

## RECENTLY PATENTED INVENTIONS.

## Engineering.

**LOCOMOTIVE.**—William J. Tripp, New York City. This invention provides an improvement on a former patented invention of the same inventor, whereby extra large driving wheels may be employed, and the boiler be located as low down as possible. The driving wheels have their axles extended exteriorly of the boiler, either above, in the front, or in the rear, the wheels having hubs, each journaled in the side frames, and each carrying a crank pin for connection with the engines or the front or rear driving wheels, by means of a pitman or connecting rod.

**ROTARY ENGINE.**—George I. and Gottlieb Jorda, New York City. A revolvable piston connected with the driving shaft is held to turn in a two-part case, in which are connected chambers registering with parallel chambers in the piston, a steam inlet connecting with one of the outer case chambers and an exhaust port connecting with one of the inner piston chambers. The construction is inexpensive and very simple, the steam acting continuously to turn the piston, and the engine being designed to utilize to its greatest extent the expansive force of the steam.

## Railway Appliances.

**RAILROAD CROSSING.**—Michael J. Keenan, Galveston, Texas. This is a simple and durable crossing, readily set up and connected with the main and crossing track rails. It comprises a center piece and two side pieces, the crossing track rails forming an integral part thereof, and the two side pieces serving to clamp the main track rails on to the center piece.

**CAR FENDER.**—George E. Cates and Diederich Reuschenberg, Brooklyn, N. Y. This is a semicircular device pivotally connected to a fixed support beneath the car, springs connecting the fender with the car in advance of its pivotal connection. The device is so connected with the brake lever and the brake-applying mechanism that the fender will be lowered close to the ground whenever the brakes are applied, the fender automatically raising itself when the brakes are taken off.

**CAR FENDER.**—James W. McKinnon, New York City. This device is adapted for pivotal or hinged connection with the car, spring cushions being interposed between it and the car, while an adjusting device for raising and lowering the fender is adapted to be operated from the car. The lower forward portion of the fender has a brush surface, designed, when the fender is lowered, to sweep away any obstructions from the track.

**CAR STAKE.**—Peter Anderson, Prentice, Wis. Attached to a platform car, according to this invention, is a stake socket, in which is an adjustable stake provided with rack teeth, a pinion on a shaft having a hand wheel engaging the stake. The arrangement is such that a pair of stakes may be at any time lowered by the operating mechanism to the level of the car, or raised to the desired height and there locked.

## Mechanical.

**SAW FILING MACHINE.**—Ben. Tholen, Texarkana, Ark. This machine is adapted to rapidly and accurately file and sharpen cotton gin or similar saws. A rocking bearing mounted on a suitable support carries a turning and sliding shaft having at its rear end a driving gear, and on its outer end a sharpener, the arrangement being such that the entire cylinder of a gin, having the whole series of saws attached, may be hung in the machine and the saws quickly ground, the grinders being adjusted so as to register with the teeth of the saws before the machine is set in motion, and the saws being then automatically advanced tooth by tooth.

**CLOTH NAPPING MACHINE.**—Ernst Gessner, Aue, Germany. This invention relates to machines in which teasing rollers are arranged around and rotated by a drum, the rollers constituting alternating series revolving at different speeds and having teeth working in different directions. The rollers required to be cleaned or stripped by brushes while the drum is rotated, and this invention provides a new device therefor, consisting of two cleaning brushes arranged outside the drum, and having two different motions in opposite directions, arranged so that each brush will strip the alternate series of teasing rollers.

## Agricultural.

**CORN HARVESTER.**—Linus G. Stewart, Sawyer, Neb. This machine has a vertically reciprocating cutting sickle, at an angle to which is located a feed bar having a rotary reciprocating movement, to alternately approach and recede from the sickle in feeding the corn thereto. As the machine is drawn over a field the ears of corn are cut from the stalks and delivered to a carrying belt, by which they are taken to a conveyor or elevator, to be loaded in a vehicle following the harvester, or distributed in rows upon the ground. It is said that this machine will pick a load of good corn in twenty minutes, and an acre an hour.

**POTATO DIGGER.**—David J. Roush, Groveton, Pa. This is an improvement in diggers having rotary fingers arranged in series and actuated from the drive wheels to dig and elevate the potatoes, depositing them on a screen or in a receptacle. The invention provides a special form of finger, which is strong and adapted to dig and elevate the potatoes without injury.

**SCRAPER PLOW.**—Aaron J. Burr, Griffin, Ga. This plow is formed of a single piece having rearwardly and upwardly inclined wings at opposite sides of a straight middle portion, the outer face of the scraper being beveled from the middle line to the bottom edge. The implement is designed to facilitate the cultivation of cotton, corn, and other grain, the cutting edges of the scraper remaining sharp longer than with the ordinary construction, and the refuse being discharged from the plow better than is now possible.

