RECENTLY PATENTED INVENTIONS.

Electrical Devices.

COMMON-BATTERY LOCK-OUT TELEPHONE.—M. P. BOONE, Peru, Ind. This invention consists in the novel construction and arrangement of the electromechanical parts and their coöperating circuits, in which when the line is clear and no party is talking a lock-out electromagnet at a subscriber's station connected between the earth and a wire leading through an impedance-coil to one side of the battery will be inoperative; but if a circuit be established between the two lines (through a telephone bridged on the line, for instance) then all the subscribers' lock-out electromagnets connected as described become operative to lock-out.

ELECTRICAL BINDING-SCREW OR TERMINAL.—M. BOUCHET, 22 Rue Alphonse de Neuville, Paris, France. The invention relates to an electrical binding-screw or terminal designed to facilitate the insertion of the conductor, and to completely protect its stripped end, to insure a perfect electrical contact, and to resist any stress to which the conductor may be accidentally subjected, the device if made principally of insulating material being capable of insuring a connection completely insulated from its surroundings whatever may be the diameter of the conductor clamped therein.

Of Interest to Farmers.

PLOW.—J. BEARD, Westport, Cal. In the present patent the invention refers to plows, and more particularly to the shape given to the same in order to enable it to cut a comparatively wide furrow with small draft upon the horse and without liability to foul when used in sticky soil. Upon actual trial Mr. Beard has found that the plow cuts as claimed above and without additional fatigue upon the part of the horse or other animal drafting the plow.

Of General Interest.

METALLIC WINDOW.—S. U. BARR, New York, N. Y. In the present patent the object of the inventor is the provision of a new and improved metallic window which is simple and compact in construction, completely air-tight and dust-proof, and arranged to permit convenient opening and closing of the sash.

SHOE-LACE FASTENER.—C. DÉLANO, Valparaiso, Chile. In the present patent the invention relates to boots and shoes and its object is the provision of a new and improved shoe-lace fastener arranged to securely hold the ends of the shoe-lace or tie-string in position without requiring the tying of knots.

FENCE.—J. C. CHIBER, Texas, Wis. The fence comprises the combination, with a base-piece having a series of holes in its side, and a post pivoted thereto, of fence-panels extending in opposite directions from the post and lapped upon the same, an eyebolt passing through the panels and the post and serving to secure them together, and a brace pivotally connected with the eyebolt and having its free end bent laterally at a right angle, whereby it is adapted to engage the holes in the base-piece.

COPY-HOLDER.—IONE HARTLEY, Nashville, Tenn. The invention in the present patent relates to devices for holding copy, and has for its principal objects the provision of a holder which will efficiently support copy in various forms and which may be readily adjusted to permit this or to meet the particular requirements of the user.

HOSE-SUPPORTER.—E. S. DORMAN, Plainfield, N. J. The aim of the inventor is to provide a supporter made entirely out of metal and in two pieces only, the construction being such that it is light, durable, and economic and will automatically fit to any leg without alteration or adjustment, and also to provide a device which will be cool when worn, and which will in no manner interfere with the circulation of the blood.

ORE-ROASTING KILN.—J. MCNAB, Catonsville, Md. In the present instance the invention is an improvement in ore-roasting kilns, and particularly in kilns designed for use in extracting sulfur from pyrites in the manufacture of sulfuric acid. The slabs forming the arches of the fire-places may be made of fire-clay, soapstone, or similar material.

HARMONICA OR MOUTH-ORGAN.—H. H. NEILSON, Perth, Ontario, Canada. The invention refers more especially to harmonicas or mouth-organs of that type in which a longitudinally-slidable mouthpiece is employed upon the instrument for the purpose of facilitating the playing as well as preventing soreness of the lips of the player by abrasive contact of the lips with portions of the instrument in the act of playing thereon. This class has many disadvantages and objections, such as, too much friction between instrument and mouthpiece, unpleasant tingling of the lips in playing, impairment of musical tones, etc., which Mr. Neilson's invention overcomes.

Hardware.

NUT-HOLDING WRENCH.—A. SCHURR, JR., Lloyd, Mont. An object of this inventor's improvement is to provide novel means for unscrewing the nut from an axle-spindle, so that the vehicle-wheel thereon may be removed for a lubrication of the axle-spindle, and also for a replacement of the wheel and nut on the spindle without directly handling the nut, thus avoiding soiling of the hands with the lubricant usually smeared over the nut.

