WHEEL-FASTENER AND AXLE-PROTECTOR.—G. WOOD, Ballard, Wash. The purpose of this contrivance is to provide a construction whereby to quickly place and hold a wheel-hub upon an axle spindle without the use of a nut, the wheel being fastened from the rear instead of from the front, and to provide perfect protection for the end of the axle against sand, dust, etc. Means are supplied for bringing the front projection of the hub practically within the plane of the dish of a wheel.

Miscellaneous.

BAKER'S OVEN.—G. H. MCCAUSLAND, Philadelphia, Pa. In this case the object in view is the provision of means by which the oven-door may be quickly opened to introduce or remove loaves or the like into or from the oven-chamber, the door being closed in a similar manner in order to confine the heat in the chamber, the whole operation being done with less time, labor, and loss of heat than by the common method, which requires the door to be operated by hand.

BARREL-HEAD FASTENER.—H. H. KROMBERG, New York, N. Y. The purpose of this invention is to provide a device adapted to receive the chime or end sections of staves and in which the customary head may be readily laid and fastened, and, further, to so construct the device that any person of ordinary intelligence may place a head in position and remove it without injury to the contents of the barrel no matter how fragile. The device permits the heads to sustain great weight without sagging and adds materially to the barrel's strength.

BREWING.—H. A. HOBSON, 54 Church road, Acton, London, England. Mr. Hobson previously invented a method of brewing in which a hopped wort was produced by first making an infusion of hops, then running it off, and after fixing the tannic acid extracted from the hops mashing malt in the hop decoction as the mashing liquor. In the present invention the especial object is to effect an economy in working such process by extracting to the utmost extent the useful properties retained by the materials treated and making them available in the production of the wort.

MILK HEATER OR COOLER.—A. JENSEN, Topeka, Kan. This device provides means for heating, cooling, deodorizing, and aerating milk and other liquids. When milk is to be heated steam is introduced which sets up circulating currents and gradually heats the liquid flowing in a thin film over the outer surface of a conical wall. If to be cooled, a stream of cold water is introduced from the bottom of the conical pan and absorbs the heat of the milk.

CHECK-HOOK.—J. H. ALLISON, New Vienna, Ohio. This check-hook is so constructed that when a rein is held in by the hook it cannot be displaced, but the rein may be readily dropped forward after being separated from the hook a sufficient distance to allow the animal freedom to drink and move his head to and from his sides, and then by one movement of the hand the check-rein may be again carried to checking position on the hook.

COOLER.—C. F. CONOVER, New York, N. Y. This cooler is designed for cooling distilled aerated mineral waters and liquids usually contained in a large receptacle adapted to be supported on the cooler and tilted to allow emptying of all its contents and to permit quick connection between the receptacle and the cooler proper to insure a flow from the receptacle through the cooler whenever a discharge-faucet is opened.

SKIRT-HOLDER.—S. D. ENGLE, Hazleton, Pa. Mr. Engle has in view the provision of a simple article for holding women's skirts from dragging, thus relieving the user of the labor of holding up the skirt by hand. It may be used with any kind of a skirt made of thick or thin fabrics and it is operated by frictional engagement of its parts with the dress fabrics, so as to overcome any liability of injury thereto.

HYGROMETER.—J. H. GERRER, Elreno, Oklahoma Ter. This device is of that character which employs signal-flags and a dial and indicator-hand in connection with a twisted strip or string having one end free and the other fixed against movement. The strip or string must be formed of material that will expand or contract to atmospheric conditions, thereby twisting or untwisting its free end, to which end the flag-support and the indicator-hand is secured.

AWNING.—H. C. MARCUS, Bohemia, Ore. Comprised in this awning for tunnels is a collapsible frame formed of spring material, so that it may be arched upward and one side edge engaged with the side of a tunnel and the other side engaged either with the opposite side of the tunnel or with an extensible supporting-bar, the awning forming an effective covering for workmen and shedding water to the very sides of the tunnel.

MEANS FOR FIXING BOLTS, SCREWS, OR SIMILAR ARTICLES IN SOFT SUBSTANCES, SUCH AS WOOD.—J. V. E. THIOLLIER, 58 Rue de Lourmel, Paris, France. The system invented by Mr. Thiollier consists in placing between bolts and the sides of a hole in a piece of wood with which the bolt is to be engaged a metal protection consisting of a band or rod of metal wound into a coil. The chair bolt or screw is thus enveloped throughout its length, or almost so, by the coil. Under these conditions it is no longer the bolt or screw which is in contact with the wood, but the coil of metal, whose hold on the wood is determined by the impulse to expand, which it receives from the inserted screw or bolt.

