RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

ABDOMINAL REDUCING-CORSET. — S. BURNSTEIN, New York, N. Y. The more particular purpose of the invention is to provide a type of corset having portions, the general diameter of which can be contracted by degrees, and also having an auxiliary flap adapted to occupy different positions representing different diameters for the corset and provided with appropriate means located with reference to the position of this auxiliary flap.

Electrical Devices.

INSULATOR.—C. ROSENBERG and V. T. BAILEY, New York, N. Y. In the present patent the invention is an improvement in insulators such as used in connection with incandescent electric lamps, and has for its purpose to relieve the binding screws or posts of the strain incid nt to the stringing and the stretching of the wires.

TERMINAL FOR ELECTRIC WIRES.—B. MORGAN, Newport, R. I. The object of the invention is to provide a form of tip, whereby the liability of the tip becoming detached from the conductor is reduced to a minimum, in which extensive contact is made between the conductor and the tip, and in which the latter may be readily secured to or detached from a binding post or the like, without the aid of any wrench, clamp, or other tool.

REGULATION OF THE PERIOD OR INDUCTANCE OF HIGH-FREQUENCY CIRCUITS.—G. FERRIÉ, 51 bis Boulevard de Latour Maubourg, Paris, France. The invention consists in providing in proximity to the inductance windings other conductors, preferably surrounding said windings and in short-circuiting a portion of such other conductors, the inductance being regulated by varying the relative position of the inductance windings and surrounding conductors and the position of the short circuit.

Of Interest to Farmers.

VENTILATOR FOR HEN-HOUSES OR BROODERS.—G. H. LEE, Omaha, Neb. While the ventilator is intended to be used particularly in connection with brooders and hen houses, it is capable of general use as a ventilating device, that is, where an inner compartment or chamber is to have its air refreshed through communication with the outer air.

WAGON-BODY AND HAY-RACK LIFTER.—W. C. WILSON, Livermore, Iowa. The invention consists in an improved construction of wagon body lifter, in which special provision is made for bringing down the body in proper relation to the running gear when it is to be reconnected, thus avoiding all heavy lif ing and making the reconnection of the wagon body to the running gear automatic as well as its disconnection from the running gear.

BEEHIVE-CARRIER.—A. C. BROVALD, Finley, Wis. In this patent the wheel barrow is equipped with novel grasping and holding devices for the hive. The cen ers are so arranged hat when the barrow is brought to an approximately upright position adjacent to the hive, certain members on which the hive rests are centered beneath the same; whereupon the arms for grasping the hive and which are manipulated from a point near the handles are brought into proper position to securely engage the hive and properly supported in the barrow when transported.

Of General Interest.

SAFETY-RAZOR.—T. F. CURLEY, New York, N. Y. The object of this inventor is to provide a razor arranged to permit of conveniently placing the blade into accurate position on the frame or holder relative to the guard thereof, and to provide a back plate for giving the desired rigidity to the blade and which back plate can be readily opened or closed and securely locked in place when in a closed position.

HOSE-NOZZLE.—F. J. RADLER, Jersey City, N. J. The connections of this nozzle are particularly adapted for use with hose on fire water-towers, stand-pipes and the like, the object being to provide a nozzle with connections whereby it may be readily turned in various directions, the connections being so constructed that no leakage can occur at the joint.

PROCESS FOR THE MANUFACTURE OF RESINOUS PRODUCTS CAPABLE OF REPLACING NATURAL RESINS.—L. GROGNOT, 18 Rue Labat, Paris, France. Phenols have the property of combining with the aldehydes under he influence of catalytic agents (such as mineral or organic acids, alkaline or other bases) for forming the various resins analogous to the natural resins in their properties. Nevertheless the action of these catalytic agents is difficult to control and beyond what is required. The present process avoids this defect.

MOLDING-FASTENING.—A. C. GODDARD, New York, N. Y. Metal doors, windows, and other similar structures are comprised in this invention, and the object is to provide a fastening for securely fastening molding and like parts in place without the use of screws. rivets or similar fastening devices, and without showing the fastening means on he outside of the molding or marring he exterior face thereof.

SHAVING-SOAP CAKE.—L. C. BENITZ, Philadelphia, Pa. A conical cavity is worn down by the brush in the center of the top of a soap cake, and the shaving brush finally comes in contact with the bottom of the cup in which the cake is held, and at last there remains nothing of the cake save a thin ring which soon breaks up into pieces or sections that are thrown away and thus wasted. The invention provides a cake of improved shape that will wear so as to avoid the loss incident to the use of the old form.

WATER-STORAGE SYSTEM FOR USE IN EXTINGUISHING FIRES.—L. H. SONDHEIM, New York, N. Y. The object here is to provide a system whereby water may be stored in such manner as to be available in the event the usual water supply should fail, as for instance, by the breakage of the water mains by earthquake shock, or such a temporary reduction of the normal pressure occurs in the mains at a given point as to cause an inadequacy in the supply.

WOVEN FABRIC.—H. SARAFIAN, Yonkers, N. Y. The aim of the invention is to provide a woven fabric, which is soft in tread, and provided with an exceedingly strong yet flexible back, thus rendering the fabric very serviceable for use as a carpet, rug or the like. It relates to fabrics such as shown and described in Letters Patent formerly granted to Mr. Sarafian.

Hardware.

COMBINATION-TOOL.—W. WRIGHTSMAN, Evansville, Ind. This tool embodies a center punch, a try-square and a linear scale. An object of the invention is to produce a device having a center punch, and arranged so that when it engages a body of circular cross-section in a suitable manner, the center punch can be positioned at the cross-sectional center of the body.

Heating and Lighting.

BOILER-FURNACE.—J. O'NEILL, New York, N. Y. The intention in this instance is to provide a furnace, more especially designed for water-heating systems, and arranged to utilize the heat from the burning fuel to the fullest advantage, to render the furnace exceedingly strong, and durable by constructing the same mainly of sheet metal and brick-work and to allow convenient cleaning of the furnace of soot whenever desired.