**KNIFE ATTACHMENT FOR PLOWS.**—Edward Murphy, Yellow Bud, Ohio. According to this

improvement a knife is attached to the plow beam in advance of the shovels, the knife being raised and lowered at will, and adjusted to any position desired. With this object the knife is so placed and shaped that it will cut loose and in pieces pea vines, or other vines that may be twisted around the corn, any vines that may cling to the stalks being severed while the shovels are cultivating the roots.

## Miscellaneous.

**BLEACHING CANE JUICE.**—Leon F. Gaudé, deceased (Emilie Gaudé, Thibodeaux, La., administratrix). This invention covers a simple and inexpensive apparatus for effectively bleaching sugar cane juice. It consists principally of a closed box connected at one end with a juice supply and having at its other end an outlet for the bleached juice, while a perforated pipe passed through the box and immersed in the cane juice is connected with a sulphur vapor supply and a steam pipe. The arrangement for supplying the sulphur vapor is very simple, and all portions of the flowing cane juice are subjected to this vapor, with thorough bleaching effect.

**FENCE WIRE REEL.**—William J. and John M. Opper, Kenesaw, Neb. Combined with a reel in a suitable frame is a sliding block having a guide eye for the wire, a pivoted lever moving freely with the block, while a link connects a rock shaft with the lever, means being provided for rocking the shaft. The device is adapted for attachment to and to be operated from a moving wagon, to pay out and stretch or take up and smoothly reel wire that has previously been stretched.

**COAL CHUTE.**—Gustavus L. Stuebner, Long Island City, and Philipp Nies, Brooklyn, N. Y. The construction of this chute is such that the coal may be delivered from it to a given point from any desired elevation without danger of the coal being broken during its passage. As each load of coal is dumped in the chute, one of a series of doors is automatically opened and the coal is discharged, the discharge being effected through the medium of the coal delivered to the chute at the receiving end. The discharge attachment may be readily connected with or disconnected from any one of the doors.

**KEYHOLE GUARD.**—Oscar J. Davidson, Kingsburg, Cal. This is a simple device to close the keyhole whenever the bolt is shot out, and comprises two plates fitted to slide in the lock and engaging opposite sides of the bolt, so as to be moved thereby, with means for disengaging one or both of the plates from the bolt. The improvement is designed to be especially useful on the doors of bedrooms in hotels, doing away with the brass bar now commonly found on such doors, while it may also be employed on any house doors.

**BURGLAR ALARM.**—Joseph F. Stirsky, Nelson, Canada. This is a simple, durable, and inexpensive device for ready application to a window or door, where it may be fixed in such position that the opening of the window or door, or the making of an attempt to open either, will cause an alarm to be sounded. The device may, if desired, be set to sound a continuous alarm.

**NUT LOCK.**—Robert Holmes, Canon City, Col. This device is more especially designed for locking the nuts on the spindles of wagon axles, serving to retain a washer in loose contact with the true end of the spindle box and permitting the free rotation of the wheel hub in the box. The spindle has a threaded end, behind which is the washer, a polygonal nut threaded oppositely to the thread on the spindle having teeth interlocking with teeth on the washer, while a locking nut fits within the polygonal nut and upon the threaded end of the spindle.

**GATE.**—Richard T. Mulcahy, Rosenberg, Texas. This is an improvement in farm gates centrally supported on a pivot post and adapted to be swung in either direction by levers and pull cords. A latch at each end of the gate engages a keeper on a keeper post, the latches being both disengaged and the gate opened by manipulating a lever, the gate being closed and latched, after a person or team has passed through, by manipulating the lever.

**CHART BOARD.**—James S. Shepherd, Cambridge, Md. This is a holder or frame for charts usually kept in a roll, whereby they may be spread or opened and kept so displayed as to be always ready for reference. The frame has on each side keepers to embrace and hold the roll, and the ends of the keepers are connected in pairs across the board by guides or wind strips.

**GARBAGE AND ASH CAN.**—Henry E. Wolcott, Syracuse, N. Y. The can proper, according to this improvement, has a base supporting it out of contact with the floor, and bars arranged horizontally beneath the can body project through the base flange to form journals for a wheel at one side, the can being moved by being tilted and then rolled about on one wheel.

**NOTE AND ACCOUNT BOOK. ETC.**—Alfred W. P. Livsey, London, England. This improvement consists in a peculiar cutting of the leaves of a book, to facilitate turning over the leaves rapidly and easily. The cut-out portions are of uniform shape and length and commence and terminate in a different position in each, beginning with the first leaf.

**PANTALOONS HANGER.**—Andres Bera-cuerto, Matanzas, Cuba. This is a device capable of carrying a great number of pantaloons, and consists of a central rod or bar from which project brackets in which are journaled bars or rollers so arranged as to form a polygon when viewed from above. Each of the bars carries a pair of pantaloons, which are hung on the bars at their middle portions, so that the depending parts counterbalance one another. A further patent of the same inventor provides a frame which may be suspended, and in which may be hung several pairs of trousers or pantaloons.

