

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM ENGINE.—John N. Kemmerer, Loganton, Pa. This invention provides a novel mechanism to apply power to the crank shaft, levers arranged side by side having a sliding connection with the crank, one of the levers being pivotally secured at one side of the shaft and the other at the opposite side, with operating devices to rock the levers, thus overcoming dead centers and increasing the power. Improved throttle devices are also provided for use in connection with several steam cylinders and steam channels leading to their opposite ends, so that steam may be admitted to the inner end of one cylinder and the outer end of the other and *vice versa*, there being likewise improvements in the valve gear for operating and controlling the valves of the different cylinders.

SPARK ARRESTER.—Langford C. Mabie, Richmond, Va. This is an improvement for locomotive and other high pressure engines designed to entirely eliminate from the products of combustion all sparks and cinders and carry them to a place of temporary deposit, also carrying off the thick black smoke. Within the stack is a novel construction and arrangement of two freely revolving wheels having radial blades set at an inclination to the plane of the wheel like a windmill wheel, the inclination of the blades of the two wheels being reversed to give them revolution in opposite directions, separating, by centrifugal action, the sparks and cinders from the blast at two different points.

CUT-OFF GOVERNOR.—Levi O. Harris, Cadillac, Mich. This is an automatic device for steam engines, designed to secure an economy of fuel and the more steady running of the engine. Within a cylindrical casing communicating with the steam chest is an annular chamber in which revolves a closely fitting sleeve having valves on its periphery, and in this sleeve oscillates another sleeve with ports corresponding to the ports of the casing, the first sleeve having an outer extension sleeve connected to a bevel gearing, while the inner one has a shaft connected with the governor levers. In operation the steam has to pass through registering openings, and the ports are thrown more out of register as the engine runs too fast, being in perfect register only as the engine is run at the speed designed.

WRIST PLATE.—James Barclay, Sioux City, Iowa. This device consists of two plates or disks arranged concentrically and mounted to turn independently one of the other, one of the disks being connected with the valve rods and the other with the hook or eccentric rod, there being also a locking device for connecting the two disks with each other. The wrist plate thus provided is of simple and durable construction and the arrangement permits the engineer to easily start the engine without being compelled to lift the hook rod and hold it up while manipulating the throttle valve and starting bar.

BALANCED SLIDE VALVE.—William T. Harrison, Pooler, Ga. This is a valve of simple and durable construction, arranged to supply the cylinder with a full charge of steam at the time the piston is at the commencement of the stroke. The invention consists of inlet ports formed in the slide valve and a balance plate provided with a port adapted to connect with the valve inlet ports at the time the steam is admitted to the end of the cylinder.

VEHICLE PROPELLING MECHANISM.—Isaac B. Jones, Xenia, Ohio. A shaft carrying a cone pulley, and adapted to be driven in either direction by a motor, is located on the vehicle body, a belt connecting this pulley with a second cone pulley on the axle of the vehicle, a convenient shifting mechanism for the belts being provided. The mechanism is simple and durable and permits of readily changing the speed of the vehicle without changing the speed of the motor, while it is also arranged for conveniently running and steering the vehicle in any desired direction.

Railway Appliances.

CAR COUPLING.—E. H. B. Knowlton, West Superior, Wis. This is an improvement in that class of devices known as "twin jaw" couplers, and the invention provides means whereby the jaws can be automatically coupled and locked when brought together, together with means for automatically locking them in an uncoupled position when they are separated. The lock can be quickly and easily operated to uncouple the jaws, and the top surface is without any irregularities or openings to afford lodgment for ice, snow and dirt.

RAILWAY GATE.—John S. Chambers, Jr., Allegheny, Pa. This is a swinging gate which will entirely close the crossing, and will fold when raised, thus clearing overhead electric wires and other obstructions. It has a main arm to which is pivoted a supplemental arm, an inclined guide pivoted to the main arm projecting over and beyond the pivot of the arms, while a cable has one end secured to the free end of the supplemental arm and is passed through the guide, its other end being secured to the support at the pivoted end of the main arm. The length of the arms is varied according to the height of the obstructions above the track.