Household Utilities.

STRAW-BURNING STOVE.—H. C. RUGGLES, Moro, Ore. The invention relates to stoves for use in burning a highly combustible substance as hay or straw. The aim is to produce a stove which is simple in construction and provided with improved means for insuring a good draft and for controlling the draft.

WASHBOARD.—LOUISE H. PERCY, Philadelphia, Pa. The invention has in view the provision of means for supporting the board over the tub in a substantially horizontal and slightly depressed position. Its use prevents backache from bending, prevents injury to the hands, such as callous knuckles and injuries resulting from pins, broken buttons, etc. The finest or coarsest article may be cleaned in one-half the time and in a manner saving long boiling and the use of chemicals.

PORTABLE REEL GAS-OVEN.—G. B. MEEK, New York, N. Y. The object here is to prevent heating of the exterior wall by the heat of the gas burners employed in the baking. This is accomplished by forming each of the walls or wall sections with an inner packing of asbestos or other suitable non-heat-conducting material, and outside of the asbestos lining, there is provided a plurality of air passages, so arranged that an automatic circulation of air is maintained.

Machines and Mechanical Devices.

WATER-MOTOR.—H. BROWN, Brandt, Ohio. The purpose in this invention is to simplify the piston construction by making the cylinder from the wall of the chambers between the piston faces, to mount the inlet and exhaust ports in the cylinder wall and to provide mechanism intermediate the piston faces for operating the valves.

SAWMILL.—F. O. WILLEY, Newport, Ind. The object of the inventor primarily is to provide in connection with a saw mill or other like cutting machine a variable feed, which is under the absolute control of the operator, and which will give every possible rate of travel to the feed carriage within certain limits in either direction.

AUTOMATIC STOP FOR TALKING-MACHINES.—R. B. SMITH, New York, N. Y. The more particular purpose in this case is to enable a moving member carried by the machine and having a travel related to the progress made by the record to play, to act upon and operate one or more brakes for the purpose of stopping the machine promptly when the playing of the record is completed.

DRIVEN WHEEL.—J. T. MOORE and W. J. FLEMING, Evansville, Ind. The object of the improvement is to provide a driven wheel wherein the momentum of the driving wheel at all times, when in action, predominates over the driven wheel, and the wheel is especially adapted for use as the driven wheel of a band saw or band knife machine but may be used in any loose pulley where a minimum momentum is desired.

CAMERA ATTACHMENT.—E. L. HALL, New York, N. Y. There is provided in this invention a construction of a camera finder furnished with an adjustable hood that is applicable to any type of camera and which can be expeditiously and conveniently fitted thereto, and which is also capable of being readily removed.

PANTOGRAPHIC SHIFTER.—H. L. FALCO, New York, N. Y. The invention relates to printing and arts allied thereto, the more particular object being to provide means for readily shifting a printing film or the like, for the purpose of multiplying the design carried by the film. The mechanism is a system of levers for use in moving the printing film frame and mechanism for guiding the operator as he actuates the system of levers by hand.

Railways and Their Accessories.

RAILWAY-SIGNAL.—M. M. KANE, Montgomery, Ala. This signal is for use in preventing collisions or accidents caused by open switches. The object of the inventor is to construct a signal or semaphore in such a way that it may be readily operated so as to display different colors indicating whether the track is clear or not.

TRACK-SANDER.—J. SCHMITZ, San Francisco, Cal. The aim of the invention is to provide a simple and efficient track sander, which can be applied to railway rolling stock of various kinds, which is inexpensive to manufacture, and by means of which sand can be distributed in a plurality of directions and delivered to the track at a plurality of points.

TICKET OR RECEIPT CUTTER.—G. McN. ROSE, JR., Nashville, Tenn. The invention is an improved device for use in cut ing and thus dividing receipts, or tickets, given for cash fares paid by passengers on railway trains. It is embodied chiefly in he form, arrangement and adaptation for adjustment of the several coacting cutters. The device may be quickly and easily adjusted.

Designs.

DESIGN FOR A GLOVE.—I. OLIVER, New York, N. Y. The glove is formed with a hand and a gauntlet portion. The latter is split from the junction of the hand portion therewith to its free end, on the side adjacent to the little finger and the sides of the split are snap fastened. The wrist portion is split from he beginning of the palm upwardly and the sides of the split are provided with buttons and button holes.

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.

Notes and Queries.

Full hints to correspondents were printed at the head of this column in the issue of November 14 or will be sent by mail on request.

Attention has been called by several correspondents to the answer to Query 11007, regarding the properties of aluminium. The editor must say that the latter part of the answer is not entirely justified by the facts in the case. The compounds of aluminium are not to be regarded as poisons and are simply adulterants of food. For this reason some have condemned the use of aluminium dishes, but they are no worse in this respect than tin, if as bad, and excepting he caustic alkalis, the amount of action of these chemicals of foods upon the aluminium is so small that the salts formed cannot be sufficient to do harm.

(11033) B. T. asks how to make buff wheels. A. Turn up the wooden disk to form the wheel on the mandrel on which it is to run. Cover the periphery of the wheel with good glue, prepared as for gluing wood, stretch the leather around and confine it with shoe pegs driven in about 2 inches apart. When dry turn off true with a sharp chisel. Give the leather a coat of glue and roll it in emery, so as to make it retain it by being imbedded in the glue. Let the wheel dry until the glue is hard and it is ready for use.