**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.

**PLUMBING, DRAINAGE, WATER SUPPLY AND HOT WATER FITTING.** By John Smeaton. London: E. & F. N. Spon. New York: Spon & Chamberlain. 1893. Pp. 236. Price \$3.

The English practice in plumbing is always of interest to Americans, and in this work we have an excellent treatise upon it, which shows that our neighbors are not at all behindhand in their ideas of external and internal plumbing, and it is evident that we, by studying their methods, can obtain useful points. In examining the book it will be found, however, that the writer has not neglected American practice. It is profusely illustrated and should be a welcome contribution to our sanitarians' libraries.

**HOW TO FRAME A HOUSE, OR BALLOON AND ROOF FRAMING.** By Owen B. Maginnis. New York: Owen B. Maginnis. 1893. Pp. 31. Price \$1.

This pamphlet is devoted to the balloon frame, as regards the main structure of a house, while the roof framing forms the other of its topics. It is liberally illustrated, but is destitute of an index.

**TABLES FOR THE COMPUTATION OF RAILWAY AND OTHER EARTHWORK.** Computed by C. L. Crandall. Second edition. New York: John Wiley & Sons. 1893. Pp. 18. Price \$1.25.

This eminently practical work will, we are convinced, be warmly received as tending to save much labor in the calculations of irregular fillings and excavations. It naturally does not lend itself to a review, but noting that this is a second edition with sundry additions, we see that it has already been well received, and the second edition should naturally meet a still better reception.

**AN EXAMINATION OF WEISMANNISM.** By George John Romanes. Chicago: The Open Court Publishing Company. 1893. Pp. ix, 221. Price \$1.

This contribution to the theories of what may be termed the post-Darwinian period of science, involving an examination of heredity, which is perhaps the most effective antagonism that Darwinism has had to encounter in the scientific field, will be welcomed by all biologists. The book is characterized by an excellent glossary, as well as by a sufficient index. It is arranged more or less chronologically, and in one of its titles purports to bring Weismannism up to date, i. e., 1893. As frontispiece a portrait in photogravure is given, whether of Weismann or of Romanes is not elucidated, as far as we have seen in the book.

**DAS EISENBAHN-GELEISE.** By A. Haarmann. Leipzig: Wilh. Engelmann. Two volumes. Pp. 852, 1837 wood engravings. Paper. Price \$13.35.

This publication on "The Railroad Track," by the well known general manager of the George-Mary mine in Osnabruck, Germany, is no doubt the most extensive work that has ever been published on the subject. The first volume treats of the general history of the railroad track. In the first chapter we find a short but exceedingly interesting history of the building of roads from the time of the Assyrian Queen Semiramis to the first wooden railroads for coal mines, built under Queen Elizabeth in the second half of the sixteenth century. The author brings us to the present era, and treats in the first volume of the different forms of rails, the ties, means for fastening the rails in place, the rail joints and the switches. The second volume is devoted to a special history of the track systems and the construction of the railroad beds. Under the track systems we find chapters on single tie systems, wooden longitudinal ties, the stone tie systems, the wooden cross ties, the various iron tie systems, and tie rails. The construction of the railroad bed embraces the gauge, the profile, the bed and the preservation thereof. The text is very well written, and the illustrations are very creditable. Much of our information in the article on railroad construction in all ages, in our issue of December 9, may be found at greater length in this book.

**MAXIMS AND INSTRUCTIONS FOR THE BOILER ROOM, USEFUL TO ENGINEERS, FIREMEN AND MECHANICS, RELATING TO STEAM GENERATORS, PUMP APPLIANCES, STEAM HEATING, PRACTICAL PLUMBING, ETC.** By N. Hawkins. New York: Theo. Audel & Co. Pp. x, 331. Price \$2.50.

This work, containing a great many practical points in connection with the evolution of steam, with numerous illustrations, will be found acceptable to many young engineers. One feature of the book is a chapter of "don'ts" which quite impressively presents maxims for the engineer's and fireman's consideration.

**INIGO JONES AND WREN; OR, THE RISE AND DECLINE OF MODERN ARCHITECTURE IN ENGLAND.** By W. J. Loftie. New York: Macmillan & Co. 1893. Pp. xiii, 284. Price \$4.50.

This really elegant work is devoted to a peculiarly interesting period in the art history of England, the time when a national school of architecture, whether we consider it handsome or ugly, was definitely formed. The impressions of Wren's work upon the world are visible to-day in some of the churches of New York City, and much is there which is criticized by the disciples of Ruskin. Yet these buildings have from their history and associations acquired a certain degree of respect. The present work is most elegantly illustrated and is a veritable edition de luxe.

