intermittently the desired distance for cutting off a square blank from the stick for the formation of the bung, for trimming the square blank to form a cylindrical blank and to compress the same into a bung of truncated-cone shape, and for stopping the machine when the end of the stick is reached.

Prime Movers and Their Accessories.

ELASTIC-FLUID TURBINE. — Den-Ichiro Nishizaki, No. 1 Tsuna-Machí, Mita, Tokyo, Japan. In operation, the fluid enters through throttle-valves and by the nozzles is directed against the innermost series of blades on the high-pressure side of the turbine. After having acted upon the innermost ring interposed guides deflect the fluid to the next ring of blades until the outermost ring has been acted upon, after which the fluid is deflected by guides toward the axes of the checking-valves, which are lifted into a chamber and from thence through to a chamber arranged circumferentially of the casing. From the latter chamber fluid is admitted by means of the check-valves through passages to the outermost ring on the low-pressure side, and after having acted upon all the rings on this side the fluid passes into the interior of the casing and to the condenser through an opening. Mr. Nishizaki has patented another elastic-fluid turbine, which is an improvement on his copending application formerly filed, and is designed especially to diminish losses of heat by radiation through the walls between successive pressure-chambers and to reduce axial thrust and obtain axial balance, as well as to diminish frictional loss to a minimum by reducing the number of running-wheels without sacrificing efficiency.

TURBINE - REGULATOR. — Den - Ichiro Nishizaki, No. 1 Tsuna-Machí, Mita, Tokyo, Japan. This invention relates to a system of elastic-fluid-turbine regulator to be used in connection with elastic-fluid turbines claimed in Mr. Nishizaki's previous applications; and its objects are to obtain results of very sensitive speed regulation with said turbines by reducing friction of the working parts of the regulator to the minimum, as it is known that friction destroys the sensitiveness of the regulator.

STEAM-TURBINE.—A. Bonom, New York, N. Y. In this case the invention has reference to steam-turbines, and the general purpose of the improvement is the production of a turbine which will be economical in steam consumption and of high efficiency. More specifically, the object is to produce a turbine which will be of compact form and in which the steam-space enlarges with the expansion of the steam.

Pertaining to Vehicles.

JACK.—W. Umstead, Jerseytown, Pa. This invention relates to jacks, and is particularly useful in connection with devices of this character to be used for raising wagons off the ground for the purpose of removing the wheels. An object is to provide a device of this kind which can be used at various heights from the ground without adjustment and which can be operated by means of a simple manipulation.

DEVICE FOR SMOOTHING WAGON-ROADS.—F. W. Lechner, Wenona, Ill. This device is adapted to be attached to any vehicle and used as a drag to smooth the road behind the said vehicle. It is well known that if roads are dragged with a harrow while soft they may be caused to dry up very much quicker, and in drying if the roads are repeatedly dragged deep ruts and grooves are avoided and a smooth hard surface is left when the ground becomes thoroughly dry.

BUGGY - TOP - PROP ATTACHMENT. — G. Lake, Memphis, Tenn. In this patent the invention has reference to improvements in attachments for top-props for buggies, its object being to provide a device for receiving and holding the bow of a folding buggy-top and take up the jar and jolting usually received by the bow of buggies when the top is lowered.

SLEIGH.—H. A. Le Baron, Ridlonville, Maine. Bob-sleighs are improved by this invention. The object is to provide a sleigh that will be light, but strong, and so constructed that the runners will have a yielding or swinging movement relatively to the body, thus preventing to a great extent strain or possible disturbing of the load in the vehicle when the runner strikes or passes over an obstruction.

SPRING-WHEEL.—J. H. Fawkes, Detroit, Mich. This invention is an improvement in spring-wheels. By the use of the improved wheel a considerable amount of rubber is saved in the tire, since one-half of the ordinary tire is dispensed with, thus permitting the construction of tires of greater diameter with the same amount of rubber as now used in tires of much smaller diameter.

Designs.