(11034) C. L. F. asks how to preserve bird-skins. A. Make an incision from the breastbone to the vent; with a small piece of wood work the skin from the flesh. When the leg is reached, cut through the knee joint and clear the shank as far as possible, then wind a bit of cotton wool on which some arsenical soap has been put round the bone; do the same with the other leg. Now divide spine from root of tail, taking care not to cut too near the tail feathers, or they will come out. Next skin the wings as far as possible and cut off. The skin will now be entirely clear of the body. The skin must now be turned inside out and the neck and skin gently pulled in opposite directions till the eyeballs are fully exposed. The whole of the back of the head may be cut off and the eyes and brain taken out and their places filled with cotton wool. The whole skin should be rubbed well with arsenical soap or plain arsenic, and the neck returned to its natural position, when, after filling the body with a little dry grass or wool, the job is done. It is very easy, and the skin of a bird is much tougher than one would suppose, though, of course, they vary, the night-jar being very thin, while humming birds are fairly tough. All the apparatus required is a sharp knife and a pair of scissors, or, for large birds, a strong pair of nippers to divide the bones.

(11035) C. L. asks how to lace belts. A. The ends of a belt should always be cut off square, not guessed at by the eye, but laid off with a tool. The holes ought to be made with a small punch at a proper distance from the end; the size of the holes and the distances of them depending on the width of the belt. The use of an awl is reprehensible, for the holes are apt to be made irregular by it, and much larger than there is need of. The end of the lace should be tied with a square knot in the middle of the outside, for the corners of the belt where it is cut are most exposed and apt to whip out. Tying a belt lace does not look so neat as where the ends are put through an incision, but tying saves the belt from having extra holes made in it. The laces ought to be of the same thickness from end to end, or as nearly so as possible. It often happens that laces have very thin spots in them; such should be kept for short belts, and never used for long ones. Moreover, the holes must be made at equal distances apart and not too many of them. Every hole weakens the belt, and none that are not absolutely essential should be cut. All new laces, as well as new belts, should be stretched by hanging weights on them before they are used; petroleum, sawdust, resin, and similar substances should never be used. When a belt gets harsh or dry, neat's-foot oil is the best thing to apply to it.

(11036) C. M. S. asks: 1. Why does not an arc lamp short-circuit a current or cause a live wire, the same as when the two wires leading from the generator are touched together and pulled apart, thus making an arc? A. The carbons of an arc lamp do not short-circuit the current because he resistance of the coils in the lamp cut the current down to the number of amperes needed to light the lamp. 2. Is there any form of a rheostat used in the ordinary arc lamp? A. There is a rheostat in all arc lamps. 3. Please send me one of the SCIENTIFIC AMERICAN SUPPLEMENTS showing the construction of an electric furnace. A. Our SUPPLEMENT 1182 contains a good article upon the construction of an electric furnace.

(11037) K. G. C. asks: Owing to the precession of the equinoxes, is the apparent diurnal motion of Polaris around the pole of the northern celestial sphere describing now a larger or a smaller circle than formerly, or in other words, is the star approaching or receding from the actual pole? A. At present the distance of Polaris from the North Pole is about one and a quarter degrees. At the time of the Star Catalogue of Hipparchus, it was 12 degrees distant from the pole. It will approach the pole for the next hundred years, at which time it will be within a half degree of the pole. After that time it will recede from the pole, or rather the pole will recede from the star.

(11038) L. C. S. writes: 1. As I understand it the resistance is what makes the field coil get hot. In order to avoid the heating more wire is added; now, if resistance is what heats the coil, how do you account for the coolness of the fields after adding more wire, consequently more resistance? A. Your statement that resistance causes the heating of an electric circuit is less than half right. The exact statement is that the heat developed in a circuit is directly proportional (1) to its resistance in ohms, (2) to the square of the current in amperes, (3) to the time that the current flows in seconds. Now one ampere flowing through one ohm develops 0.24 calorie in one second. Putting these facts in a formula we have: Heat in calories $= 0.24\ C^2Rt$. It can now be seen why the heating of a coil can be remedied by adding more wire. The increase of resistance cuts down the amperes in the same ratio as the increase. But the reduction of the amperes affects the heating power in the ratio of the squares of the amperes. Thus, if the resistance were doubled the amperes would be halved, but the heat produced would be reduced to one-fourth of what it was, since the square of $\frac{1}{2}$ is $\frac{1}{4}$. 2. What is the cause of the humming in the field coils and pole pieces of an induction motor when the armature does not revolve, but the current is passing through the fields? A. The alternations of an electric current produce vibrations which are heard as sound. These can be heard near an arc light run by an alternating current, or near an alternating electro-magnet. 3. What changes are necessary to reverse the running of an induction motor? Crossing the positive and negative wires at the binding posts will not do it. Of course, merely reversing the main wires will produce no effect upon the direction of rotation of a motor. If the induction motor is two phase, the direction of rotation will be reversed by changing the two leads of either phase. If it is three phase, it will be reversed by changing any two of the leads. The different phases are a fraction of a period behind each other, and the direction of rotation depends upon the direction in which the phases lag behind around the rotating part of the motor, whether clock-wise or contra-clock-wise. To reverse the motor the direction of the lag in phase must be reversed. 4. Would it be possible to illustrate and explain the induction motor in the SCIENTIFIC AMERICAN some time in the future? A. The induction motor has been fully treated in several books recently published: Oudin's "Polyphase Apparatus," price $3 by mail; Thompson's "Polyphase Currents," price $5 by mail. These, with Thompson's "Elementary Lessons," price $1.40, will put you in possession of quite a complete library of the subject at present.

(11039) R. W. asks for a rough method of estimating the horse-power of a steam engine. A. Multiply the square of the diameter of the cylinder in inches by 0.7854, and this product by the mean engine pressure, and the last product by the piston travel in feet per minute. Divide the last product by 33,000 for the indicated horse-power. In the absence of logarithmic formulæ or expansion table, multiply the boiler pressure for ⅝ cut-off by 0.91, for ½ cut-off by 0.85, ⅜ cut-off by 0.75, 3-10 cut-off by 0.68. This will give the mean engine pressure per square inch near enough for ordinary practice, for steam pressures between 60 and 100 pounds, always remembering that the piston travel is twice the stroke multiplied by the number of revolutions per minute.