SHADE-HANGER.—W. DISNEY, Cincinnati, Ohio. The improvement in this patent relates to shade-hangers for windows, the inventor's object being more particularly to produce an adjustable hanger and to prevent the free ends thereof from wearing upon the woodwork of the window. In this shade the usual support is not needed, the pressure of a cord being all the support required.

BUCKSAW.—C. T. REDFIELD, Glenhaven, N. Y. Mr. Redfield in this device has made an improvement in buck-saws; and it consists in a novel construction and combination of parts whereby the saw-frame can be strongly braced so that it cannot rack on the joints, will always remain in perfect alinement, and will be rigid in use without any danger of breaking.

PHOTOGRAPHIC MOUNTING-ROLLER. J. H. HAMPP, New York, N. Y. One object in this case is the provision of means for imparting a traveling motion to a pressure-roller, so as to make it traverse the work on a bed of the apparatus, the mechanism being autoreversible and arranged to clear the driving and idler pinions of the sprocket-gear-driving mechanism. Another is to provide means for raising the roller with relation to the bed in order that the work may be placed in position beneath the roller, certain of the roller-operating devices being arranged to permit of its adjustment by the lifting devices.

UNIVERSAL FRACTION RULE OR SCALE. W. F. LEAVELL, Castlerock, Wash. This invention has for its object the provision of a device by means of which all the fractions of an inch not usually found on an ordinary rule may be readily obtained, while at the same time the ordinary linear scale-measure may be used on the same instrument.

DRAWING-FRAME.—L. J. WRIGLEY, Lawrence, Mass. The present improvement has reference to drawing-frames for drawing fiber in the several processes in textile-mills, the object being to provide means in lieu of the usual weights, springs, or levers for holding down rolls and also to furnish means for automatically releasing pressure should the sliver lap around the drawing-rolls or other obstruction occur in the fiber.

NUT-LOCK.—H. A. HOUSE, Aspen, Col. The improvement made by this inventor consists of certain novel features of construction which provide a simple, cheap, and efficient locking device for nuts, which will effectually prevent retrograde movement thereof and which will permit the nut to be readily applied or removed.

APPARATUS FOR HEATING FLUIDS OR FLUID MIXTURES.—F. S. CHAPMAN, Kenton, Ohio. This apparatus comprehends a pair of electrodes incased in a non-electric conducting-body, with their opposing faces separated to form a passage-way for the fluid, and a metallic casing which serves as a solid exterior for holding the electrodes and their surrounding non-electric body intact during the handling of the complete device, and which also serves as a convenient means for joining with the faucet of ordinary house-service pipes.

MANUFACTURE OF TABLE KNIVES, FORKS, OR SIMILAR ARTICLES.—H. JOEST, Hanover, Germany. The intention in this case is to connect a tang throughout its length, or nearly so, with a handle and at the same time anchor it in the handle, so as to protect both tang and handle against the entrance of liquid and render them immune to the effects of acid liquids or vapors. This is attained by casting around the tang of a knife or fork in a mold an alloy of aluminium and magnesium. This adheres closely to iron or steel, behaving toward the latter like a solder, so that the tang becomes a part of the handle.

INK-REDUCER AND PROCESS OF MAKING SAME.—F. FISHER, Brooklyn, N. Y. By means of this reducer printers' ink is softened and caused to properly adhere to paper, thus preventing the liquid from peeling off. The reducer also prevents the ink from being offset from the paper, that is, it prevents the application of excessive quantities. Owing to this, and to the ink treated with the reducer, drying very rapidly, fresh-printed sheets placed one upon the other will not adhere nor will a lower sheet transmit its impression to the back of an upper sheet.

TOY.—O. F. HALE, Pocahontas, Iowa. The invention in this case resides in a novel manner of sustaining a clown in an upright position, and in the peculiar arrangement of those parts in connection with a spring-board on which the clown stands and which is vibrated to produce the desired movements of the clown or other performer.

HOSE-COUPLING.—E. J. PACE, Salem, Ohio. The object of this invention is to provide a coupling for water, steam, or air conducting hose which has novel duplicate connecting sections, is very simple, easy to connect and detach, is reliable in service, and is light, durable, and of shapely design, and has no projections from its general surface.