Household Utilities.

BEDSTEAD.—C. H. GASAU, New York, N. Y. This invention has reference to improvements in bedsteads, an object being to provide a bedstead of novel construction that may be readily adjusted as to length, that may be quickly changed to form a crib, and that may be compactly folded for storage or transportation.

Machines and Mechanical Devices.

APPARATUS FOR CUTTING PLASTIC MATERIAL.—W. NIEBUR, JR., New York, N. Y. This device cuts plastic material into blocks or cakes. It is especially intended for cutting small cakes of butter from a large mass, and by means of the improvement cakes of any size may be rapidly cut without handling the cakes in any way. This is a decided advantage over the devices heretofore commonly employed for the purpose, since when the small cakes are formed handling of the cakes may tend seriously to misshape the cakes of butter. The present is a continuation of this inventor's copending application formerly filed.

TRANSOM-LIFTER.—J. W. NEFF, Morgantown, W. Va. The object had in view by Mr. Neff is the provision of means and devices adapted for working or lifting transoms which may not only be cheaply manufactured, but simple in construction and effective for easy working of pivoted or swinging transoms and windows in general having similar modes of attachment to their support.

Prime Movers and Their Accessories.

WAVE-MOTOR.—F. S. KEYES, Warren, Mass. In this patent the invention relates to apparatus for utilizing the energy of such movements in large bodies of water as waves. Its principal objects are the provision of an apparatus of this character in which the intermittent movement will be transferred into a continuous force by integrating the energy of successive waves and different parts of the same wave.

STARTING-CRANK FOR EXPLOSIVE-ENGINES.—W. H. SCHOONMAKER, Montclair, N. J. This crank is adapted especially for use in connection with internal-combustion engines in manually starting or "turning over" the same. Heretofore a common disadvantage and danger have existed in the backward turns of the engines, due to premature explosions during the starting operation, thus causing the crank or starting device to be violently torn from the hands of the operator and frequently injuring him. The invention overcomes this by providing a crank which as the engine "kicks back" automatically releases its connection with the engine, so that the engine-shaft may perform one or more revolutions without carrying the crank with it.

STEAM-BOILER.—G. O. STURTEVANT, Athol, Mass. Mr. Sturtevant's invention is an improvement in steam-boilers, and with his construction of boiler and support he is able to secure a maximum of heat, since all the radiation from the furnace-wall is utilized in heating the water. The radiation from the boiler is also utilized to a considerable extent.

Railways and Their Accessories.

RAILROAD-TRACK.—E. F. SEIDER, Upper Sandusky, Ohio. The inventor's object is to provide together with other improvements, novel devices for securing the rail-fastening spikes in connection with a metal rail-supporting plate. He is able to fasten a rail to a metal tie or sleeper, the latter to be a substitute for the wooden tie now generally employed. The tie prevents rails from spreading and rails may be laid more readily and uniformly, and require no gage in order to get proper width of track and keep it in line. Ballast can be packed around the tie so it will not creep or slide. Tie is made of any length, and where switches are run in the ties can be made any lengths and fasteners applied to any part of top plate to secure the rails.

SPEED AND DISTANCE INDICATOR.—E. SCHULTZ, Berlin, Germany. This invention consists in alternately and at equal intervals of time coupling and uncoupling a pointer to and from a rotating shaft, speed of the shaft being proportional to speed of traveling to be measured and the said pointer being adjusted to return automatically to its zero position under spring-pressure or by gravity or the like. More than one pointer can be used, in which case they are preferably so operated that one is coupled to the shaft at the moment at which another pointer is uncoupled from the latter. It may be used on railway-vehicles or other vehicles, also as a tachometer, or in cases where converting a rotary movement into rectilinear or circular movements rising from and falling to zero again.

Pertaining to Recreation.

TOY.—O. HAMMARLUND, New York, N. Y. The inventor provides a number of blocks having magnets therein. The blocks are preferably placed in a box, closable at will. In conjunction with the box he employs a device, a "detector-tube," which comprises a tubular body with a freely-mounted magnetic needle therein. By placing the blocks in the box and holding the detector over the same the needle will be actuated by the variously-positioned magnets in the box, and if the positions of the needles which correspond to the particular blocks has been memorized he can tell the locations of blocks within without removing the cover of the box.