DESIGN FOR A SOCKET FOR INCANDESCENT ELECTRIC LAMPS.—J. A. Mebane, South Boston, Va. The socket in this design is approximately bell-shaped, and the body has exteriorly a series of parallel vertical rounded ribs and intervening grooves, the lower ends of said ribs running out on the flared base or rim of the socket and terminating in acute angles or points.

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

Notes and Queries.

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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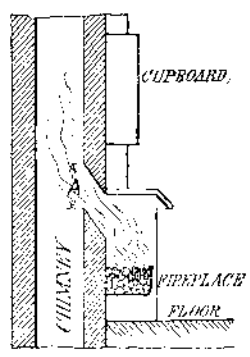
Minerals sent for examination should be distinctly marked or labeled.

(10491) L. B. J. asks: I am confused on this problem: Hiscox says, in "Gas, Gasoline, and Oil Engines," page 65, "having 120 volts 24 amperes, resistance was cut in to give 110 volts and 21 amperes." Now, what was this resistance? I compute as follows: 120 less 110 gives 10 volts as the drop, which divided by 21 gives about 0.5 of an ohm as the resistance. Yet 120 volts through 0.5 ohm resistance gives, as I understand, 240 amperes. I know that I must be wrong. Please explain in Notes and Queries. What if the amperage was 1, 12, or 48 instead of 24? In these cases what would be the resistance and the amperage? That is, in dropping to 110 volts. A. If with 120 volts 24 amperes flow, the resistance must be 120 divided by 24, or 5 ohms. If with 110 volts 21 amperes flow, the resistance must be 110 divided by 21, or 5.24 ohms. The resistance needed to make this change is 0.24 ohm. If with 120 volts 12 amperes flow, the resistance must be 120 divided by 12, or 10 ohms. As the resistance was 5.24 ohms when with 110 volts 21 amperes flow, we must add 4.75 ohms to bring about the change. In the same way for any other numbers.

(10492) T. J. writes: Will you please inform me how to bleach yellow feathers white on a live bird? A. Peroxide of hydrogen is the only chemical that can be used on a *live* bird without danger to the animal. This chemical is the one that is extensively used for bleaching hair.

(10493) H. B. asks: At how many revolutions a minute could a solid cast-iron disk be run with safety—the disk having the following dimensions: Diameter, 5 feet 6 inches: thickness at hub, 4 inches; and tapering to ¼ inch thickness at the rim. We mean, of course, if this were running free, and were not acted on by any other forces except centrifugal force. A. The disk may be run at a speed of 550 revolutions per minute with a safe factor of from 5 to 6, depending upon the quality of the iron. See Scientific American Supplement, No. 891, on centrifugal force as applied to revolving machinery; 10 cents mailed.

(10494) R. D. says: I have been a reader for a number of years, and for this reason felt that I might impose on your good nature by asking if you could tell us whether or not we could put a fireplace in our chimney without spoiling the draft for the other connections. There are only two openings into it, both in the basement. We want to put the fireplace on the first floor if possible. Our local masons do not know much about fireplace making. If possible, please make a rough sketch of what you would suggest. If it was a double-flue chimney we could no doubt arrange it easily, but we have only one



flue to work on. A. In reply to your inquiry regarding the placing of a fireplace in your chimney, we would say that unless there was plenty of draft to spare in the chimney a fireplace would greatly reduce the draft in the chimney. The opening for the fireplace must be smaller than the two openings in the basement and should be arranged as shown in the sketch. However, unless there is plenty of draft to spare, it would not be advisable to put in the fireplace; and as we have no means of determining the draft, we cannot definitely advise you concerning this subject.

(10495) H. F. says: Can you give me a process to treat linotype metal that has deteriorated in quality through constant remelting, other than by adding old type metal or new linotype metal? A. Linotype metal for remelting should be kept free from all substances which do not belong there. The addition of a very little zinc or brass, etc., will make the metal unfit for use. The addition of type, stereotype or electrotype plates should also be avoided, as these are made on different formulas, and would, of course, change your mixtures. If your metal works poorly, send a sample to a reliable concern for analysis, who will supply you with a "tempering metal" to suit the condition of your metal.