(11040) H. B. asks for a formula for insulating material. A. Linseed oil, 2 parts; cotton seed oil, 1 part; heavy petroleum, 2 parts; light coal tar, 2 parts; Venice turpentine, ½ part; spirits of turpentine, 1 part; gutta percha, 1-6 part; sulphur, 2 parts; heat the oils separately to about 300 deg. F.; cool to 240 deg., and mix in the other materials, the sulphur last. Heat to 300 deg. F. for about an hour or until the mixture becomes pasty, and on cooling is soft and elastic.

(11041) F. W. B. says: My boat is 20 feet long by 4 feet 5 inches wide, with easy lines, and my engine is supposed to be a high-speed double-cylinder opposed motor, bore 4 inches, stroke 4 inches, weight less than 200 pounds. It is said to give 4 horse-power at 500 R. P. M., and I would like to know what size propeller you would advise me to use, and what should be the proper pitch, and whether it should be two fluke or three. A. The size of a screw depends upon so many things, that it is very difficult to lay down any rules for guidance. However, the following rules are given sometimes for ordinary cases, where the size and power of the boat does not exceed a speed of 20 knots per hour. First: The "pitch" of a propeller is the distance which any point in a blade, describing a helix, will travel in the direction of the axis during one revolution, the point being assumed to move around the axis. The pitch of a propeller with a uniform pitch is equal to the distance a propeller will advance during one revolution, provided there is no slip. In a case of this kind, the term "pitch" is analogous to the term "pitch of the thread" of an ordinary threaded screw. Let P = pitch of propeller in feet. Then

$$P = \frac{10133\ S}{R\ (100-x)}$$

In which S = speed of boat in knots, R = revolutions per minute of propeller, x = percentage of slip. Assuming a speed of 10 knots per hour for your boat, with engine running at 500 R. P. M., and assuming a 10 per cent slip, we get a pitch of

$$P = \frac{10133 \times 10}{500\ (100-10)} = 2.25 \text{ feet.}$$

This is probably high, due to the fact that we assumed a low percentage of slip.
Diameter of propeller =

$$K\sqrt{\frac{I.\ H.\ P.}{\left(\frac{R \times P}{100}\right)^3}}$$

K = constant = 17.5. I. H. P. = 4. R = 500 R. P. M. P = 2.25. Therefore, diameter of propeller under these conditions, namely, four blades to the screw, made of cast iron, would be approximately one foot diameter. To allow for any increased slip which may occur, and other contingencies which may arise, we would not advise a screw less than 2 feet in diameter, calculated on a pitch of 2 feet. This will easily allow for any increased speed desired over 10 knots up to 15 knots per hour.

(11042) C. J. N. asks how to draw on glass. A. To write or draw on glass, it is necessary to impart to the surface a certain degree of roughness. This may be done by grinding or etching, but much more easily by applying some appropriate varnish. A good matt varnish is made by dissolving in 2 ounces of ether, 90 grammes of sandarac and 20 grammes mastic, and adding benzol ½ ounce to 1½ ounces, according to the fineness of the matt required. The varnish is applied to the cold plate after it has set. The glass may be heated to insure a firm and even grain. To render the glass again transparent, after writing upon it, apply with a brush a solution of sugar or gum acacia. Still better as a surface for writing or drawing is a varnish of sugar. Dissolve equal parts of white and brown sugar in water to a thin syrup, add alcohol, and apply to hot glass plates. The film dries very rapidly, and furnishes a surface on which it is perfectly easy to write with pen or pencil. The best ink to use is India ink, with sugar added. The drawing can be made permanent by varnishing with a lac or mastic varnish.

(11043) W. F. J. asks how to make waxed paper on a small scale. A. Place cartridge or other paper on a hot iron and rub it with beeswax, or brush on a solution of wax in turpentine. On a large scale it is prepared by opening a quire of paper flat upon a table, and rapidly ironing it with a heavy hot iron, against which is held a piece of wax, which, melting, runs down upon the paper and is absorbed by it. Any excess on the topmost layer readily penetrates to the lower ones. Such paper is useful for making waterproof and airproof tubes, and for general wrapping purposes.

(11044) S. C. H. asks: 1. What is the meaning of "ampere hour"? A. An ampere hour is a current of one ampere flowing for one hour. This phrase is exactly the same in form as "horse-power hour" or one horse-power used for one hour. 2. How is the amperage of any light or coil measured? A. The amperes used by a light or coil are measured by an ammeter put into the circuit so that the current flows through it. 3. What are the necessary steps for a young man to get a position as electrician on board an ocean liner? A. To become an electrician in any position, learn the business thoroughly and then apply for the place you want. Make it appear that you are the man for the place, and you will be likely to get it.

(11045) C. W. N. asks: 1. Approximately how large a spark coil is needed in wireless telegraphy to transmit through a distance of one mile, and how large for a distance of five miles? A. A coil giving a spark one inch long will transmit one mile over water. Over land the spark length varies with the character of the surface. A coil giving a ten-inch spark will answer for a variety of distances and circumstances. 2. In winding a large spark coil in which the greatest amount of wire is placed on the middle part of the coil, I have learned that it is customary to leave a space between the core and the wire at the ends. Is there any disadvantage in winding so that the wire lies directly on the main insulating tube? A. The space is left because of the greater tendency of the spark to jump from the secondary into the primary as the ends of the coil are approached. See Hare's "Construction of Large Induction Coils," price $2.50 by mail. 3. Is there any better insulator than paraffine for use in the construction of coils? A. Paraffine or a heavy oil is employed. 4. What is the best material to use in separating the sections of the secondary? A. Hard rubber disks. 5. Are there any means by which the voltage of the secondary wire of a coil may be determined? A. Widely different estimates are to be found of the voltage necessary to force a spark through various lengths of dry air. There is no rule giving a certain result for lengths beyond a few centimeters.