Pertaining to Vehicles.

DUMPING-WAGON.—C. CARROLL, Chicago, Ill. In this case the invention is an improvement in dumping-wagons, and has for an object, among others, to provide a novel construction for supporting the screws and the traveling nuts for operating the lifting-rods connected with the body. The construction avoids exerting the weight of the load upon the screws in such manner as to bend the same downwardly, and will be found very effectual.

WHEEL.—P. J. CAESAR and E. SCHELL, St. Paul, Minn. The object in this instance is to construct a resilient wheel which will wholly or partly avoid the necessity of springs on the vehicle with which the wheel is used. This end is attained by a certain peculiar connection between the spokes and rim of the wheel, which involves a spring or cushion and which results in a resilient action between the spokes and rim.

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. 7243.—For manufacturers of springs.

For mining engines. J. S. Mundy, Newark, N. J.

Inquiry No. 7244.—Wanted, the names of a few exporters of rosin.

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

Inquiry No. 7245.—For makers of key ring tags and dies for marking the same.

Drying Machinery and Presses. Biles, Louisville, Ky.

Inquiry No. 7246.—For manufacturers of patented, mailable household articles.

2d-hand machinery. Walsh's Sons & Co., Newark, N.J.

Inquiry No. 7247.—For manufacturers of liquid carbonic acid.

Perforated Metals, Harrington & King Perforating Co., Chicago.

Inquiry No. 7248.—Wanted, the addresses of manufacturers of window sash locks.

Handle & Spoke Mchy. Ober Mfg. Co., 10 Bell St., Chagrin Falls, O.

Inquiry No. 7249.—Wanted, a compressed air fire alarm whistle.

Adding, multiplying and dividing machine, all in one. Felt & Tarrant Mfg. Co., Chicago.

Inquiry No. 7250.—Wanted, a portable acetylene gas mine lamp.

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

Inquiry No. 7251.—Wanted, the names of Brown machinery makers.

I sell patents. To buy, or having one to sell, write Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y.

Inquiry No. 7252.—For manufacturers of paper bag machinery.

WANTED.—Patented specialties of merit, to manufacture and market. Power Specialty Co., Detroit, Mich.

Inquiry No. 7253.—For manufacturers of furniture, also of goods which can be sold by mail.

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

Inquiry No. 7254.—For machinery used in making artificial granite or marble, as, for instance, cement blocks with a facing or veneering, or crushed marble which can be polished, same as solid marble.

Gut strings for Lawn Tennis, Musical Instruments, and other purposes made by P. F. Turner, 46th Street and Packers Avenue, Chicago, Ill.

Inquiry No. 7255.—For a device to measure and fill cans.

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

Inquiry No. 7256.—Wanted, the name and address of the makers of the steel termed "Invar."

Absolute privacy for inventors and experimenting. A well-equipped private laboratory can be rented on moderate terms from the Electrical Testing Laboratories, 548 East 80th St., New York. Write to-day.

Inquiry No. 7257.—For makers of a collapsible box or barrel to be used for crockery in large packages.

WANTED.—The patents or sole agency for Britain and France, of new machines and articles used in the Brewing and Allied Trades. Highest references given and required. State best terms with full particulars to "Wideawake," care of Street's Agency, 30 Cornhill, London, England.

Inquiry No. 7258.—For manufacturers of heavy felt, such as felt shoe soles are made of.

Inquiry No. 7259.—For manufacturers of large springs, such as are used for large music boxes, clocks, etc.

Inquiry No. 7260.—Wanted, prices of machinery, and also estimate on complete outfit for the manufacture of soap, to produce from 3,000 to 15,000 pounds a day of 10 hours.

Inquiry No. 7261.—For dealers in the Feheardsley Axle Cutter, or the Beardsley Axle and Thread Cutter.

Inquiry No. 7262.—For a machine for making round toothpicks.

Inquiry No. 7263.—For manufacturers of leather-board or other leather composition, likely to use powdered leather or leather turnings.