**POOR'S DIRECTORY OF RAILWAY OFFICIALS.** 1893. Compiled from official information. Poor's Railroad Manual, New York. London: Effingham Wilson. Pp. 511. Price \$3.

Poor's Manuals have acquired a national standing. In the present one we find copious indexes, including directories of railroad officials in the United States and Canada. An index to railway and affiliated industries is given, and this matter is indexed in so many different forms as to

be easy of reference under very different captions. Thus the officials are arranged by States and cities in one index, and in others they are indexed under the names of railroads or under their titles. Street railways and traction systems, with interesting statistics, are included. The statistic pages of the street and traction railroads at the present day are of the utmost interest, and are so thoroughly subdivided as to make quick reference for specific data very easy.

**UNIVERSITY CORRESPONDENCE COLLEGE TUTORIAL SERIES. The Tutorial Physics. Vol. II. A Text Book of Heat, with numerous Diagrams and Examples.** By R. Wallace Stewart. London: W. B. Clive, University Correspondence College Press. Pp. vi, 286. No index. Price \$1.40.

This book, the second of the Tutorial Physics, very acceptably treats of its titular subject, giving numerous problems and examples of calculations. It bears throughout the aspect of thoroughness, something which the system of examinations in England has done much to impair in English literature. The value of the work would be greatly enhanced by an index.

**ELEMENTARY PALEONTOLOGY FOR GEOLOGICAL STUDENTS.** By Henry Woods. Cambridge: at the University Press. 1893. Pp. vi, 222. Price \$1.60.

This little work may be termed a manual of natural history of invertebrate fossils. It is an admirable supplement to a general geology. It makes no attempt to treat of the identification of strata, but treats the natural history of fossil remains only. A reasonably full bibliography of the science is given. The work may be recommended to geological students.

**ROMANCE OF LOW LIFE AMONG PLANTS, FACTS AND PHENOMENA OF CRYPTOGAMIC VEGETATION.** By M. C. Cooke. London: Society for Promoting Christian Knowledge. New York: E. & J. B. Young & Co. 1893. Pp. vii, 320. Price \$1.60.

Algae, fungi, and lichens, together with ferns and their allies, are the general subjects treated of in this work. It is most interestingly written and furnishes an example of how natural history, while scientifically and correctly treated, can be made to read as interestingly as fiction. The section on fungi especially treating of all the curiosities of mushroom life is most interesting.

**THE LOCOMOTIVE.** Published by the Hartford Steam Boiler Inspection and Insurance Co. New Series. Vol. XIII. Hartford, Conn. 1892. Pp. iii, 192.

This serial publication of the Hartford Steam Boiler Inspection and Insurance Company has been received by us as usual. We find it in considerable matter of interest. Some very interesting illustrations and notes of practical engineering incidents, with other material form the body of the text.

**ELEMENTS OF HANDICRAFT AND DESIGN.** By W. A. S. Benson. London and New York: Macmillan & Co. 1893. Pp. xv, 151. Price \$1.60.

This exceedingly attractive book is designed for the manual training of children, both boys and girls. As simplifying the methods by which articles can be produced and showing how to do really good work in mechanics it is to be warmly recommended. The very numerous illustrations and the highly characteristic nature of the designs lend great attraction to a work in any sense most meritorious. It should be considered and used both as a school and also a home manual.

**LES EAUX-DE-VIE ET LA FABRICATION DU COGNAC.** Paris: Librairie J. B. Bailliere et Fils. 1893. Pp. 278. Price 80 cents.

**ROUND THE WORKS OF OUR GREAT RAILWAYS.** By various authors. London: Edward Arnold. Pp. vii, 232. No index. Price \$1.40.

The American engineer interested in English practice can do no better than study such works as the present. Its numerous illustrations and very graphic text tell of present practice in English locomotive works and also treat of old time railways. The work we can warmly recommend to our readers who are interested in the construction of locomotive engines.

**THE CHILD PHYSICALLY AND MENTALLY.** Advice of a mother according to the teaching and experience of hygienic science. Guide for mothers and educators. By Bertha Meyer. Translated by Friederike Salomon. Revised by A. R. Aldrich. New York: M. L. Holbrook Co. London: L. N. Fowler & Co. All rights reserved. Pp. x, 155. No index. Price 50 cents.

This pamphlet, without index, but with a satisfactory contents, is devoted to the care of infants. It will, we believe, be useful in many homes, in which too much negligence of the proper care of children is found. It was written originally in German and is dedicated to Victoria, Empress of Germany.

**THEORETICAL ELEMENTS OF ELECTRO-DYNAMIC MACHINERY.** By A. E. Kennelly. Vol. I. New York: D. Van Nostrand Company. London: E. & F. N. Spon. 1893. Pp. 87. Price \$1.50.