(11046) J. G. M. asks if cast iron balls and cones can be cast so as to wear, and if they cannot, kindly state what other material can be used besides steel. A. Cast-iron balls and cones are not suitable for bearings for vehicles or machines. Nothing is better than truly finished steel balls and bearings, hardened.

(11047) C. G. W. says: Will you kindly inform me through your Notes and Queries column how I can artificially color a meerschaum pipe? A. Ordinarily the pipe is boiled for coloring in a preparation of wax which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerschaum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather. Fill the pipe and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking, put fresh tobacco on the top and smoke to the same level. When once burnt the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschaum is prepared. The coloring is produced by action of the smoke upon the oils and wax which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

(11048) F. B. C. asks for rules for calculating speed of pulleys. A. The diameter of the driver being given, to find the R. P. M. of the driven; Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven. Ex.—24 inches diameter of driver × 150, number of revolutions, = 3,600÷12 inches diameter of driven = 300. The diameter and revolutions of the driver being given; to find the diameter of the driven, that shall make any given number of revolutions in the same time. Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter. Ex.—Diameter of driver (as before) 24 inches × revolutions 150 = 3,600. Number of revolutions of driven required = 300. Then 3,600÷300 = 12 inches. The rules following are but changes of the same, and will be readily understood from the foregoing examples. To ascertain the size of the driver: Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make and divide the product by the required revolutions of the driver; the quotient will be the size of the driver. To ascertain the size of pulleys for given speed: Rule.—Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of main shaft.

(11049) L. P. says: Will you give me a rule for finding the power a stream of water is capable of developing, when the size and drop of stream are known? A. The gross power of a fall of water is the product of the weight of water discharged in a unit of time into the total head, i. e., the difference of vertical elevation of the upper surface of the water at the points where the fall in question begins and ends. The term "head" used in connection with waterwheels is the difference in height from the surface of the water in the wheelpit to the surface in the penstock when the wheel is running. If Q = cubic feet of water discharged per second, D = weight of a cubic foot of water = 62.36 pounds, A = total head in feet, then $D \times Q \times H$ = gross power in foot pounds per second, and $D \times Q \times H \div 550$ = gross horse-power. A waterwheel or motor of any kind cannot utilize the total head H due to losses at the entrance and discharge from the wheel. There are also losses due to friction, etc., which place the average efficiency of waterwheels at about 75 per cent. Thus net

$$\text{horse-power} = 0.75 \times \frac{Q \times H \times D}{550}.$$

A head of water can be made use of in one or more of the following ways, namely: 1. By its weight, as in the water balance and overshot wheel. 2. By its pressure, as in turbines and in the hydraulic engines. 3. By its impulse, as in the Pelton waterwheel. 4. By a combination of the above. Referring to your question, we might say that it would be impossible to compute the horse-power of a stream of water when the size and head are known only. It would be necessary to measure the quantity of water which flows in a certain time. From this value Q could be determined in the formula, H could be measured, and the horse-power calculated. 2. A dynamo of what lighting capacity will a 3-horse-power gasoline engine run? A. A 3-horse-power gasoline engine would run a dynamo which could be operated on a lighting system carrying safely thirty 110-volt 16-candle power Edison incandescent lamps on a parallel circuit.

(11050) W. S. asks: Is it possible to consume all the oxygen in a confined quantity of air, viz., in a sealed iron pipe? A. Yes; by placing copper scraps in the pipe and heating the air in the pipe. The oxygen combines with the copper, forming a solid substance, and leaving the nitrogen uncombined.

(11051) C. M. writes: 1. I want to use a call bell in kitchen, battery to be in second story, from which run two wires. I want one push button in one room, one in second room, one in parlor, one in room down stairs, also one in dining room—five push buttons; how could I connect all buttons to work properly with only one bell? A. Carry one wire from one post of the battery to the bell, and from the other side of the bell a wire which shall branch through each push button to the other side of the battery. There will then be a complete and separate circuit through battery, bell and a push button. 2. I have one lamp, 8 candle power, 26 volts; could I light it with 14 cells improved standard Fuller battery? If so, how about the amperes it will use with 26 volts? A. You can light the lamp with 26 volts and 1 ampere of current. 3. How old is Mr. Edison? Also, who was the first that invented the electric light? I mean both the arc and incandescent lamps. A. Mr. Edison was born February 11, 1847. The first man who ever saw a spark from artificially excited electricity is said to have been Otto von Guericke in 1660. This was the first electric light. Sir Humphry Davy is credited with first producing an electric arc light in 1801. He had a battery of 3,000 plates, each four inches square, and used charcoal points made of wood, which he immersed in a mercury bath to increase the conductivity. With this he melted many refractory substances such as lime, platinum, sapphire, and diamond. The incandescent lamp was invented and perfected by Edison.

(11052) G. S. M. asks: Will you kindly let me know through the columns of your paper whether it is necessary for the temperature of the air to become 32 deg. F. or lower in order to produce a "white frost"? If not, please give reasons. A. It is necessary for the air to be at 32 deg. at the point where the white frost forms. It is not necessary for it to be at 32 deg. any distance above that point, even one foot above. The air is a nonconductor of heat, and may be several degrees warmer at a very little distance from the place where frost is forming. Vegetation and stones are better conductors of heat than is air, and hence become cooler than the air. Hence the dew is deposited on these, and the dew freezes to ice crystals, which is frost.

(11053) G. B. asks: We have tried different ways in cutting round glass rods of ½ inch to ⅝ inch without good results. Will you kindly advise best way of doing same? A. A glass rod is usually broken by making a cut on one side with a file or diamond and giving a quick bend at the point opposite to the cut. An improvement upon this method, although requiring more work, would be to make a cut entirely around the rod, and apply heat at the place where the cut is made. A red-hot piece of iron ⅝ inch in diameter will be the best for applying the heat to the rod. This may be fitted into a handle and used as a soldering tool is used in the hand.