Inquiry No. 7264.—For manufacturers of bonbons and fondants.

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.

(9763) W. A. W. asks: Will you please inform me what number of watts will be consumed per hour by one T. H. constant-current series open arc on 50 volts and 9.6 amperes? A. A lamp consuming 9.6 amperes at 50 volts will in one hour consume 480 watt-hours (9.6 × 50). A watt-hour is one watt exerted for one hour. Your lamp uses 480 watts all the time it is lighted. Meters generally register watt-hours; 480 watts for one hour are 480 watt-hours. The question as you put it cannot be answered. Watts alone do not imply *time*. The time must be specified. Your lamp consumes 480 watts for any time it is lighted. In one hour it therefore consumes 480 watt-hours of electrical power. See Swoope's "Practical Electricity," page 218, price $2.

(9764) A. A. B. asks: I wish to ask through your paper if it is not possible for the manufacturers of incandescent light bulbs to complete the bulb without having to form the little sharp point on the rounded end? A. Incandescent lamp bulbs are made without any point upon the large end. They may be had from dealers in electric supplies.

(9765) C. L. H. asks: Can you tell me if any one makes an electric arc that could be used as a blowpipe? Something after the diagram sent. I wish to use it to melt small amounts of platinum. A. It is not difficult to arrange an electric arc blowpipe for melting metals, or soldering, in the manner your sketch shows. We should use the current which passes through the carbons for the magnet. Put the magnet of a few turns of wire in series with the carbons. Adjust the number of turns of wire and the distance of the magnet from the arc to produce the blowing power required. The apparatus is so simple that no special instruction is required for setting it up or operating it.

(9766) J. W. M. says: Would be glad to have you publish a decision of the following dispute: One party claims that a piece of iron, stone, or a piece of wood water-soaked until heavy enough to sink below the surface, would sink to the bottom of the ocean, no matter what the depth is at the point the object is placed in the water. The other party claims that they would remain suspended in the water at varying depths from the surface depending on their specific gravity, the iron even not reaching the bottom in the deeper parts of the ocean. A. A body which will sink at all in water will sink to the bottom. Sea water is compressed but 44 millionths by one atmosphere, and at higher pressures it is compressed less. Metals are more compressible than water. Hence it is seen that a piece of metal will have its density increased more as it sinks than the sea water will, and it will sink faster as it sinks deeper.

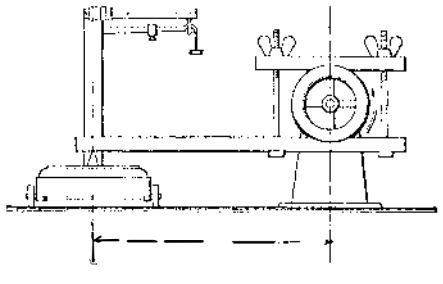
(9767) C. H. B. asks: Will you please tell me whether or not the angle formed by the sun's rays with the earth's surface at forty-five degrees of latitude, when the sun is directly above the equator, is forty-five degrees? I ask this question to settle a difference of opinion. A. In latitude 45 deg., when the sun is vertically over the equator its rays make an angle of 45 deg. at noon with a horizontal plane; but not at any other hour of the day.

(9768) J. E. B. asks: Please answer the following questions. They are of great importance to your reader. 1. Is force an inherent property of matter? 2. Is life a force, differing from gravitation or chemical affinity only in degree? Or is it an entity, separate and independent of matter? 3. Are life, soul, and form identical? If not, what is the difference? 4. Is the brain the reasoning organ, or the organ of that which reasons? 5. Is it the quantity or the quality of brain, or both quality and quantity of brain combined, that are responsible for the degree of reasoning power possessed by the individual? 6. Can animals be hypnotized? If not, why not? A. The questions which you submit are truly of great importance, but they can hardly be classed as scientific questions in a physical sense. They are rather metaphysical or philosophical, and one's answers would be very powerfully influenced by his general views upon philosophy. We should hesitate to project a discussion of these matters into our columns, since when one has given his answer, his an-

swer is simply his opinions, and another has as good a right to differ as to agree. We think it is generally held that force is not inherent in matter, since the same amount of matter can have different quantities of force at different times. For example, water in the forms of ice and steam possesses very different amounts of force from what it has as water. At absolute zero matter has no heat energy. It is probable that some hold the material view of life, that it is similar to ordinary forces, but that is not our personal view. We think too that the brain is the organ of a being who reasons, acts, and controls his own actions, for which he is held responsible both in law and morals. This view seems to us to be fundamental to the existence of the state and nation as well as to morality. So too we should say that quality of brain is more controlling than quantity, although very small brains are usually indicative of low intelligence. No balance can determine the qualities of a brain completely, any more than a scalpel can separate, or dissect life from the living being, and say, "I have found it." We believe that animals can be hypnotized.