COMBINED CANE AND CHAIR.—R. C. DULIN, McKeesport, Pa. This combined cane and chair consists of a simple, strong, and cheap article in which the parts fold compactly in order to facilitate transportation or handling, the seat being easily unfoldable for use to afford support for the person. The construction admits of the use of two seats in connection with a single staff. The article is equipped with means for the attachment of an umbrella.

TOY BOAT.—A. M. ROYSE, Winchendon, Mass. In this toy the purpose is to so construct the metal hull of a keel boat that when the boat is not in water or when it is packed, the keel can be folded, thus facilitating packing and carriage, and to reach such a result in a simple, practical manner, and so that when the keel parts are in position for use, the keel will be as rigid as if made of one piece.

REVERSIBLE SMOKE-STACK.—S. T. WALTON, New York, N. Y. The smoke-stack is so constructed, that it may be turned end for end, whereby to readily clean the stack, the stack remaining upon its pivots, and to provide means for securing the stack to its base, whichever end is uppermost, by means of a slip collar and guys. It is made to be readily reversible and conveniently secured in proper position.

MEANS FOR REPAIRING BOOTS AND SHOES.—G. W. CASE and D. L. SWINTON, JR., Port Jervis, N. Y. The intention of the inventors is to provide an apparatus by which a new rubber sole may be expeditiously applied to the upper of a boot or shoe or a rubber patch may be vulcanized on a worn boot or shoe at the heel or sole thereof, the new sole applied by their apparatus having a surface, whereby repairs may be effected and the owner saved the expense of buying new articles. The inventors also provide a mold having a pattern-surface to give the corrugated face to the bottom of the new rubber sole.

BUILDING BLOCKS.—W. D. KILBOURN, Pueblo, Col. The object of this invention is to provide a series of blocks of various shapes by means of which a great variety of structural devices in miniature may be built up, thus not merely providing amusement as a toy, but serving to develop the mechanical ideas of a child or person.

CLUTCH.—M. MCHALE, Phœnix, and J. TRAINNER, Eholt, Canada. The invention in the present case has reference to new improvements in clutches, the object in view of the inventors being to provide a clutch of simple construction and adapted for use for various purposes—such, for instance, as a drill-chuck or for locking together two members of a tripod-leg.

GLOVE.—A. G. HOEGREN, Chicago, Ill. This glove invention has for an object, among others, to provide an improvement in the cut of the inside portion of the palm and fingers of the glove whereby to secure a considerable width in the inner sections of the finger pieces of the glove.

HARNESS-LOOP.—J. H. R. HAUCK and J. L. WARDEN, Pleasanthill, Mo. In this case the invention relates to harness-loops formed of metal; and it consists of a peculiar loop of that character involving novel and improved securing means. The loop is adapted to be applied to any strap or portion of harness with less liability of severing the stitches than with any similar loop known to the inventors.

APPARATUS FOR CONTINUOUS FRACTIONAL DISTILLATION OF PETROLEUM.—W. D. PERKINS, Oil City, Pa. Mr. Perkins, in this case, provides an apparatus by which the fractional distillation of petroleum or similar liquids is effected continuously and rapidly, so that several distinct products are obtained, the same differing in specific gravity and other qualities. The whole operation is practically effected automatically, it being only necessary to supply gas, water, and steam in a certain manner.

SUSPENDER-BELT.—L. REITER, New York, N. Y. This contrivance is an improvement in those devices which serve as combined suspenders and belts, the devices being readily convertible from one of the articles to the other. The construction provides for neatness and effectiveness; this is particularly so in the case of the belt, since when adjusted as a belt the article does not appear to be anything more than such.

HAIR-CRIMPER.—MARGUERITE I. CONNELL, New York, N. Y. The purpose in this case is to provide a curler having a pliable body made of soft rubber—for example, in spiral form—and an elastic retaining device in the form of a tie or an equivalent device capable of extending practically from one end of the body to the other for the purpose of retaining the hair in position upon the body of the curler, the hair being wound on the body to impart a wave to the hair when the device is removed. This device for curling or waving the hair is used without heating and will not cause discomfort during repose.

FEEDER FOR FOUNTAIN PENS.—J. WEEKS, Brooklyn, N. Y. Provided in this invention is a reliable feeder for pens adapted to any barrel and so constructed that it may be used in connection with any style of pen, the pen constituting a valve for the outlet of the feeder, normally concealing the outlet, but automatically opening it to supply ink the moment the pen is brought into action and enabling the pen to be carried point down without danger of leakage, and kept constantly moist with ink, in condition for instant use.