(11054) J. P. A. asks: Comparing the chemical equivalents (atomic weights) given in Century Dictionary with those stated in text books on this subject, I find considerable difference in the figures. In some cases, the amounts are one-half for those of text books as against the amounts of Century Dictionary, while in other cases the differences of amounts are without definite proportion. If the determination of equivalents of elementary bodies has passed beyond the presumptive state, will you kindly advise me where the truth of this matter may be found? A. We should no more think of going to the Century Dictionary for the chemical equivalents, or atomic weights of elements, than we should think of going to an almanac seventeen years old. The Century Dictionary is most valuable in its field; but surely its field is not to give data which have been made far more correct since its publication seventeen years ago. The American Chemical Society has a committee upon atomic weights, and its figures reported from time to time are received as authority. Probably the most weighty name in connection with this work is that of Prof. F. W. Clarke, the chief chemist for many years of the United States Geological Survey. The determination of atomic weights has passed beyond the "presumptive stage," and the results may be found in any recent chemistry, such as Remsen's "College Chemistry."

(11055) A. M. asks: Please let me know what I would need to cause the sound of a clock to be transmitted a distance of, say, 150 feet by electricity. A. A simple device would consist of a telephone transmitter in front of the clock and a receiver at the point at which you would hear the ticking.

(11056) J. W. D. asks: 1. How long does it take to decompose one pound acidified water with a current of 100 volts? A. The time required to decompose a pound of water depends upon the amount of electricity used. If 13½ amperes are used at 100 volts it will require one hour. From this the time for any other current can be found, or the current for any other time. Water is decomposed with any voltage greater than 1.47 volts. You will see then that 100 volts is very much higher than is necessary. 2. How much does it cost to run a dynamo of 1,000 volts annually, including all expenses? A. That depends upon how many amperes the dynamo is to furnish. A dynamo giving 1,000 volts might be lighting a small village, or it might be lighting a large section of your city. The cost would not be the same in both cases.

(11057) G. G. S. asks: Please inform me as to the amount of current used by (1) ½-inch solid carbons, (2) ½-inch soft core carbons, (3) ⅝-inch solid carbons, (4) ⅝-inch soft core carbons, when used in a stereopticon on 110-volt alternating current circuit. A. Stereopticons are usually run with ½-inch carbons. We have never used one with a larger carbon. The ½-inch carbon will carry as high as 25 amperes, but 10 to 15 amperes is the usual current for such a lamp. A ⅝-inch carbon would carry 25-16ths as much current as a ½-inch carbon. The current would be proportional to the area of cross section of the carbon.

(11058) M. C. A. asks: Will you please inform me what size and how many feet of wire it will take to make an electric heater, 104 volts, say 5 to 7 amperes capacity? A. Seven amperes at 104 volts require 15 ohms of resistance. For a rise of 190 degrees F. the resistance rises 40 per cent. Hence about 5-7 as much wire will be needed if you wish to raise the temperature about to that of boiling water. No. 14 iron wire may be used. This has about 65 feet to an ohm. These are approximate numbers, and you can adjust the quantity to the temperature you wish to maintain.

(11059) J. O. D. says: Do you publish an Encyclopedia of Receipts and a book on patent laws? A. We recommend and can supply you with the "Scientific American Cyclopedia of Receipts, Notes and Queries," last edition containing 15,000 receipts, 736 pages, cloth bound, price $5. Our "Scientific American Reference Book," price $1.50, gives the patent laws. Always give full name and address when corresponding.

(11060) W. A. L. asks: Is there any other metal that can be used in a gravity battery besides zinc that will not dissolve? A. There is no way of obtaining electricity without using up some material. In the dynamo steam or water power is employed. In the battery we usually burn up zinc. It is just as impossible to produce electricity without a disappearance of some other form of energy as it is to heat a house and still have the coal, or cool a refrigerator and still have the ice.

(11061) C. S. J. asks: I wish to learn the cause of trichinæ in pork. A. The *Trichina spiralis* is a worm, a parasite of the hog. It is often found in great numbers in the flesh of these animals, in the encysted condition but still alive. If such meat is eaten without cooking thoroughly, the parasite is taken into the body and is rapidly propagated. The worm came originally from the rat. As hogs eat rats, they pass into the hog and thence into man. The only preventive is thorough cooking. This kills the trichinæ. No rare or underdone pork should ever be eaten. The risk is too great. The cost of immunity is so little, that anyone may be safe. Cook all pork thoroughly. 2. The cause of ptomaine poisoning by eating pork. How the poison can be prevented, and whether or not there is any way of detecting the presence of poison before using the meat? A. Ptomaines are formed by decomposition. If only fresh food is used, one will be safe from these poisons.

(11062) H. S. N. asks: I have been a reader of your paper for several years, and always enjoy reading it. I should like to submit a problem for solution. The problem is this: Several years ago I took a picture of a fast train while running, a Michigan Central flier, at a point about two miles east of Decatur. On development the plate showed a blur of 1-32 inch, i.e., the pilot did. I used a Vive extra rapid plate; the focus of the lens was 6 inches; the distance of the engine, the pilot, from the camera, 50 feet; the length of exposure, 1-100 of one second; camera was placed at an angle of 15 deg. with the track. What was the speed of the train? The camera was a Vive, 4¼x4¼, meniscus lens. A. The solution of your problem of the speed of the train is not difficult, at least so far as a sufficiently close approximation is concerned. Start with the fact that the image of the pilot moved 1-32 inch during exposure. Since the lens is 6-inch focus and the pilot is 50 feet away, the pilot moved across the line drawn through the center of the lens, 100 times 1-32 inch, or 3.125 inches, since 50 feet is 100 times 6 inches. And since the camera made an angle of 15 deg. with the track, we must divide the 3.125 inches by the sine of 15 deg. to find the distance the pilot moved during the exposure. This gives 12.07 inches as the distance the train moved in the time of exposure, or 1-100 second. In one second it moved 1,207 inches, or 100 feet 7 inches. This is a speed of somewhat over 71 miles per hour. As we said above, this is an approximate solution, but still not far from the result which an exact solution would give.