(9769) J. W., writes: I always like to read the SCIENTIFIC AMERICAN, but I must take exception to the article, "The Pigmies of the Congo," of August 5. I cannot see how *you* can use such apodeictic statements regarding the long-exploded *theories* of evolution. I think that is not worthy of the SCIENTIFIC AMERICAN. Again, we have had now *ad nauseam* about reasoning cats. Animals (brutes) cannot reason, simply because they have no *rational soul*. The brain can *think* no more of itself than an ax can chop of itself—both are but instruments in the hands of an individual that *knows how*. A. We note with regret your criticisms of certain expressions in a recent article regarding pigmies, and also of the letters from correspondents showing remarkable instances of intelligence in animals. The printing of a letter from a correspondent does not in any way commit the paper to an indorsement of the views contained in the letter. The correspondence column is the property of the correspondents, and very frequently matter appears there to which the editor would personally most emphatically dissent. It seems to be the inalienable right of Americans to an expression of their opinions in print, and we are quite willing to grant some space to such free expression. We feel sure that good comes of it. However, with reference to the remarkable instances cited, we simply ask why deny to a quadruped a mode of action which is granted to a human being under similar circumstances. If a young child jumps up and opens a door in the manner the cat did, without any instruction, we should call it remarkable and an act of reason. The difference is not far to seek. The cat goes no further; the child does. Animal reason is narrow in range, and cannot be indefinitely developed. Nor can the child's, for that matter. But the human limitations are far beyond those of the animal. We believe that our view is shared by many scholars. As to the hypothesis of evolution, while we do not elect ourselves defenders of it or of any other special mode of the production of the present state of life on the earth, we must say that our acquaintance with the colleges and the professors of biology in them leads us to think that evolution is now more firmly believed by those whose studies give them the right to an opinion about it than it ever has been. We do not know a professor of biology who is not an evolutionist. Doubtless the pendulum of thought in this direction is not yet at rest, and will swing to and fro so long as mind remains active, but it seems certain that the old beliefs have no longer the hold upon scholars that they had previous to the publication of the "Origin of Species" by Mr. Darwin. We are not biologists, but as careful observers of the trend of science we think we rightly represent the state of present opinion.

(9770) J. B. A. says: In "Notes and Queries" No. 9544 asks for rule for calculating power of gas engines, and the answer gives the rule which answers a question that I would have asked sooner or later, but I wish to go a little farther and ask: How do you proceed in making the "actual brake test" for horse-power in gas engines? I bought an engine rated at 2½ horse-power, and they wrote me, after shipping, that the engine developed nearly 4 horse-power actual brake test. A. In order to make a brake test of an engine, it is necessary to construct on the flywheel of the engine a Prony brake, which acts on the principle of the one shown in the drawing. Two



pieces of wood are clamped about the pulley in such a way that the friction can be increased or decreased, as desired, by tightening the bolts. If the pulley is large, very often a number of ropes are used in place of the lower clamp in such a way that they may be tightened by means of screwing up a bolt from the pulley. One of the arms is extended a considerable distance, so as to allow its farther end to rest on a knife edge on the platform of a scale, or else be attached to a spring balance. In order to make tests, the screws of the brake are tightened until the engine is carrying the full load that it is able to carry without having its speed reduced too much. The pressure which the arm exerts on the platform scale is weighed, and the number of revolutions which the engine makes per minute is counted. During the test it is often necessary to have some means of applying water to the pulley to prevent its becoming too hot. The horse-power is figured by the following formula: Horse-power = 6.28 times the weight on the scale in pounds times the length of the arm measured from the center of the pulley to the knife edge in feet, times the number of revolutions per minute, divided by 33,000.