TRAIN SMOKE CONDUIT.—Chester L. Morrison, West Point, Va. This invention covers an improvement in devices for carrying away smoke from a locomotive, providing for this purpose a simple and inexpensive apparatus by means of which the cinders, smoke, etc., will be discharged from the rear end of the train, where they cannot annoy the passengers. It consists of a conduit made up in sections and open at each end, the section on the locomotive having a flaring mouth which is open over the smoke stack, and the conduit running the entire length of the train. Simple and effective means are provided for coupling the several sections together, so that they will be smoke tight and will conform to the different movements of the cars.

Mechanical Appliances.

PUNCH.—Francis N. Simmonds, San Francisco, Cal. This is an inexpensive article to make, while designed to operate efficiently, the penetrating portion of the punch being cheaply and easily renewed after it is worn out. It has a removable face with a screw-threaded bore aligning with that of the body to which it is attached, and a bolt with an operating head is passed down through the body and face, the lower end of the bolt being threaded to engage the threads of the bore of the face. The lower end of the bolt has a slightly projecting hardened centering point, the several parts being so firmly united that there is no liability of the face getting loose upon the bolt.

COAL DRILL.—Charles S. Sheppard, Pittston, Pa. An auger is formed at one end with a dovetailed groove having its sides diverging outwardly, and a center cutter engages with its shank one side of the groove, while a cutter standing at angle thereto engages with its shank the other side of the groove, a bolt in the auger end having its head wedge-shaped engaging the adjacent inner sides of the shanks of the center and cutter. The drill is of simple construction, and is designed to easily and conveniently cut a large opening in the coal without requiring much power.

Agricultural.

PLANT FRAME.—Edward K. Jones, Portland, Oregon. This frame has a soil receptacle, with a cover and fruit protector having openings for the plants to project through, and prevents the washing away of the soil and its spattering upon the fruit. It is especially adapted for strawberry culture, and is preferably 5½ by 12 feet in size, accommodating 12 dozen plants, the openings being 4 inches in diameter. It is adapted for use in all localities, the plants being readily protected from heat or cold, and it is provided with perfect means for ventilation, irrigation, and drainage. With this frame fruit may be produced very early in the season, and its production continued until very late, young plants being forced to early maturity and made to yield large quantities the first season.

ANT HILL CUTTER.—John T. ym, North Bend, Neb. This device comprises a frame with side runners, with a cutter arranged obliquely to and secured at its front end to one of the runners, while adapted at its rear end to permit trash and the like to pass off. It is designed to be dragged over the ground by a horse, when the cutter will strip the ant hills off close to the ground surface, so they can be readily removed and the ground left in condition for cultivation. By means of an adjusting lever the cutter may be lifted and held off the ground in moving the machine from place to place.

Miscellaneous.

METHOD OF MINING COAL.—Peter C. Forrester, Wilkeson, Washington. The method of mining provided by this invention consists of first forming in the vein a series of vertical cuts and horizontal cuts or drifts or cross cuts intersecting with the vertical cuts, and then undercutting or blasting from below the pillars of material formed between the cuts and cross cuts. By this method the miner will not be at all subjected to the obnoxious gases arising in blasting or undercutting, and can always go to a place of safety whenever a blast is fired, while there is also a saving of lumber used in building the cuts.

VEHICLE WHEEL.—August Bauer, Sandusky, Ohio. This wheel has a circular brace fastened to it at a point between the hub and felly, the brace consisting of two circular rings or flanges, with intermediate filling blocks or sections between the spokes, the rings and filling blocks being clamped together by bolts or rivets. This improvement may be applied to any old wheel to strengthen it and prolong its usefulness, preventing the spokes from breaking, bending or getting loose.

TAIL BOARD SPRING.—Freeman Nickerson, Jr., Fall River, Mass. This is a combined spring and catch, constructed of two pieces of metal, for keeping the tail board of a vehicle closed when shut, while readily admitting of the opening or dropping of the board when the vehicle is to be loaded or unloaded. The spring is made of sheet steel, and the catch, secured to it is very solid and strong and made to project beyond the free end of the spring, where it is of a roll or hook shape above, to form a ready handle for lifting the spring. The device is designed to be much cheaper than the ordinary device for the purpose.