THIMBLE PUZZLE.—H. SCHIERHORST, New York, N. Y. In the operation of this puzzle a person removes a cover and holding the device by means of the base tilts the box from side to side, so as to roll the thimbles around in any manner. The purpose is to lodge the thimbles upon bosses; but the operator may vary the game by trying to lodge one of the thimbles upon a particular boss, or to lodge both upon the bosses.

FOLDABLE PAPER BOX.—H. LOWY, New York, N. Y. The inventor's object in view in this improvement is to rapidly and economically produce a box-blank which is of such form that it can be bent or folded easily to complete the box and have its parts so arranged and interlocked that the use of paste or other mucilaginous material is obviated. The box-blank can be stamped or cut without waste of the paper-stock, and the box resulting from the bending of the blank is held together by the engagement and interlocking of its parts.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Business and Personal Wants.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. **In every case it is necessary to give the number of the inquiry.**

MUNN & CO.

Marine Iron Works. Chicago. Catalogue free.

Inquiry No. 4353.—For parties to do lithographing on oiled silk.

AUTOS.—Duryea Power Co., Reading, Pa.

Inquiry No. 4354.—For manufacturers of metal diaphragms.

Morgan Emery Wheels. Box 517, Stroudsburg, Pa.

Inquiry No. 4355.—For makers of coil springs of ¼ to one inch in size.

"U. S." Metal Polish. Indianapolis. Samples free.

Inquiry No. 4356.—For manufacturers of hollow lamp wicking, or for a knitting factory.

For bridge erecting engines. J. S. Mundy, Newark, N.J.

Inquiry No. 4357.—For a machine for cutting tobacco into proper shapes for making cigarettes.

Blowers and exhausters. Exeter Machine Works, Exeter, N. H.

Inquiry No. 4358.—For parties to manufacture a filing case, also a pneumatic handle bar grip; both patented inventions.

For sale, lease, or on royalty. Puzzle (or game) patented. Address E. M., Box 773, New York.

Inquiry No. 4359.—For a machine to make starch from sweet potatoes,

Mechanics' Tools and materials. Net price catalogue. Geo. S. Comstock, Mechanicsburg, Pa.

Inquiry No. 4360.—For machinery for making pearl buttons.

Sawmill machinery and outfits manufactured by the Lane Mfg. Co., Box 13, Montpelier, Vt.

Inquiry No. 4361.—For manufacturers of straw burners for boilers.

Let me sell your patent. I have buyers waiting. Charles A. Scott, Granite Building, Rochester, N. Y.

Inquiry No. 4362.—For makers of machines for gumming labels.

Automobiles built to drawings and special work done promptly. The Garvin Machine Co., 149 Varick, cor. Spring Streets, New York.

Inquiry No. 4363.—For a table with top laid off in squares both ways on which to cut glass square and in dimensions.

Crude oil burners for heating and cooking. Simple, efficient and cheap. Fully guaranteed. C. F. Jenkins Co., 1103 Harvard Street, Washington, D. C.

Inquiry No. 4364.—For manufacturers of goat carriages.

The largest manufacturer in the world of merry-go-rounds, shooting galleries and hand organs. For prices and terms write to C. W. Parker, Abilene, Kan.

Inquiry No. 4365.—For makers of petroleum vapor lamps.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

Inquiry No. 4366.—For manufacturers of or dealers in tanners' or curriers' tools.

Contract manufacturers of hardware specialties, machinery, stampings, dies, tools, etc. Excellent marketing connections. Edmonds-Metzel Mfg. Co., Chicago.

Inquiry No. 4367.—For machinery for printing advertising on lead pencils.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $5. Munn & Co., publishers, 361 Broadway, N.Y.

Inquiry No. 4368.—For manufacturers of motor cycles or gasoline engines for bicycles.

WANTED.—Plans and specifications for building a 21-inch engine lathe. Liberal pay for modern and up-to-date ideas on such a machine. Address A. L., Box 773, New York.

Inquiry No. 4369.—For makers of telegraph and telephone instruments and supplies.

Manufacturers of patent articles, dies, metal stamping, screw machine work, hardware specialties, machinery and tools. Quadriga Manufacturing Company, 18 South Canal Street, Chicago.

Inquiry No. 4370.—For makers of soda water generators.

