehicle, A. Paterson 396,762
Back band hook, E. A. Isaacs 397,002
Barrel hoops, retaining device for, C. Verniaud 397,100
Battery. See Electric battery. Secondary battery.
Bearing, anti-friction, A. W. Terry 396,968
Bed, spring, Caylor & McCreery 396,806
Beehive, Beeson & Hirschfeld 396,724
Bell, door, W. H. Fauber 396,993
Belt stretching machine, C. L. Ireson 396,874
Billiard scoring board, R. N. Montgomery 397,019
Binder, T. F. Bourne 396,980
Blacking, swab for liquid, G. S. Wolff 396,790
Blast, hot air, W. O. Miller 396,947
Blasting compound, R. Sjoberg 397,095
Board. See Billiard scoring board.
Boat joint, H. M. Sprague 396,776
Boiler. See Range boiler. Steam boiler.
Boiler, J. B. De Barthe 396,731
Bolt. See Flour bolt.
Bolting reel, H. A. Hueffner 397,057
Book support, F. E. Healey 396,741
Boor or shoe heel, H. A. Webster 397,041
Bottling sodawater, etc., apparatus for, C. C. Haley 396,928
Box. See Axle box. Fare box. Journal box. Letter box.
Brace. See Shoulder brace.
Bracelet, T. King 396,939
Brake. See Sleigh brake. Wagon brake.
Brake handle, J. W. Fowler 396,924
Brick kiln, F. W. Dennis 396,733
Brick kiln, J. Taber 396,966
Brush, cylindrical, G. S. Gladding 397,076
Brush, hatter's, W. A. Faber 396,812
Brush machine, E. W. Porter 396,954
Brush, tooth, W. H. Smith 396,898
Bung, automatic stop valve, L. F. Smith 396,961
Burner, R. P. Ambler 396,798
Butter tub, L. K. Tewksbury 396,969
Button, L. Sievert 397,030
Calendar, J. M. Moore 396,760
Can nozzle, oil, J. S. Peter 396,891
Car brake, G. O. Kane 396,876
Car coupling, Cael & Ogle 396,919
Car coupling, F. J. Hughes 397,058
Car coupling, I. Kling 396,878, 396,879
Car coupling, J. B. Maas 396,943
Car coupling, W. Metcalf 397,017
Car coupling, G. Mock 397,018
Car coupling, J. Mutton 396,888
Car coupling link, F. F. Boyce 396,726
Car door, C. Trier 396,903
Car wheel, R. N. Allen 396,721
Cars, closet for railway, Kennard & Cory 397,005
Cars, electric lighting and heating, J. F. Shawhan 396,836
Cars, pipe coupling for railway, P. S. Wiseman 396,908
Cars, ventilating and warming railway, Murray & Harrison 397,092
Carpet beating machinery, W. H. Hankinson 396,997
Carpet sweeper, P. H. Wiedersum 397,102
Carrier. See Cash and parcel carrier.
Cart, dumping, J. Cable 396,982
Case. See Latch case. Library case. Lock case. Type case.
Cash or parcel carrier, E. B. Stocking 396,778
Casting steel pipes, apparatus for, W. E. Koch 396,747
Catheter, R. N. Mayfield 396,754
Cellars, apparatus for delivering ashes from, M. Foreman 396,973
Centrifugal machine, G. N. Downs 397,051
Chair. See Dental chair. Surgical chair.
Check rowing attachment, G. L. Banks 396,848
Chimney protector, Brenner & Myers 396,855
Cigar bunching machine, A. K. Degood 396,732
Cigar perforating machine, E. Bernardt 396,801
Clasp, F. B. Spooner 397,034
Clevis, M. T. Cole 396,859
Clothes line frame, F. W. Hofele 396,817
Coal hod, E. Barrath 396,974, 396,975, 397,047
Collar, horse, R. Brownson 397,066
Conductor support, D. Steussy 397,036, 397,037
Cork cutting machine, H. S. Larsen 396,882
Corn sheller and wash board, combined, Stukes & Reid 396,902
Counter, E. T. Harris 396,81
Coupling. See Car coupling.