WIRING FENCE PICKETS.—Lemuel H. Slagle, East Brady, Pa. A machine of simple and durable construction, designed to be very effective for this purpose, is provided by this invention, the machine crossing the wires after the picket is inserted, and having a tension device to give a proper tension and twisting to the sets of wires. A series of levers are pivoted on a post, each lever having forked ends to receive the wires, and a retaining wire is held on each lever to extend across the fork and hold the wires in place, while a bar is pivotally connected to the levers to give them a swinging motion.

LADDER.—James F. Mitchell, Titusville, Fla. This ladder is especially designed for picking oranges and other fruit. It has a straight section, hinged to the top of which is a section that is curved and extended laterally in a plane at an angle of not less than forty-five degrees to the body of the ladder, the top section being in most cases extended at a right angle to the body portion.

FEED TROUGH.—Earl B. French, Oakland, Cal. In this feed trough the feed is supplied gradually, so that the animal will be compelled to eat his feed slowly and thoroughly masticate it. The trough is made with a side reservoir separated from the other portion by a removable partition, a ratchet mechanism holding the partition in position in the reservoir. The flow of feed is controlled by the movement of the partition by the animal feeding, this also preventing the trough from clogging, while the adjustment of the partition provides for different kinds of food.

KNOCKDOWN EXHIBITION STAND.

Herman A. J. Rieckert, New York City. This stand has two connected corner posts, sides being hinged to the posts and shelves hinged to the connecting bars of the posts, each made in two parts hinged together and resting on cleats formed on the sides. The stand is of simple and durable construction, and can be readily folded for storing and transportation. It is arranged to be conveniently set up for use in stores, hotels, and like places, for exhibiting goods.

JOURNAL PAGE FILE.—John O'Rourke, Mandan, North Dakota. Covers adapted to inclose heavy indexed pages are hinged to a central base portion, a jointed section forming the back edge and permitting the file to be closed as an ordinary book. On the base is a spring-pressed bar carrying curved file posts, the doubled-over upper ends of which enter sockets in the top of posts secured to suitable plates on the base, the pressing down of the curved posts forming the usual file loops, and enabling the journal sheets to be turned freely from one cover to the other. The improvement forms a simple file which may be conveniently operated, and in which may be kept journal sheets, statements, summaries, and matters of a similar nature, in form for ready reference.

BEER DRAWING APPARATUS.—Peter F. Gaynor, Greenbush, N. Y. This invention affords a simple means by which beer may be conveniently drawn under pressure from the cask, the device being inserted in the cask without spilling any beer or freeing any gas. The spile is of the usual external shape and within it is a seat against which fits a rubber packing valve having at its lower end a swinging flap normally pressed upward by the pressure within the cask. A novel form of stem and handle takes the place of the ordinary cock, the beer flowing as readily through it as through the usual faucet.

BAR FIXTURES.—John Neumann, Brooklyn, N. Y. This invention provides separable and interchangeable bar fixtures, such as rising chambers, shelves, and drain trays, that the position of the parts may be changed as desired, and so that any of the parts may be readily detached from other adjacent parts for cleansing or repair. The improvement is applicable to counters or bars where liquors of various kinds are served to customers by the glass.

LAMP BURNER.—Patrick J. F. Graeme, Beulah, Canada. A triangular frame is adapted for vertical movement at each side of the wick, and there are horizontal spring-actuated piston rods at each side of the frames, each having a head block contacting with the frames, while telescopic hoods secured to the head blocks inclose the wick tube. The construction is such that the flame may be extinguished and the wick trimmed automatically upon lowering the wick, it being also provided that the wick may be raised and lowered without operating the extinguishing and trimming mechanism.

TEA KETTLE.—John Black and Fred. C. A. Natus, South Chicago, Ill. The breast of this kettle rises above the general level of the top and above the filling opening, forming an air space when the kettle is filled, and this space is connected by a tube with the upper part of the spout, and the bail when thrown over rests on projections which prevent undue heating. By this construction the water in the kettle is prevented from boiling over at either the spout or filling opening, and in handling the kettle there is no danger of burning or scalding the hands.