WANTED.—To lease two 40 to 50 ton six wheel, or eight wheel or ten wheel, or Mogul locomotives. Send general dimensions and report on conditions with proposition. Georgia Iron and Coal Company, Chattanooga, Tenn.

Inquiry No. 4371.—For manufacturers of flexible shafts.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Inquiry No. 4372.—For makers of fancy woods for inlaying purposes.

Inquiry No. 4373.—For manufacturers of paper-making machines.

Inquiry No. 4374.—For a complete outfit for an electric light plant, also one for soda water works.

Inquiry No. 4375.—For makers of portable houses.

Inquiry No. 4376.—For makers of carbons for arc lamps, dynamo brushes, etc.

© 1903 SCIENTIFIC AMERICAN, INC

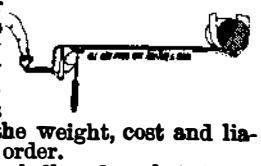
Inquiry No. 4377.—For makers of die stock cutters.

Inquiry No. 4378.—For manufacturers of nuts, short threaded bolts, etc., in large quantities.

Inquiry No. 4379.—For machines for grinding sawdust and shavings into an impalpable powder.

Simplicity and efficiency are the essential requisites of a mechanism intended for general use. This is especially true of typewriters which, up to the present time, have been extremely complicated and expensive.

The well known American Typewriter Company, of 267 Broadway, have perfected the simplest possible form of a type-bar. The key is on one end and type on the other end of one steel bar



which takes the place of twenty pieces ordinarily used and saves fully 1,200 parts. This greatly decreases the weight, cost and liability to get out of order.

Type-bars have a ball and socket joint, and the lightest touch at the key end gives a powerful blow at the type end.

In other respects the American is exactly like the $100 machines having ba l-bearing carriage, wheel escapement, universal keyboard, highest speed and manifolding power.

Several thousand of these machines have been sold in the past three years and the Company has exceptional facilities for manufacturing on a large scale.

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.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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.

(9067) C. N. writes: It has been asserted recently in a photo-magazine that the beam of light entering the lens of a camera during the exposure of a plate for 1-1000 of a second is 185 miles long. (1-1000 part of the velocity of light taken at 185,000 miles per second.) It is stated in support of the allegation that the light entering the lens during an exposure has "its origin in the sun, and the beam, or rather the multiplicity of rays, hit the object, are reflected therefrom, and ultimately reach the plate. Without contesting the explanation of the action of light, is the explanation a sound argument that the length of the beam is 185 miles? If not, is the length merely the distance of the object—say 50 feet from the camera? A. The statement as quoted from the journal is quite correct. As much light strikes the plates as light travels in the time of exposure. A second exposure, and 185,000 miles of light waves strike the plate. The light does not stand still between a plate and an object 50 feet away. It comes from the object all the time. It moves as fast from the object to the camera as it does anywhere in the air. And the action of the light is cumulative upon the plate; 185 miles of waves beat against the plate and affect it 1-1000 as much as 185,000 miles of waves would do.

(9068) H. L. F. says: Can a locomotive make better time on a high mountain than on the sea level, provided that the grade is the same in each case? It appears as though if air is rarer there would be less back pressure, and for that reason the steam would act more powerfully on the piston rod. A. Whatever advantage in steam pressure a locomotive would derive at a high altitude from the reduced pressure of the air would be met by the reduction of the quantity of oxygen in the air. If back pressure is reduced by the former cause, the amount of air needed to consume a certain weight of coal would be increased by the latter. We also think that the steaming qualities would be impaired on the mountain. We have not data of actual runs at hand, but should not expect any great difference between sea level and the altitudes attained by ordinary roads.

(9069) J. D. asks: 1. Can a small glass coherer for wireless telegraphy be made to work without the air being exhausted? What is the cost of making one? A. A coherer will work without exhausting the air, but will not be durable owing to the oxidizing of the grains of the metal in the air. The cost of the coherer unexhausted is not large; we cannot say just what it may be. 2. Can I use a small hand dynamo instead of an induction coil to get a spark in front of the coherer? A. A hand dynamo will not give a spark of the sort which an induction coil will give. To send even for a short distance, under a mile, will be best done with a coil giving at least an inch spark. 3. I passed a current from ten O. K. dry cells over the coherer tube, but could not get the bell to ring (a small door bell) except I brought both wires together. The tube was a small glass tube 1½ inches long, two copper wires and some nickel and silver filings. A. Ten or a hundred dry cells will not give any current across a piece of glass. 4. What size spark and what would be the cost of a coil which would enable me to send a message a mile? Please give the amount of wire to make an induction coil which would give a 2-inch spark, and any other useful hints regarding its construction will be anxiously looked for. A. For a 2-inch spark the dimensions should be as follows: Core, 9 inches long and 1 inch in diameter, No. 22 soft iron wire; primary coil, No. 14 magnet wire, two layers on the core; secondary, No. 36 silk-covered magnet wire, 2½ pounds; condenser, 60 sheets of tinfoil, 6 x 6 inches. The paper sheet, 7 x 8½ inches. For the construction of such a coil a book like Norrie's "Induction Coils" is almost indispensable.