Mr. Kennelly in this work presents a collection of a series of articles which have already appeared in the *Electrical Engineer*, of New York. His desire and intention, he states, has been to develop the applied or arithmetical theory of electro-magnetism for the use of students, so that they will find just the necessary amount of mathematics without going into the intricacies of

purely theoretical formulae. This promise is of course not rigorously carried out, as we find the calculus is used throughout, while the formulae involve elementary algebraic knowledge on the part of the users. We are very glad indeed to see such a book produced, tending to remove the atmosphere of mystery from calculations.

**CONTINUOUS CURRENT DYNAMOS AND MOTORS.** Their theory, design, and testing, with sections on indicator diagrams, properties of saturated steam, belting calculations, etc. An elementary treatise for students. By Frank P. Cox, B.S. New York: The W. J. Johnston Company, Ltd. 1893. Pp. 271. Price \$2.

The specialization of dynamo work is illustrated in this contribution, where all the calculations are kept down to the practical ones required in constructing the machines. It will be found a most excellent contribution to the subject, and one in line with the work reviewed in the preceding notice.

**PRIMER OF PHILOSOPHY.** By Dr. Paul Carus. Chicago: The Open Court Publishing Company. 1893. Pp. vi, 232. Price \$1.

Philosophy in this book is treated of from the standpoint of experience. Experience by the writer is made the sole base of philosophy. The methods of philosophy are said to be derived from experience and the problems of life are to be solved by the methods of philosophy. This is the abstract of the scheme of the work.

**PRACTICAL DYNAMO BUILDING, WITH DETAIL DRAWINGS AND INSTRUCTIONS FOR WINDING.** By L. C. Atwood. St. Louis: Nixon-Jones Printing Company. 1893. Pp. vi, 143. No index. Price \$3.

The title of this book exactly describes its contents. It consists of a description of a number of dynamos, the details of construction of each one being given without any attempt to theorize. At the end of the book are given appendices of tables, underwriters' rules and regulations for wiring, and a chapter on how the electromagnet is produced, another on the history of electricity and the electric light, and one on the incandescent system, and a final one on the economy. The lack of an index is a bad feature.

Any of the above books may be purchased through this office. Send for new book catalogue just published. MUNN & CO., 361 Broadway, New York.

## SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY, 1894.—(No. 99.)

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1. Elegant plate in colors showing a suburban dwelling at Bridgeport, Conn., recently erected for L. D. Plumb, Esq., at a cost of \$4,500 complete. Floor plans and perspective elevation. An excellent design. Mr. C. T. Beardsley, architect, Bridgeport, Conn.
2. Plate in colors showing the residence of Thomas C. Wordin, Esq., at Bridgeport, Conn. Two perspective views and floor plans. Cost \$3,600 complete. Mr. Joseph W. Northrop, architect, Bridgeport, Conn.
3. A colonial dwelling erected for Philip Lucas, Esq., at Mount Vernon, N. Y. Perspective and floor plans. An excellent design. Cost \$7,000 complete. Mr. Louis H. Lucas, architect, Mount Vernon, N. Y.
4. A cottage at Cranford, N. J., erected at a cost of \$5,000. Floor plans, perspective view, etc.
5. Engravings and floor plans of a suburban residence erected at Brookline, Mass. Mr. F. L. Rodgers, architect, Boston, Mass. A very attractive design.
6. A dwelling recently erected at Elizabeth, N. J., at a cost of \$5,500. Floor plans and perspective elevation. Mr. J. E. Baker, architect, Newark, N. J.
7. A new frame schoolhouse at Elizabeth, N. J., erected at a cost of \$16,000 complete. Elevation and floor plans. Messrs. Charlock & Howard, Elizabeth, N. J., architects.
8. A dwelling recently erected for W. E. Clow, Esq., at Buena Park, Chicago, Ill. A picturesque design. Two perspective views and floor plans. Mr. Greg Vigeant, architect, Chicago.
9. A town library of moderate cost at Colchester, England. Perspective view and plans.
10. A house at Cambridge, Mass., erected at a cost of \$6,000. Mr. J. T. Kelly, Boston, architect. Perspective and floor plans.
11. Restoration of the Pantheon at Rome. Half page engraving.
12. Miscellaneous Contents: A rival to oak.—Seaside painting.—Miscellaneous weights.—Water tanks.—Improve your property.—Cement.—Peruvian ruins.—Ornamental iron and brass work, illustrated.—Facts for builders.—The Goetz box anchors, post caps, and hangers, illustrated.—Improved gasgrate, illustrated.—Improved drawing instruments, illustrated.—Climax gas machine, illustrated.—Improved square chisel, mortiser, and borer, illustrated.—Adamant brush finish.—Patent stair gauge, illustrated.

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## Business and Personal.