COOLING APPARATUS.—Sherman L. Smith, Plymouth Penn. This is an apparatus designed to facilitate the transportation in good condition of butter and like articles in warm weather, providing therefor a tray-holding receptacle adapted to be placed in a cask containing ice or spring water, there being a locking connection between the receptacle and the cask. The receptacle is preferably made of sheet metal, and its construction is such that portions of its contents may be readily removed without disturbing others.

TOY.—George W. Galbreath, Sedalia, Mo. This is a device constructed somewhat in the nature of a target, and provided with an attached elastic cord carrying a weight which may be made to strike the target, the latter when being struck at the center automatically sounding an alarm. The toy may be held in the hand, one or both hands being employed in its use.

TRUSS.—William A. Adair, Moline, Kansas. This is an improvement in trusses to be worn on the body in cases of hernia, and is light, strong, and easily adjustable, to enable the pads to bear where necessary, while it is adapted to conform to the movements of the body, and sufficiently elastic to adapt itself to any momentary local expansion.

URINAL.—Charles G. Zeilman, Albany, N. Y. This invention provides an automatically operating flushing device, which also affords a positive seal at all times against the escape of sewer gas. The construction is simple and the parts are not liable to get out of order.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

TRAVELS AMONG THE GREAT ANDES OF THE EQUATOR. By Edward Whympfer. With maps and illustrations. New York: Charles Scribner's Sons. 1892. Pp. xxiv, 456. Price \$6.

SUPPLEMENTARY APPENDIX TO TRAVELS AMONG THE GREAT ANDES OF THE EQUATOR. By Edward Whympfer, with contributions from H. W. Bates, F.C.S. (and many others). London: John Murray. 1891. Pp. xxiii, 147.

These sumptuous and richly illustrated volumes it is quite impossible to review within the limits of the space

at our command. Edward Whympfer is the first man who succeeded in climbing the Matterhorn in Switzerland, and his graphic account of his travels and mountain climbing in South America is simply fascinating. The desperate hardships encountered at such high elevations are pictured, and the oddities of the characters met with, whether of his party or not, give an agreeable flavor of humor to the recital. The appendix, a separate volume, touches upon the scientific results of the expedition.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Vol. VII. 1891. New York: Published by the Institute. Pp. xi, 635.

All that is necessary to say of this very handsome volume is that every electrician should possess it. The papers, their authors, and the discussions annexed to such papers give the highest value to the work as an exponent of advanced electrical views. The steel engraving, portrait of Elihu Thomson, will recall to many the features of the great engineer, the inventor of electric welding and investigator and inventor in many other branches of alternate current work. Among the more notable papers in it may be cited Tesla on Alternating Currents of very high Frequency, Kennelly on inductance, with the discussion and committee's report, and reports on the Frankfort Electrical Congress. But this particularization does not affect the value of the other papers with accompanying discussions.

ENCYCLOPÉDIE SCIENTIFIQUE DES AIDE-MÉMOIRE, PUBLIÉE SOUS LA DIRECTION DE M. LEAUTE, MEMBRE DE L'INSTITUT. Etude Expérimentale Calorimétrique de la Machine à Vapeur. Par V. Dwelshauvers-Dery. Paris: Gauthier-Villars et Fils. Pp. 213.—Transmission de la Force Motrice par Air Comprimé ou Rarefié. Par A. Gouilly. Paris: Gauthier-Villars et Fils. Pp. 170.—Résistance des Matériaux. Par M. Duquesnay. Paris: Gauthier-Villars et Fils. Pp. 187.—La Distribution de l'Électricité. Installations Isolées. Par R. V. Picou. Paris: Gauthier-Villars et Fils. Pp. 168. Price per volume, 75 cents.

We note the reception of four little volumes of this encyclopedic aid to memory. The books are all well edited, and the subjects seem well treated. Where required they are illustrated, and the attractive appearance of the books adds materially to their value.

THE GALVANIC CIRCUIT INVESTIGATED MATHEMATICALLY. By Dr. G. S. Ohm. New York: D. Van Nostrand Company. 1891. Pp. 269. Price 50 cents.