(9070) A. N. asks: 1. How can I make a wireless telegraph? A. The set of wireless telegraph apparatus which is best adapted to be made by an amateur is described in the Scientific American, September 14, 1901. 2. I have 2½ pounds of No. 31 B. W. G. double-cotton-covered copper wire. Now I want to know how to use this wire to the best advantage in making an induction coil, not making it (the coil) any longer than possible. How much wire must I use in the primary coil, and size? Is paraffine wax as good to insulate the layers as shellac? Can oiled paper be used on a small coil of about ¼ inch? In making a coil, is it best to have the coil long and thin or short and thick? A. A wire as large as No. 31 is not to be advised for making an induction coil. It will, however, give some spark, but not as long as No. 36 wire would give. The data for a coil are fully given with mode of construction and figures and dimensions of all parts in Norrie's "Induction Coils," which we can send for $1 by mail. If you buy the book, you will find all the questions you have asked explained, and more which you will soon be desirous of asking as you go on with the work. 3. Is there any easy way by which B. W. G. may be changed to B. & S. wire gage, or B. & S. to B. W. G.? A. There is no relation between the B. W. G. and the B. & S. sizes of wire. The way to compare sizes is to have a copy of both tables and see the diameters of the sizes in each.

(9071) D. A. A. asks: What horse power could be developed with latest improved turbine, with stream of water filling 12-inch pipe with fall of 10 feet? A. A stream filling a 12-inch pipe does not signify the quantity of water flowing in any given time, which is essential in estimating horse power. You will find in Scientific American Supplement, Nos. 788, 789, 791, 805, 1049, a very complete series of articles on the measurement of water power and its development by water wheels and motors; 10 cents each mailed.

(9072) J. C. McC. asks: 1. Would like to know how I can estimate the lifting power of an electro-magnet. A. The usual formula for magnetic traction as given in Thompson's "Electromagnet" is that a magnet will lift 147 pounds per square inch of polar surface when there are 100,000 lines of magnetic flux per square inch of cross section of core of magnet. It will be easier for you to put the current upon the magnet and find how much it will lift. Or if you wish to work the matter out by theory, get Thompson's "Electromagnet," price $6, or Fleming's "Magnets and Electric Currents," price $3.50, and study it up. 2. Can the porous cups and carbons of Leclanche batteries be renewed? If so, how? A. The carbons of a battery never are exhausted. As long as they last, they are as good as ever. The material in the porous cup, the dioxide of manganese, becomes exhausted of oxygen, and is thus worn out. The porous cup is often filled with iron rust in its pores, and is usually thrown away when exhausted.

(9073) M. F. S. says: Will you please give, in an early number of the Scientific American, a receipt for polishing horns for hat racks, etc.? A. First scrape with glass to take off any roughness, then grind some pumice stone to powder, and with a piece of cloth wetted and dipped in the powder, rub them until a smooth face is obtained. Next polish with rottenstone and linseed oil, and finish with dry flour and a piece of clean linen rag. The more rubbing with the stone and oil, the better the polish. Trent sand is used in the Sheffield factories. It is a very fine and sharp sand, and is prepared for use by calcining and sifting.

(9074) J. F. R. says: Have you any articles in Scientific American Supplement showing the construction of a spark coil giving a spark of 2 inches or upward? Also an article showing an adjustable vibrator for same? A. Our Supplement No. 160, price 10 cents, gives full plans for a coil giving with ease a spark 1½ inches long. By winding a half pound more of wire on the secondary you should obtain a spark 2 inches long from the coil. A better proportioned coil with winding in sections for sparks may be found described in Norrie's "Induction Coils." These descriptions tell how to make vibrators as well as all the other parts of the coil.