(9771) F. W. C. asks for a liquid polish for metals. A. Try the following:

Peroxide of iron (jewelers' rouge)	20 parts
Rotten stone	20 parts
Infusorial earth	20 parts
Oxalic acid	1 part

Palm oil sufficient.
Vaseline sufficient.
Oil of mirbane sufficient to perfume.

Pulverize and mix, so proportioning the palm oil and vaseline that you have a liquid sufficiently "thick" to hold the powders in suspension. We would remind you that the preparation of polishes, simple as it seems, is an art, and, like every other, requires a certain amount of practical experience, as well as a knowledge of the materials entering into the composition of the polishing mixture used, and of their preparation for use. To attain a high and uniform grade of polish, the materials must be reduced to a very fine and uniform powder. One single grain of the material larger or sharper than the rest will produce scratches that interfere with the finish given the metal. To make sure of your jewelers' rouge being free from dust and grit, prepare it fresh, as follows: Make a solution of iron sulphate (copperas), and another of oxalic acid. Add the latter to the former, as long as it throws down a precipitate. Filter off the liquid, and wash the residue on the filter with repeated charges of water, and dry. When dry, place in a suitable container, and heat gently. It soon ignites and burns until only an impalpable powder is left. This is the polishing material. The infusorial earth must be freed from sand, grit, etc., and reduced by grinding to a condition similar to that of the iron peroxide. The rotten stone and acid must also be powdered. If care and attention be given to these details, you can scarcely fail to get good results.

(9772) L. L. L. asks: Why do all dummy advertising clocks in front of jewelry stores read 8 o'clock and 17 minutes? A. The time on the dummy watches used by jewelers is the exact time when Abraham Lincoln was assassinated.

(9773) F. B. W. asks: Can you explain the phenomenon of the Aurora Borealis? A. We cannot explain the theory of the Aurora Borealis. The most we can do is to state the view held by the best scholars concerning it. To begin with, highly heated metals or carbon send out numerous minute particles with high velocities. These particles are called corpuscles, or electrons. They are known to carry charges of negative electricity, and to move with a very high velocity. It is reasonable to regard the sun and other stars at their enormous temperatures as sources of such particles, which move in mighty streams through the celestial spaces. When such particles strike a rarefied gas they render it luminous, as is seen in vacuum tubes. Such luminosity is associated with the discharge from the negative electrode of these tubes and has a name, —"cathode rays." In the upper air these corpuscles from the sun may well be considered to produce luminous effects, such as the auroral light. Arrhenius first suggested this theory of the aurora, but it is now quite generally adopted. Duncan's "New Knowledge," price $2, page 238, gives it in some detail. It is also to be found in Thomson's "Conduction of Electricity through Gases," price $4.

(9774) J. W. says: As a subscriber of your paper for a number of years, I take the liberty of asking a few questions in regard to the Corliss engine. First, what power would be developed with a 24 x 36 cylinder with 90 pounds steam pressure, speed 90 revolutions per minute? Also, 100 revolutions per minute; 115 revolutions per minute; 125 revolutions per minute? Same size cylinder and steam pressure to govern in each case. It has also been stated by one of our leading manufacturers in this city that the above engine equipped with an inertia shaft governor and double eccentric, running at a given speed per minute with 100 pounds steam pressure would develop 300 horse-power; while the same engine equipped with a double eccentric and an ordinary flyball Corliss governor would develop, with the same steam pressure and speed, 500 horse-power. To my mind this is absurd, but he is so positive, and a business man of some prominence, would you kindly give me your opinion? In other words, why should an ordinary Corliss governor give 200 horse-power more than an inertia shaft governor under the same conditions? What has the governor to do with the developing of power? A. The horse-power which an engine of any given size will develop at a given boiler pressure and speed will depend entirely upon the *point of cut-off*, or, in other words, upon the friction of the stroke during which steam is being admitted to the cylinder. It is possible to have the cut-off so early that the average pressure in the cylinder during the stroke will be nearly zero. On the other hand, it is possible to have the cut-off so late that the average pressure in the cylinder during the stroke will be approximately equal to the boiler pressure. The maximum economy with the Corliss engine is attained when the cut-off is about 30 or 35 per cent of the stroke; and the cut-off under maximum load should not be later than 40 per cent or 45 per cent of the stroke when an economical engine is desired. With cut-off at one-third of the stroke, the main effective pressure in the cylinder would be about 4-10 of the boiler pressure, or, in the instance that you mention, 36 pounds, and the horse-power at 90 revolutions would be

$$\frac{22 \times 24 \times 24 \times 36 \times 2 \times 36 \times 90}{7 \times 12 \times 3500} = 265 \text{ horse-power.}$$