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

"U. S." metal polish. Indianapolis Samples free. Best Handle Mach'y. Trevor Mfg. Co., Lockport, N. Y. The exhibit of Wm. Jessop & Sons has received the highest award at Chicago Exhibition.

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The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y.

Patent Electric Vise. What is claimed, is time saving. No turning of handle to bring jaws to the work, simply one sliding movement. Capital Mach. Tool Co., Auburn, N. Y.

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## Notes & Queries

### HINTS TO CORRESPONDENTS.

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

**References** to former articles or answers should give date of paper and page or number of question. **Inquiries** not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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

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**Books** referred to promptly supplied on receipt of price.

**Minerals** sent for examination should be distinctly marked or labeled.

(5666) M. T. asks: 1. What is the best way to leave boilers that have been using salt water and now are not to be used for several months? A. If there is any fresh water to be had, the boiler should be thoroughly cleaned out and washed out with freshwater, then filled with fresh water and steam got up, a few pounds pressure, and air blown out at the safety valve; the boiler pumped full of water while steam is on, allowing the safety valve to be blown enough to get rid of all air inside of the boiler; then close all valves and cocks on the boiler to keep out air. The airless water will preserve the inside of the boiler from rust. The flues and shell should be thoroughly cleaned. 2. I have two tandem compound engines, working with 100 pounds steam pressure. I would like to know if it would not be more economical to run the pressure down when I have only half load, i. e., would I not get better work from the low pressure cylinder if the high pressure were to carry the steam longer and exhaust into the receiver as a higher pressure, thereby making the low pressure piston do more work? A. You have only to set the cut-off to suit the work required; or, if the load is variable during the day or night, throttling by the steam valve is preferable. This may vary the relative work of each cylinder; but as the vacuum may be constant under the varying conditions, there can be no material loss of steam, whether less pressure is carried in the boiler or the cut-off carried back; but probably both are advisable in our uncertainty as to the present position of the cut-off. 3. Why is zinc used in boilers using salt water, and what is its action? Is it a benefit or not? Is there any substitute? A. Zinc is used for removing scale by its galvanic action, its proper connection being by copper wires with the stays at the top of the boiler. 4. If I were to run a 100 horse power engine with 100 pounds steam, and only have 25 horse power of work, would not the low pressure piston form a vacuum on the steam side, owing to the other cylinder cutting off so early with the high pressure, thus making the low work against the high pressure cylinder? A. There should be no vacuum in the low pressure cylinder until the cut-off has been reduced to one-tenth and under, and then only a partial vacuum at end of the stroke. There is no harm in this practice for a tandem compounded engine. 5. Please state at what pressures I should carry the steam to get the best results. Both the engines are working with about 26 inch vacuum. A. The most economical pressure for running a tandem compound condensing engine cannot be stated without a knowledge of its proportions; but assume that 60 pounds pressure and a proper change in the cut-off will be your best practice. 6. How much economy is there in a slow speed Corliss engine over the high speed class? A. The economy of slow or high speed is mostly in the wear of the engines and their size. For engines of 100 horse power, 100 revolutions per minute is the best speed.

(5667) J. A. asks: 1. Can I enlarge the small motor described in SUPPLEMENT, No. 641, to one-half horse power? A. You can, but it is better to follow SUPPLEMENT, No. 844. 2. How can I make the one described in No. 600 small enough for one-half horsepower? A. As the size given is a little less than a horse power, it will answer probably as it is. Or you may reduce its dimensions in the ratio of the sixth roots of 1.2. (See answer 5, below.) 3. How many storage cells will it take to run the last named motor as one-half horse power? A. Twenty-five. 4. Can I charge the same with gravity batteries? A. Yes, if you allow enough cells of gravity battery. A series of ten gravity cells will charge four storage cells, but very slowly. The series of gravity cells may be parallelized to increase the rapidity of charging. 5. If not, can you tell me where I can get directions for making one-half horse power motor? A. A very slight reduction in size (about 98.89, or  $\frac{1}{10}$  the dimensions of No. 600) will be right. The size of wire and number of turns depends on the voltage to be employed. Calculate as if for a dynamo. Calculations will be found in Sloane's "Arithmetic of Electricity," \$1 by mail.