(9075) J. W. H. says: Will you kindly tell me how to rid a house of cockroaches? A. Some years ago we had a cockroach powder analyzed and found it to consist of powdered borax 90 per cent; corn starch 10 per cent, and a little coloring matter. We think this will answer your purpose.

(9076) G. B. asks: 1. I have read that the earth has eleven motions. Please explain them. A. We have never seen the statement that the earth has eleven motions, and cannot explain them. It has more than eleven motions. It rotates upon its axis, causing day and night. It moves around the sun, causing the year. It goes with the sun in space. Of this and all other motions of the earth we are not conscious. It is moved by the attraction of the moon to and fro each month, some thousand miles or more. It is moved to a less degree by each of the other large planets, seven in number. This would make eleven motions, but there are others. It has recently been found that the earth shifts a little, so that the north pole of the earth seems to describe a path in the earth. The axis is not always in the same place. In addition we have the familiar motions of nutation, due to the change of position of the moon with reference to the ring of matter around the earth's equator, and precession of the equinoxes due to the similar positions of the sun. All these may be found given in any textbook of astronomy. Todd's "New Astronomy" is a reliable work upon the subject. 2. What were the two prize problems that were solved in 1687 and 1716 by Sir Isaac Newton? A. We cannot find that Newton solved any prize problems in the years stated. His *Principia* was published in 1687, and he became the most famous man of his time. In 1693 he published the method of fluxions. Perhaps it is to this that reference is made. In 1713 the final publication of the *Principia* as we have it occurred. Newton was then 71 years old. We doubt if he competed for any prizes after that date. 3. Give a formula for the pull toward the plane of rotation of a centrifugal engine governor, the single-arm type. A. The pull of centrifugal governor balls toward the plane of rotation is equal to their centrifugal force due to velocity, minus the weight of the balls, multiplied by the sine of the angle of the arms to the plane of rotation, if horizontal. 4. How can aluminium be powdered? A. Aluminium can be powdered by mechanical means, as emery, etc., are powdered. The various grades may then be separated by the water process. We do not know any way of precipitating aluminium chemically in a finely-divided state.

(9077) A. S. asks: I have some dry batteries that have partly run out, and I would like to know what I can put in them to strengthen them. A. Dry cells are usually thrown away when exhausted. You can punch a hole in the top and fill them with a solution of sal-ammoniac and water, and use them as wet cells till the zinc is used up. Some have charged them like storage cells and given them further life. The cost of this is probably more than the service obtained from the recharged cells. It is probably quite as cheap to buy new cells.

(9078) H. W. H. asks: Is there more expansion of a charge of air and gas when burnt or exploded in a closed chamber than in a jet in the open? What is the cause of a pipe snapping when steam is first turned in it? A. The result of the burning of a certain charge of gas and air is not dependent upon its being in a closed or open space. The same amount of heat and gases should be produced, whether the explosion takes place in the open or in a closed chamber. In the open air the resulting power cannot be used, and is soon dissipated into the space around. The noise produced when steam is turned into a cold pipe is due to the partial vacuum produced by the condensation of the steam. It is called a water hammer.

(9079) P. E. J. asks. When the elements cæsium and rubidium are placed in water they decompose it with the liberation of H, which takes fire, but does Cs give the flame a blue color, or Rb a red? In nearly all books on chemistry I find that the element erbium has never been isolated. On looking through Merck's Index, 1896, a catalogue of nearly every chemical known, I find it thus: "Erbium (E) metal, dark gray powder." Also tell me if this element is not like didymium, which has been split into different elements? A. Cæsium was named from the blue lines which its flame gives in the spectrum, of which there are two. The word cæsium means skyblue. Rubidium in a similar way gives two dark red lines. The word rubidium means dark red. Both are from the Latin.—With reference to erbium, Remsen's "College Chemistry" says: "A final statement cannot be made as yet. It is even questionable whether it is an element."

(9080) J. D. says: Will you kindly tell me how and what preparation is used in sticking pictures on glass so that it will not blister? Most of the art stores have for sale pictures that they call "medallions," which appear to be a piece of glass pasted over the front of a picture. I have endeavored to do this, and have wet my picture and coated the glass with a thin coating of thin white glue and also paste, and also with library paste. It looks very well while it is moist, especially after I have rubbed all the air bubbles out, but after it dries it appears flaky in places, as if the picture did not stick to the glass. I have also tried putting the picture on under water, thinking by this means to keep the air from getting between the picture and the glass. A. According to the Werkstatt, clean the inner hollow side of the glass thoroughly, pour on gelatine dissolved in boiling water, lay the picture on and pour on gelatine again, so that everything swims. Then neatly remove what is superfluous, so that no blisters result, and allow to dry. The following recipe is said to be still better: Gelatine, 16 parts (weight); glycerine, 1 part (weight); water, 32 parts (weight); methylic alcohol, 12 parts (weight). The mixture is prepared by causing the gelatine to swell in water, then dissolving it with the use of moderate heat, adding the glycerine, stirring thoroughly, and pouring the whole in a thin stream into the alcohol.