At other speeds, the power would be in proportion to the speed; thus: At 100 revolutions, horse-power equals 294; at 115 revolutions, horse-power equals 339; at 125 revolutions, horse-power equals 368. At the steam pressure of 100 pounds, and the cut-off mentioned above, the horse-power would be 11 per cent greater. If the cut-off comes later in the stroke than estimated above, the mean effective pressure would be greater and the horse-power correspondingly greater. It is, therefore, perfectly possible that the statement made to you by the manufacturer to whom you refer is entirely correct. The range of cut-off with an inertia shaft governor is not nearly as great as the range which is possible with the ordinary flyball governor. The latter type of governor might easily permit a cut-off sufficiently late to allow the engine above mentioned, at a boiler pressure of 100 pounds and a speed of 100 revolutions per minute, to develop 500 horse-power. With this late cut-off, however, the engine would not be wroking with great economy.

(9775) E. E. asks: How is the focus of a concave lens determined? Is it the radius of a circle, or half the radius of the curvature? Please inform me as to both plano and double concave. A. All foci of concave lenses are virtual. For a biconcave lens of glass, whose index of refraction is 1.5, with the same radius of curvature on each face, the principal focal length is equal to the radius of curvature. For a plano-concave lens of the same glass, the principal focal length is equal to twice the radius of curvature. In these respects the concave and convex lenses agree, excepting that the focal length of concave lenses is negative. The formula for determining focal length of concave lenses is $\frac{1}{f} = \frac{1}{p} - \frac{1}{p'}$.

ELECTRIC LAUNCH MOTOR.—THE design in this paper is for a motor of unusual simplicity of construction, which can easily be built by an amateur at small cost. It is intended for a boat of about 24 feet over all and 4 feet 6 inches beam, drawing 18 inches, and is capable of propelling such craft at a speed of 7 miles per hour. Illustrated with 21 cuts. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 1202. Price 10 cents by mail, from this office and from all newsdealers.

NEW BOOKS, ETC.

THE STORY OF THE CONGO FREE STATE. By Henry Wellington Wack, F.R.G.S. New York and London: G. P. Putnam's Sons, 1905. 8vo.; 125 illustrations; pp. 643. Price, $3.50.

The present voluminous, but extremely interesting work is from the pen of an American who, as a student of mid-African affairs for the past seven years, and a close observer of the rapid progress toward complete civilization now being made in that part of the world, feels it to be his duty to lay before his countrymen the true and complete story of the conception, formation, and development of the Congo Free State. The motive prompting the writing of this book, which is of a character such as to have entailed much laborious and careful work, is to be found in the fact that during a period of several years there has been an organized campaign against the Congo Free State. The author, who is a Fellow of the Royal Geographical Society and a member of the New York bar, was in a position, because of a residence of several years in the United Kingdom, to observe the development of this movement. In the course of an interview with the King of the Belgians, the author frankly stated that he wished to have access to all the documents of the Congo administration office, for the purpose of writing an impartial book that would place the public in possession of the true facts regarding the affairs of the Congo. The King gave the author access to the offices of the Congo administration, where many weeks were spent in translating and copying documents. That the work is an impartial one may be judged from the fact that it is written by an outsider to the controversy, and that neither the manuscript nor the proofs were submitted to any person connected either directly or indirectly with King Leopold, the Congo Free State, or the Belgian government.

OUR STELLAR UNIVERSE. A ROAD-BOOK TO THE STARS. By Thomas Edward Heath. London: King, Sell & Olding, Ltd., 1905. Price, $2.

The author of this book, while converting for his own information the parallaxes of a long list of stars from seconds of arc to light-years, discovered a very suitable scale for stellar differences. After collecting all the information obtainable as to stellar parallaxes and magnitudes, he has written this small