(11063) J. S. N. asks: Will you kindly answer in your column of Notes and Queries the inclosed questions relative to Roman computation? I suppose the matter is simple enough, but I have never come across any work explaining it, nor any person whom I have asked who could throw any light on the subject. A. Very little is known concerning the method by which the Romans used their very inconvenient notation for performing the ordinary calculations. They are supposed to have used the abacus for all except the most simple problems. This instrument is in common use now by all Chinamen, and it is not difficult for any one to see it used wherever these men may be found. A description of the abacus may be had from any encyclopedia. There was a rod for each denomination of numbers to millions, seven rods each carrying five balls. Another set of short rods corresponded to these, and had one ball sliding on each. They could thus count by fives and carry by tens. Other rods supplied their need for calculating ounces. Further than this their business did not require them to go; they never needed to divide the distance of the sun by the velocity of light. They died in total darkness in regard to both of these data of the universe. As we said at the outset, we do not know the detail of the method by which the Romans made their calculations. Their mode of writing numbers was not like ours by placing like denominations in the same column, but each letter had its significance, and each number could be added by itself on the abacus, since each rod meant a denomination.

(11064) W. D. W. says: Will you be kind enough to answer the following questions for one who is anxious to know and who has the greatest respect for your opinion on scientific matters? 1. Will electric wires, furnishing current for arc lights coming in contact with street trees, injure them, that is, when the insulating covering has worn off from rubbing against the branches of the tree? One of the tree and park commission of this city (Columbia, S. C.), a college professor and a very intelligent gentleman, insists that the electricity, that is, all that is taken by the tree in wet weather, will do no harm, while I hold to the opinion that it will ultimately kill it, and I wish to know which one of us is wrong. A. We have found by experience that leakage from electric arc light wires does injure the limbs of trees, particularly when the difference of potential is very great, although we do not believe it would kill the tree unless it was very young. 2. When a tree has been killed by escaping electricity, how long a time should elapse, in case the leak be located and stopped, before it will be safe to put another tree in its place? A. We see no reason why another tree cannot be put in at once if the ground has been removed. 3. Some very large oaks that are exposed to the smoke from the railroad workshops have died very recently, and I am anxious to know if the smoke is responsible for their dying. The shops have been there for a long time, and it seems that if the smoke is the sole cause the trees ought to have died long before this time. It may be possible, however, that loss of vitality on account of age may be partly responsible for their dying. A. If the trees are very close to the top of the smoke-stacks, we have no doubt that the trees have lost some vitality on account of it, as the products of combustion are very destructive to vegetable life, but the trees would have to be under the direct influence of the smoke.

(11065) C. D. asks: 1. What point below the freezing point do air, hydrogen, nitrogen, oxygen, become liquid? A. These temperature points are very nearly as follows in Fahr. degrees, below zero: Air, 312; hydrogen, 422; nitrogen, 317; oxygen, 297. 2. Please give me the address of a reliable company that sells chemicals and chemical apparatus. A. You had better deal with a firm in the city near your home than buy at a distance and pay transportation charges. Our advertising columns very often contain the advertisements of these dealers. We do not advertise dealers in the Notes and Queries column. 3. Where can I get some books on argon, helium, neon, krypton, and xenon, and give me the prices of them? A. We can send you many valuable papers on the rare gases of the atmosphere which have appeared in the SUPPLEMENT. Among them are argon, Nos. 1000, 1001, 1002, and others, price ten cents each; helium, Nos. 1056, 1057, price ten cents each. 4. What kind of chemical books, as organic chemistry, etc., so I can find liquid formene? What is formene? A. Formene is a tetrachloride of carbon CCl_4. Its preparation can be found in the Dispensatory. Its properties are those of an anæsthetic, similar to those of chloroform, soothing the pain of neuralgia and even causing insensibility. As it has been the cause of death also, it is not used by physicians. It is not a substance for an amateur to meddle with. 5. What are the uses of liquid air? A. At present liqud air is not put to any commercial use.

NEW BOOKS, ETC.

ANIMAL ROMANCES. By Graham Renshaw, M.B., F.Z.S. London: Sherratt & Hughes Co., 1908. 8vo.; 204 pp. Price, $3.

The book is illustrated by a number of most interesting half-tones showing some interesting beasts of Africa. One view of giraffes is most entertaining. The author has written a number of books on natural history and the present volume is a worthy successor to "Natural History Essays," "More Natural History Essays," "Final Natural History Essays."

DOCUMENTARY SOURCE BOOK OF AMERICAN HISTORY. 1606-1898. Edited with notes by William Macdonald. New York: The Macmillan Company, 1908. 12mo.; 116 pp. Price, $1.75.

The present volume has been prepared in response to a request frequently made by teachers who have used the author's "Select Charters," "Select Documents," and "Select Statutes," particularly designed for the course of instruction of an elementary or comprehensive character, all of which covers the colonial and the constitutional periods of American history in a single year. The book is filled with vitally important documents dealing with American history, such as the Navigation Act, the charters of various States, the Treaty of Paris, the Sugar Act, the Declaration of Independence, the Missouri Compromise, the Kansas-Nebraska Act, the Dred Scott Decision, the Civil Service Act. In all, there are 187 documents.

THE GARDENS OF ENGLAND IN THE MIDLAND AND EASTERN COUNTIES. Edited by Charles Holme. London and New York: John Lane Company, 1908. 4to.; 136 plates, 8 in color. Price, $3.50, postage 35 cents.