(9081) The I. L. & S. Co. ask: Can you furnish us the formula for a dry powder chemical fire extinguisher, such as is used to throw on fire to extinguish? A. 1. Alum 24 per cent, ammonium sulphate 52 per cent, ferrous sulphate 4 per cent. 2. Common salt 60 per cent, sal-ammoniac 60 per cent, sodium bicarbonate 80 per cent. 3. Sal-ammoniac 100 per cent, sodium sulphate 60 per cent, sodium bicarbonate 40 per cent.

(9082) A. G. S. asks: 1. Is there any way to make an electric automobile run by a 5 horse power motor, so that you could charge the batteries while making a run if you used two sets of batteries, or if you had three sets and have two sets charged all the time, while you charge the third, then throw one of the first set out, and throw the third set in the circuit to take the place of the one you threw out of circuit? A. The plan to charge a part of a storage battery of an automobile while the carriage is in use is not feasible. It would require a dynamo on the carriage and a battery capable of running a motor large enough to run the carriage and the dynamo at the same time. The dynamo must furnish current enough to charge nearly one-third of the battery while another third is running the carriage, and the last third is running the dynamo. That is, two-thirds of the battery is to run the motor, and one-third to be charged. If perpetual motion were possible this would be possible. But so long as there is always a loss of power by friction and other resistances the scheme will not work. 2. Is there any power lost in running machinery with belts, and if so what per cent? A. There is a loss by friction, which varies according to the conditions such as the size of pulley, etc. 3. Is there any power lost in the transmission of a current of electricity, and if so what per cent? A. Power is always lost in transmitting electricity. That is, power is required to drive an electric current through a wire. The loss depends upon the length of the wire. A dynamo of moderate size may lose as much as ten per cent. A large one will lose less. The line loss in a long line may be as much as thirty per cent. A motor will lose from five to ten per cent. 4. Can you boil machine oil or linseed oil without having an explosion? A. Oil may be heated without taking fire. Care is always necessary when heating any inflammable substance. 5. Have you a machine shop where you make experiments? A. We have adequate laboratory facilities at an institution of learning in this city.

(9083) C. S. N. asks: As the cause of my electric gas lighter failing to work, I found the connection between the wire from battery and pipe had become loosened. After removing the old wire and making a new connection, I found that the old wire had become silvered in appearance, as if it had been immersed in silver-plating solution. The wire was an ordinary copper bell wire from which I had removed the covering. I have four Gonda cells and 8-inch spark coil. The coil was on + wire between the battery and pipe connection. I afterward changed the spark coil to the — wire; leaving the + wire connected to gas pipe as before. Can you give me an explanation of the silvered appearance of the wire, and could the fact of my long-distance telephone being grounded by means of the gas pipe have anything to do with it? Which wire should be connected with the gas pipe, or does it make no difference? A. We have tested the coating upon the wire, chemically, as well as can be done with so small a quantity. It appears to be zinc. If the pipe to which the wire was attached was galvanized, this would indicate electrolysis, provided the wire was from the positive or carbon pole of the battery. The coating of the wire might be solder if any solder were in contact with the wire. It makes no difference which wire is attached to the gas pipe so far as the service of the bell is concerned. If there is a loose joint and electrolysis takes place, the wire is eaten off, which is attached to the zinc of the battery.

(9084) B. B. H. says. 1. I understand that electricity does not flow through the wire, but around it. Explain in what way wire acts as a conductor to electricity? A. An electric current of ordinary pressure, or voltage, flows through the metal of the conductor. It always excites a magnetic field around the wire, but the wire is in reality the conductor of the current. A discharge of very high potential, such as lightning, passes along the surface of a wire without penetrating the metal very deeply. It is this that your remark refers to, and not to an ordinary current of moderate voltage, as, for instance, any voltage up to 1,000 to 5,000, or any voltage used by man for power or light. All these flow through the metal of the conduc-

© 1903 SCIENTIFIC AMERICAN, INC