The science series of the D. Van Nostrand Company has never received a more interesting acquisition than the present one. It is a translation of the famous paper of Dr. G. S. Ohm, published in 1827, in which Ohm's law was enunciated for the first time. The only previous translation has been hard to obtain, and electricians will generally welcome the present translation.

A MANUAL OF PHONOGRAPHY, OR WRITING BY SOUND. By Isaac Pitman. London: Isaac Pitman & Sons. Australia: Edwards, Dunlop & Co. 1890. Pp. 87. Price 40 cents.

THE PHONOGRAPHIC TEACHER. By Isaac Pitman. New York: Isaac Pitman & Sons. Canada: The Copp, Clark Co. 1891. Pp. 46. Price 15 cents.

PRACTICAL CARRIAGE BUILDING. Compiled by M. T. Richardson. Profusely illustrated. Vol. 1. New York: M. T. Richardson Co. 1892. Pp. 222. Price \$1.

We have before now favorably commented on previous works on practical blacksmithing. We can extend the same favorable consideration to this book. It seems thoroughly practical and to the point, and well adapted for repairers who have many different cases of breakage and wear to deal with. Numerous illustrations are given to elucidate the text. Many contributions from practical workers make the book read like an emanation of experience.

STEREOTYPING. The papier mache process. By C. S. Partridge. Chicago, Ill. 1892. Pp. 139.

The long process of stereotyping is given in detail by Mr. Partridge. The tools, presses, etc., required are illustrated, and every step of the process receives due consideration. The author claims to have embodied the best receipts and processes as evolved from seventeen years' personal experience.

IRRIGATION CANALS AND OTHER IRRIGATION WORKS. By P. J. Flynn, C.E. San Francisco, California. 1892. (Two vols. in one.) Pp. xx, 398; x, 283. Price \$8.

The general subject of open channel irrigation as employed in the Western regions of the United States is the topic treated in the seven hundred pages of this work. The first volume is devoted to irrigation canals and other irrigation works, the second to flow of water in irrigation canals. We can only make the old complaint that space forbids anything like an adequate review of this very handsome work. It is a credit to the publisher as well as to the author, and will be found of extensive use.

SAFETY VALVES: THEIR HISTORY, INVENTION, AND CALCULATION. By William B. Le Van. New York: N. W. Henley & Co. Pp. xiv, 155. Price \$2.

As the safety of a boiler and the life of its engineer and others depend on the all-important safety valve, it is eminently appropriate that a book should be devoted to so important a topic. Sticking safety valves,

miscalculated levers and similar factors have been responsible for many disasters. In Mr. Le Van's work we have the full subject properly presented, calculations elucidated, the different constructions shown, and last, but not least, the ills that safety valves are heir to are described. The numerous illustrations are an excellent feature.

RECORD OF SCIENTIFIC PROGRESS FOR THE YEAR 1891. By Robert Grimshaw, M.E., Ph.D. New York: Cassell Publishing Co. Pp. vi, 372. Price \$1.50.

In brief form the entire field of scientific work is covered by the author. The mere recital of his headings would fill the space allotted for a review. The absence of illustrations and the necessarily short treatment allotted to so many subjects are the features of the work which we can least approve of. The volume will be found, however, of use and interest. An excellent index closes the work.

HOW TO MAKE INVENTIONS. By Edward P. Thompson. New York: D. Van Nostrand Co. No date. Pp. ii, 161. No index. Price \$1.

As this work covers the whole field of the arts it is certain that if reviewed carefully errors could be indicated. But in the main it is an excellent manual, and will be read by many desirous to become inventors. Considerable labor on the author's part must have been requisite to give so logical and clear an arrangement to such diversified material. As is always the case when a book of this type is well done, it is most interesting reading and can be commended to many others than inventors.

A CONCEPT OF POLITICAL JUSTICE. By J. W. Sullivan. New York: Twentieth Century Publishing Co. 1891. Pp. 58. Price 10 cents.

THE MODERN COOK BOOK. Springfield, O.: Mart, Crowell & Kirkpatrick. Pp. 320.

THE FORGING OF THE SWORD AND OTHER POEMS. By Juan Lewis. Illustrated by Charles Bradford Hudson. Pp. 103.