The publications of "The Studio" are noted for their sumptuousness, and the present volume is no disappointment. The illustrations are beautifully chosen and finely executed, the color plates being very remarkable productions. They are reproductions of water colors. The stately homes of England offer a never-failing field for the artist photographer. The text, which occupies some thirty-seven pages, is excellent.

AIR LIQUIDE, OXYGENE, AZOTE. Par Georges Claude, lauréat de l'Institut. Préface de M. d'Arsonval, membre de l'Institut. Paris: H. Dunod et E. Pinat, 1908. 8vo.; 400 pages, 149 figures. Price, $3.00.

This work comprises within its scope all the phases of its subject. It is divided into four parts. The first is devoted to the principles of the liquefaction of gases, with the history of the early experiments. The second part is upon the industrial liquefaction of the air, with the necessary discussion of the principles involved and the demonstration of the results which can be expected. The completeness of the work may be seen in the fact that it includes the American machine of J. F. Place, which was introduced to the public in the spring of 1908. The third part contains the many curious experiments which illustrate the wonderful phenomena of the realm of the absolute zero. The last part is devoted to that most important topic, the separation from each other of the gases of the air. It is in this part that the highest practical interest is centered, since it has become probable that liquid air will find its chief commercial value as a source of pure oxygen and nitrogen for manufacturing purposes, and not as a source of power or as a refrigerating agent. To all the departments of its subject the book is a valuable contribution.

THE COMING SCIENCE. By Hereward Carrington. With an Introduction by James H. Hyslop, Ph.D., LL.D. Boston: Small, Maynard & Co., 1908. 16mo.; 393 pages. Price, $1.50.

In presenting this work to the public the author must not be understood as indorsing or even as accepting all the views and theories that are advanced from time to time throughout the book. He offers these tentatively and merely as possible explanations for facts that, on the strength of existing testimony, he has assumed to be established. There are eighteen chapters, among which are "The Problems of Hypnotism"; "The Problems of Telepathy"; "The Problem of Sleep and Dreams"; "Modern Spiritualism"; "The Case of Mrs. Piper"; "The Nature of Apparitions"; "Experiments in Weighing the Soul"; "Premonitions." The book is arousing considerable attention.

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Eraser cleaner, blackboard, T. Adams.... 906,983
Ester, diaminobenzoic acid alkamin, A. Einhorn 907,017
Evaporator, O. Faller 907,109
Evaporator or heater, vacuum, J. E. & F. M. Dunn 906,517
Exerciser, A. Limoges 906,538
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Explosive, safety, N. Ceipek 907,007
Eyeglass case covering machine, A. Axell.. 906,672
Eyeglass cases, machine for covering, F. A. Tibbals 906,579
Fabrics, apparatus for stretching portions of, W. H. & C. H. Mitchell.... 907,081
Fair lead, E. L. Horton 906,802
Fare and ticket receptacle, portable, E. J. Vargyas 906,835
Faucet, self closing, Stevens & Cordley.... 906,665
Feed bag, A. Gaul, Jr.... 906,702
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Fence building machine, wire, M. A. Moss. 906,547
Fence compensator, wire, D. L. Mullinix.. 906,814
Fence post, H. F. Gehant 906,522
Fence reel, wire, S. Leigh 906,725
Fender. See Car fender.
Filing device, vertical, E. K. Sumerwell... 906,750
Film handling device, T. S. Graves.... 907,037
Fire damp, preventing the liberation of, A. von Groling 906,872
Fire extinguisher, chemical, H. A. Giseke.. 907,029
Firearm sight device, A. Swasey 906,751
Fish bait, J. B. Fischer 906,519
Fish hook, M. Greer 906,792
Flag ring, H. F. Schwartz 906,744
Floor dressing machine, Kraemer & Child.. 907,058
Flue cutter, J. W. Faessler 906,866
Fluid pressure engine, W. T. Lewis.... 906,808
Fly catcher, F. Korndoerfer 906,897
Fly paper holder, S. F. Monell 906,646
Fly paper holder, J. O. Forker 906,867
Fly trap, C. Roberts 906,935
Folding machine, G. Kleim 906,722
Friction coupling and brake, K. Maybach. 907,074
Fruit grader, H. A. Beekhuis 906,605
Fruit jar, G. H. Ricke 907,091
Furnace grate, J. D. Savery 906,823
Furnace regulator, J. Watson 906,590
Furnaces, apparatus for handling matte and slag of copper blast, G. K. Fischer.... 906,622
Furniture, knockdown article of, P. Morrison 906,909
Furniture support, E. Hackh 906,873
Garment, W. J. Newman 906,551
Garment, F. G. Rich 906,658
Gas machine, Schmitt & Neumann.... 906,940
Gas producer, J. Maly 906,812
Gas, producing, C. J. Greenstreet 906,793
Gas producing apparatus, F. E. Fink.... 907,110
Gas regulator, O. W. Lutz 906,810
Gas retorts, centrifugal machine for feeding, C. Eitle 906,785
Gases, apparatus for the analysis of, J. A. Caldwell 906,687
Gasket, J. C. White 906,761
Gasoline engine, C. S. Cole 906,773
Gate, J. J. Carrigan 907,006
Gear, multiple friction transmission, W. O. & J. D. Worth 906,844
Gear, running, B. W. Berry 906,996
Gear, speed change, G. O. Leopold.... 906,902
Gearing, A. Liese 906,063
Glass, apparatus for and method of manufacturing wire, Speer & Taylor.... 906,952
Glove, C. Bernard 906,856
Gocart, collapsible, Fay & Hopkins.... 906,621
Graining machine, A. H. Sherwood 906,946
Grappling device, H. L. Ingalsbe.... 907,056
Grate, F. Frechette 906,521
Grate, E. L. Long 906,641
Grate bar and fuel saver, J. M. Fleming... 907,111
Guide, J. R. Mitchell 906,543
Gun control, electrically operated, J. B. Ryan 906,939