(5668) G. R. C. asks: 1. Does combustion in common air vary in rapidity in proportion to pressure; i. e., for instance, would a fire burn half as fast in a one-half vacuum or four times as fast in compressed air, at a pressure of 60 pounds per square inch, as it would at common pressure of 15 pounds per inch? A. No exact experiments have been made determining any ratio between the rate of combustion and the density of the air fed to any kind of fire. The result will vary with the combustible; but the combustion increases faster than the pressure with many combustibles; that is, within certain limits. 2. Please to inform me at what temperature or pressure hydrogen gas is liquefied. Is oxygen liquefied at same temperature? Also at temperature of 212° F., what pressure is required to liquefy CO<sub>2</sub>? A. Hydrogen is known to have been liquefied. Oxygen has been liquefied by several chemists, among them Picot, Cailletet and Hautefeuille, Wroblewsky, Olszewski, and Dewar. Olszewski determined the boiling point, which is close to that at which it begins to liquefy, 294.4° F. below zero. The liquid oxygen has, at this temperature, a maximum density of 1.137. Wroblewsky cooled it to 392° F. below zero, without solidification. At 212° F. carbon dioxide cannot exist in the liquid form. Andrews discovered, some thirty years ago, that what is called the "critical point" of carbon dioxide is as low as 87° F. At this point it begins to gasify gradually, under any pressure, and at a few degrees higher passes wholly into a transition state, independent of pressure. For valuable articles on the liquefaction of gases, we refer you to our SUPPLEMENT, Nos. 489, 896, 878, 932; also SCIENTIFIC AMERICAN, No. 2, vol. 67, and No. 11, vol. 68.

(5669) S. A. D. asks: 1. Should the shutter in a detective camera be in a certain place, or will it give good results in the rear of the lens inside of the box? A. A shutter placed between the lenses is supposed to be in the best position; but practically it makes no difference whether it is placed in front or behind. 2. Is it necessary to have the aperture in the shutter the size of the lens, or would it work the same if it were as large as the largest stop in taking instantaneous exposures? A. It is advisable to have the aperture in shutter fully as large as the lens opening, in order to obtain the advantage of all the illumination.

(5670) C. E. P. says: The inclosed piece of wood I broke from a common split basket that was used for holding clothespins, the same being frequently set in the yard during the summer season on wash day. Will you kindly explain whether it is larva or excrement, and from what kind of an insect? Reply by Prof. C. V. Riley.—The flattened, ovoid objects attached to a bit of wood broken from a split basket, the one overlapping the other, are the eggs of one of the common katydids. This is the angular-winged katydid (*Microcentrus retinervis*), which is found throughout the South and West. It feeds upon the foliage of various plants, but is not abundant enough to be specially injurious. These eggs have been variously referred to different insects by older authors, and their true nature is fully set forth in an illustrated article in the "Sixth Report on the Insects of Missouri." The first notes of this katydid are heard about the middle of July, and are made by the male, the wing covers being partially opened by a strong jerk and the noise produced by the gradual closing of the same. The song consists of a series of from 25 to 30 rasps, as of a stiff quill drawn across a coarse file, and strongly recalls the slow turning of a child's rattle, ending by a strong jerk of the same. The female responds by a single sharp chirp or techik. The young katydid issues from the egg in early summer, but leaves little evidence of hatching, as it issues from the side and the two parts of the shell contract again. There frequently issues instead a characteristic little parasite (*Antigaster mirabilis*, Walsh), which gnaws a smooth round hole, about the size of a large pin-head, through the shell.

(5671) J. L. says: I have two large mirrors which are spotted; i. e., the quicksilver is coming off in spots. Is it caused by roaches or what? Have you a receipt of any kind that I can use on them to advantage? A. Remove the silvering from the glass around the scratch, so that the clear space will be about a quarter of an inch wide. Thoroughly clean the clear space with a clean cloth and alcohol. Near the edge of a broken piece of looking glass mark out a piece of silvering a little larger than the clear space on the mirror to be repaired. Now place a very minute drop of mercury on the center of the patch and allow it to remain for a few minutes, clear away the silvering around the patch, and slide the latter from the glass. Place it over the clear spot on the mirror, and gently press it down with a tuft of cotton. This is a difficult operation, and we would advise a little practice before trying it on a large mirror.

(5672) N. A. C. asks: What is the proper and quickest way to tell whether a glass fruit jar is airtight? A. At the time of putting up fruit in glass jars the jars should be turned neck down while hot, when if not tight air bubbles will be seen rising among the fruit through the sirup as they cool. After fruit has been put away in glass jars any leakage of air will create mould on top or cause the sirup to ferment.

(5673) A. W. S. asks for a good recipe for belt glue; something that does not require more than

four hours to dry and will hold after it is dry. What is "Buffalo frozen glue"? A. For a good, quick-setting glue for belts, select the best amber-colored glue that can be found and test its toughness by breaking the pieces, which, if of good quality, will bend and spring back, and finally break with a splintered edge. Make up the glue in the usual way by soaking cold and then heating. For a pint of thick glue prepare an infusion of gall nuts (strong) and add half a gill, hot, to the pint of hot glue just before using. Use quickly, with good wooden clamps to press the belt laps close. The tannic acid properties of the gall nuts make the glue elastic and tough. The "Buffalo frozen glue" is made by freezing the glue gelatine as soon as sliced, causing it to become spongy in drying.