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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.

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(4325) N. S. P. asks (1) for a receipt for an invisible ink which can be made visible by blowing the breath on the paper containing it, and which afterward returns to its invisible state. A. Writing made with a weak solution of chloride of cobalt is blue when dry and pink when moist, therefore, if you write with this ink upon blue paper, by breathing upon it you will produce a pink color. By writing on glass with very dilute hydrofluoric acid, an invisible etching is made, which stands out clearly when the glass is breathed upon. See SUPPLEMENT, No. 373, for the full process of making magic pictures. 2. What is the metal used in the plugs connected in an electric current, and what are all of the reasons for its being used in preference to other metals? A. Tin is often used for the fusible plugs, and some of the fusible alloys are also used. The main requirements are a metal not easily oxidizable, which will fuse at a heat below that required to char wood or burn the insulation of wires. 3. Has it much resistance, and why do the plugs blow out? A. The resistance is considerably above that of copper. The plugs do not in reality blow out, but melt. 4. If two wires carrying a current of electricity are put into a bucket of water, the wires touching nothing but the water, does any current pass? If so, what per cent of the current used? A. With a low E. M. F. a very small percentage of the current will pass, and this percentage increases as the E. M. F. increases. The amount of current will of course depend upon the surfaces exposed to the water. 5. While an electric street car is running, could it be stopped quickly by reversing the motor, or would it damage it to do so? A. In most motors, if reversed quickly, there will be danger of burning out the armature. 6. While examining the bell in a telephone I noticed that the two coils

were both on the same circuit and that the circuit was not broken in any way, yet the armature, which is pivoted in the middle, has each end alternately attracted. Not understanding the reason for this, will you please explain it thoroughly? It was an old telephone not in use, and I don't know whether the bell is just like the ones in use now or not? A. The bell you examined was a polarized bell, and the current which operates it is an alternating current. The armature of the bell is magnetized, and the reversals of the current cause the armature to be alternately attracted and repelled. 7. Could you tell me of a way by which the gloss or shine can be removed from clothes? A. It is said that sponging with a solution formed by dissolving 1 ounce of ammonium bicarbonate in 1 quart of water will remove the gloss from clothes.

(4326) W. T. B. asks: 1. If a motor wound to have a resistance of 3 ohms be connected to a battery having E=5 and C=10, what is the strength of C in the motor, and what is the E? A. If your E.M.F. is 5 volts and your current is 10 amperes, the resistance of your battery must be (according to $E = CR$) $\frac{5}{10} = \frac{1}{2}$ ohm.

$\frac{1}{2} + 3 = 3\frac{1}{2}$. This is, according to the same formula, $5 \div 3\frac{1}{2} = 1.428$ amperes. 2. Is watts=C E correct for motor? A. Yes. 3. By what rule or formula can one determine as to what the E, C, and internal resistance of a battery must be, to be most efficient to drive a motor having a known resistance? A. The resistance of the battery should be equal to that of the external circuit. 4. For a plunge battery what should be the proportion of water, sulphuric acid and bichromate of potash, by weight and by measure? A. Make a saturated solution of bichromate of potash and water; to this slowly add one-fifth its weight of commercial sulphuric acid. 5. Which is the best way to connect the cells of such a battery to run a motor—in series, multiple arc, or multiple series? A. It depends upon the resistance of the motor; if its resistance is low, the cells may be connected in parallel; if it is very high, they must be connected in series. A little experiment will soon determine the best arrangement of batteries for a given motor. 6. Is the efficiency of a plunge battery impaired by the fact that the carbon plates are only one-half the thickness of the zinc one, although there are two carbons to one zinc, the other dimensions being the same? A. The thickness of the carbon plates is not very material, although those of medium thickness are preferable to very thin ones.

(4327) G. L. B. asks: Are there any means by which the time required for the sun to radiate all of its heat can be computed? A. There is no certainty in any computations in regard to the time that the sun will continue to give light enough to sustain life upon the earth. The temperature of the internal mass of the sun is only a conjecture. The temperature of the photosphere has been estimated by various observers at from 3000° to several millions. Professor Young estimates that 18,000° Fah. is probably nearer the truth than the extremes. From the radiant heat of the sun as observed on a given surface of the earth is computed the radiation in all directions throughout the sun's sphere. With this as a divisor, and the assumed units of heat held in the sun at some assumed temperature with the sun's mass as a dividend, the time is obtained. According to Newcomb, this is about 10,000,000 years, in which to wind up the age of life on the earth.

(4328) H. B. C. asks how kodak cameras are made to load and unload the sensitive film by daylight without injury. A. The roll of sensitive film has attached to its inner and outer ends a strip of black paper about a foot long. The roll comes in square shaped cardboard boxes with a slit in one corner through which the paper passes. To load the camera you simply drop the square box into the compartment in the camera, then draw the outer black paper across the stage to the wind-up roller. Attach the paper to the latter, put on the roll holder to the camera, and wind off the black paper until the sensitive film is brought into the focal plane. A certain number of revolutions tells you when the sensitive film is in place. When the exposures are made, the black paper on the inner end of the roll now surrounds the outside by continuous winding and protects it from light. The film is made of celluloid by the Eastman Co., Rochester, N. Y.

(4329) W. McC. asks: 1. A railway company in this vicinity have a pump to fill a tank for engine use; the pump and tank are one-half mile apart, and an electrical alarm is used to signal the engineer at pump when tank is full. Six cells of Leclanche battery are used, and a float closes its circuit. In very hot weather the alarm will not work, but in cold or wet weather it works well. What is the trouble and what will remedy it? A. Possibly the expansion of the wire at one or more of the joints may affect the resistance of the line, but if a ground is used, the trouble is probably due to the dryness of the earth surrounding the ground plates. The remedy is obviously to place the ground plates at a lower level, where they will be surrounded by moist earth. 2. Have you any books that you could recommend to show the manner of cutting in wires on a switchboard, especially a loop? Also any on the setting up of telegraph instruments, both the ordinary and "quad"? A. For answers to these queries consult Prescott's "Electricity and the Electric Telegraph," price by mail \$7.

(4330) E. S. A. inquires in regard to the feasibility of constructing a large induction coil under the following data. Coil heads of black rubber $\frac{1}{4}$ inch by 6 inches square, length between heads 20 inches, rubber tube one-sixteenth inch rubber on a side 1 inch internal diameter, in which the laminated core (which is movable) will be placed. Core of charcoal iron very thin with paper laminae between. Two layers of No. 12 double-covered magnet wire, B and S gauge, for primary, 20 pounds .011 inch or No. 29 B and S gauge for secondary. The question is, will the amount and gauge of the secondary wire compensate me, considering the previous data? Of course, extraordinary pains will be exercised in insulation, and a condenser will be placed in primary circuit. Can you inform me as to the length of spark, or an approximate idea of the coil's efficiency. A. We think the length of your coil is too great for its diameter; that you would succeed better by reduc-

ing the length to 12 inches and increasing the diameter correspondingly. Instead of using two layers of No. 12 wire in the primary coil, we would suggest the use of four layers of No. 16, with the ends brought out, so that you can use the several convolutions in series, or 2 in series and 2 in parallel, or all in parallel, to adapt the coil to different currents. The secondary wire is rather large for long sparks; however, it ought to give sparks of great intensity. The secondary coil should be made up in sections according to the method of Ritchie. You will probably succeed in producing a 4 or 5 inch spark.

(4331) W. S. asks (1) what to put in whitewash to keep flies out? A. We know of nothing that can be used for the purpose that will not be offensive and injurious to the occupants of the room. Dalmatian insect powder blown around the room occasionally is effective. 2. What chemical is put in a retort and then heated to make oxygen gas? A. Potassium chlorate and black oxide of manganese mixed are used for producing oxygen. 3. What makes the magnetized sewing needle described in SCIENTIFIC AMERICAN Reference Book, page 101, point north and south? A. The earth has magnetic poles like a magnet, which correspond approximately with the earth's axis. This polarity is now supposed to be due to electric currents circulating in the earth in planes approximately parallel with the equator.