(5674) R. J. L. asks: How can canvas or duck used for wagon covers and for belts be treated so that it will not be beaten or torn by mice or rats, and at the same time leaving the canvas uninjured? A. Soak or wet the canvas and belts with a strong solution of alum in water and dry; or, if the color is no object, wet the goods with a decoction of wormwood or aloes.

(5675) G. W. S. asks: What will remove stains on cotton cloth produced by a toning solution? The solution is that sold by dealers, which had been used until yellow. A. First try boiling the cloth in an ordinary clothes boiler for half an hour, then set out in the sun to dry and bleach. If this does not succeed, moisten the cloth with warm water until it is thoroughly softened; then try rubbing the stain with a dilute solution of nitric acid, one-half an ounce, mixed with twenty ounces of water, rinsing the cloth in warm water after each application.

(5676) G. D. C. writes: I wish to light a small sleeping room a half hour each night in week with an Edison six candle power lamp, incandescent. How may I make primary and storage batteries with quart and pint cells, which I have at hand? What number of each and how arranged for lighting above lamp; also how connected? A. You will need twelve volts and one and a half amperes. A six cell plunge battery, such as described in SUPPLEMENT 792, connected in series will answer. Be careful never to leave the plates immersed except when using. Storage batteries are described in several of our SUPPLEMENTS, but we do not advise you to try to make one yourself.

(5677) S. G. M. writes: I have a one horse power motor of 500 volts running in my shop. The power is furnished me by the street railway company. I would like to burn some incandescent lamps in my place, the electricity for these to be furnished by batteries; storage batteries I suppose to be the most preferable kind. Could I charge those batteries from that motor while it is running and driving my machines? How many batteries would it require for four, eight, or twelve lights to burn at an average one to two hours a day? What voltage would those lights require? How much more power does the motor require in order to charge the batteries and run my machines? Understand, while I have a one horse power motor, I hardly use over one-half horse power when running, or rather don't need more than that. What other batteries can you recommend, outside of the storage system, to burn four or eight incandescent lights? Will they last (the batteries)? Can you advise me how to arrange the batteries for said purpose? A. If your motor uses only 1½ amperes of current, you will have slow work charging a storage battery. For twelve 16 candle power lamps of 24 volts each, allow 13 cells of storage battery. If you run them two hours, the battery at the rate of 1½ amperes will require thirty-two hours to be charged again up to the starting point. If you run them only one hour, half the given number of hours will be spent in the charging. The charging will absorb about 30 volts, representing, at 1½ amperes, one-fifteenth horse power. The batteries will last a long time, with careful usage. We do not advise the use of primary batteries. Arrange batteries in series. Consult our advertising columns for addresses of electric supply firms.

(5678) B. B. W. asks: 1. What is the voltage of a single storage battery cell? A. Two volts on the discharge. Two and a quarter volts are required to charge it. 2. How many cells will it take to run fifteen 16 candle power 110 volt lamps for ten hours? A. Fifty-six. 3. How many amperes of current will that amount of cells require to run said amount of lamps, and how large will they require to be? A. 6.75 amperes, requiring rather more than one foot area of positive plate. 4. Have you a book on storage batteries for good practical use in lighting? A. We can supply Salomon's "Electric Light Installations and Management of Accumulators," price \$2; Reynier's "Voltaic Accumulator," price \$3 mailed. The first named is exceedingly practical.

(5679) R. M. P. asks: 1. Can you advise me, at earliest convenience, the object of evaporating oil to burn the gas, in lieu of burning from a wick, in the "gas-generating" devices being introduced in stoves, etc.? A. More rapid combustion, with greater freedom from smoke, is obtained. 2. Is anything gained in increasing the temperature of the gas before ignition? A. This is a gain in intensifying the heat, and if waste heat is employed, an absolute gain may be reached. 3. Is anything gained by increasing the temperature of the air (that joins the gas) before it reaches the gas for combustion? A. The same applies, but in a much greater degree. Air, however, is hard to heat, as it is very diathermic. We recommend as authorities on heat the following books, which we can supply by mail at prices given: "Thermo-Dynamics, Heat Motors, and Refrigerating Machines," by De Volson Wood, price \$4; "The Principles of Thermo-Dynamics," by Rontgen, price \$5; Peabody's "Thermo-Dynamics of the Steam Engine," price \$5 mailed.

(5680) E. R. A. asks: 1. What sizes, lengths, and weights of insulated wire (copper and German silver) will be necessary to produce following resistances: 1 ohm, 9 ohms, 40 ohms, and 150 ohms? The wire is for tangent galvanometer described in "Experimental Science." A. Consult a table on resistances of wire. These are given for copper wire, and you may multiply the given resistances by 13:1 to get the resistance of corresponding sizes of German silver wire. Only an approximation can thus be obtained. See Sloane's "Arithmetic of Electricity," page 128, \$1 by mail. 2. What weight and length of No. 40 insulated copper wire