(4332) N. C. H. asks: 1. Will you please explain to me the philosophy of the silo? Why is it the ensilage does not spoil? A. The preservation of food in the silo depends mainly on the exclusion of air. This is accomplished by placing over the ensilage a movable close-fitting cover and weighting it heavily. 2. Will you tell me of a good confectioner's receipt book and where to get it? A. The following are good books on confectionery: "Confectioner's Hand Book," price \$3; "Complete Practical Confectioner," price \$4; "Ornamental Confectionery," price \$2. We can send you either of these books on receipt of price.

(4333) N. L. writes: Will you kindly inform me, through your columns of inquiry, the voltage of a magneto-electric machine, the fields of which are composed of six 6 inch permanent magnets? The armature of one pair electro-magnets 2x1 inch, with 9-16 inch cores, wound with about No. 25 wire. A. It is impossible from the above data to estimate the voltage of the magneto-electric machine. Probably the only method of measuring the current would be by the decomposition of water and the measurement of the resulting mixed gas.

(4334) C. D. B. asks: 1. Will you state the E. M. F. of an ordinary gravity cell, and could the motor described on page 497 of "Experimental Science" be run with gravity cells? If so, how many are required? A. The E. M. F. of a gravity cell is practically 1 volt. The gravity cell is not adapted to running motors, on account of its high resistance, but with a sufficient number made up in series of six to secure the proper voltage, you can run the motor. It would probably require 60 or more cells to run it properly. 2. Will you also state the horse power of the motor? A. With a proper battery the motor will generate one horse power.

(4335) W. P. says: What is the composition of the artificial flowers and fruit used on millinery? A. Mix bread crumbs, magnesia, and finely powdered starch. When fermented, it can be formed and colored to any pattern. Use the lakes to color, and a solution of gamboge in alcohol for a varnish. From the "Scientific American Encyclopedia of Receipts, Notes and Queries."

(4336) O. D.—With gelatine bromide paper, C brand, made by the Eastman Company, Rochester, New York, and the eikonogen developer you can make prints by lamp light with the greatest ease. You should use Saxe or Rives photographic paper for blue prints. Probably the iron salts affected your paper.

(4337) F. W. D. asks: 1. Are street car motors run by the use of only one wire? A. The cars propelled by the trolley system are supplied with a current by a single wire suspended overhead, the current being returned by the track rails or by the ground, or both. See SUPPLEMENT, Nos. 707, 708, 709. 2. How can I drill plate glass? A. Make your drill of new tool steel. Do not heat it above a low red. Sharpen it, and afterward temper it by heating it to a low red and plunging it in a solution of chloride of zinc, this solution being made by dissolving the zinc in muriatic acid until it will take no more. 3. Which is the cheapest light and power? A. A steam or gas engine. 4. Describe electric welding and forging of metals. A. Electric welding is accomplished by passing a very heavy current through the pieces to be welded. You will find a full description of electric welding in SUPPLEMENT, Nos. 592, 682, 582, and 785. 5. Has anything been made to lift itself into the air? Has it wings or wheels? Describe its power. A. Up to the present time no aerial machine has been made that will lift itself and its motive power. For information on aeronautics see SCIENTIFIC AMERICAN, No. 7, Vol. 66, and SUPPLEMENT, Nos. 738, 739. 6. What dynamo will heat a bar one inch diameter to a welding heat, and at what cost? A. Write the makers of electric welding machinery for this information. 7. For experimenting purposes would you advise the purchase of a good lathe instead of having my work done by some one else? A. If you are a good workman and have plenty of time, you will probably derive more satisfaction from doing your own work. 8. Can noiseless powder be used in guns? A. We know of no noiseless powder. 9. What SUPPLEMENT tells how to make a water motor? A. You will find articles on water motors in SUPPLEMENT, Nos. 611, 617, 455, 463, 10. Will 80 lb. pressure from hydrant give eight sixteen-candle power lights with dynamo? A. With sufficient volume, yes.

(4338) J. W. S. asks: Would it be practical to propel a small boat by means of a force pump operated by foot power? The pump to take water through a tube at the bow of the boat and discharge at the stern. A. Yes. It would be practical, but a pair of oars would give you better speed and be easier.