(10496) B. G. W. asks how to charge magnets. A. Correspondents frequently ask the following questions, which are fully answered in their order: 1. For a plain description of how to proceed in order to charge a straight bar of steel with sufficient magnetism to give it the power of lifting four times its own weight. Also how to proceed with horseshoe and other forms. 2. The name of the best brand of steel to use—Jessup's, chrome, black diamond, tool or machinery. How to temper. 3. Is there any gain in allowing the bar to remain under the influence of the current for a long time, or does it receive the full charge instantaneously? In fact, we would like some information on this subject that we can rely upon. A. 1. The quickest and best way to magnetize steel bars is to place them centrally in a suitable coil, and then connect the helix with the wires from a dynamo-electric machine or powerful battery for a few seconds, remembering to break the current before removing the magnet from the coil. If the source of the current is a dynamo machine, the coil should be about 2½ inches long and should consist of 10 or 12 layers of No. 12 magnet wire. If a battery is used, a coil 1½ inches long, composed of 14 or 16 layers of No. 16 magnet wire, will be the best. The internal diameter of the coil should be only large enough to admit the bars easily. A battery of six Grenet elements, each having an effective zinc surface of 30 square inches connected in series, will do the work very well on small magnets; such, for instance, as are used in telephones. Where a number of magnets are to be made at one time the bars may be passed in a continuous line through the coil, always keeping three bars in contact end to end, adding one above the coil before taking one off below. In this manner sixty bar magnets have been strongly charged in ten minutes. Horseshoe magnets cannot be charged so readily. There are two or three ways of charging them. One way is to place them in contact with the poles of a very strong electro-magnet, removing them after breaking the current; another method is to place each limb of the magnet in a coil adapted to the current to be used, and still another method is to employ a single coil, inserting one pole of the magnet into the coil in one direction, then breaking the current, and inserting the other pole into the coil from the opposite direction. It is well to remember that the magnet will be very much impaired if the current is not broken before removing it from the coil. The secret of success in charging magnets is to have a strong current. It is impossible to make magnets satisfactorily without this all-important requisite. 2. As to the quality of steel best adapted to this purpose, machinery steel hardened and not tempered answers admirably. For horseshoe magnets German spring steel is the best. Tool steel answers well if hardened and drawn to a staw color. 3. The steel receives its maximum charge almost instantly. It is useless to allow it to remain under the influence of the magnetizing current more than a few seconds.

(10497) C. L. asks how to make a pad for rubber stamps. A. The following is said to be a cushion that will give color permanently. It consists of a box filled with an elastic composition, saturated with a suitable color. The cushion fulfills its purpose for years without being renewed, always contains sufficient moisture, which is drawn from the atmosphere, and continues to act as a color stamp cushion so long as a remnant of the mass or composition remains in the box or receptacle. This cushion or pad is too soft to be self-supporting, but should be held in a low, flat pan, and have a permanent cloth cover. The composition consists preferably of 1 part gelatine, 1 part water, 6 parts glycerine, and 6 parts coloring matter. A suitable black color can be made from the following materials: 1 part gelatine glue, 3 parts lampblack, aniline black, or a suitable quantity of logwood extract, 10 parts of glycerine, 1 part absolute alcohol, 2 parts water, 1 part Venetian soap, 1-5 part salicylic acid. For red, blue, or violet, 1 part gelatine blue, 2 parts aniline of desired color, 1 part absolute alcohol, 10 parts glycerine, 1 part Venetian soap, and 1-5 part salicylic acid. The following additional receipt is also used for this purpose: 1. Mix and dissolve 2 to 4 drachms aniline violet, 15 ounces alcohol, 15 ounces glycerine. The solution is poured on the cushion and rubbed in with a brush. The general method of preparing the pad is to swell the gelatine with cold water, then boil and add the glycerine, etc.

(10498) J. M. H. asks how to prepare and polish shells. A. 1. Porcelainous shells are so hard as to require the apparatus of a lapidary to cut or polish them, but they are generally so smooth as to require no rough grinding. They may be polished by using a felt wheel and applying putty powder. Nacreous shells or those of the pearl variety may be filed and cut without a great deal of difficulty. Pieces to be turned are first roughly shaped on the grindstone, then turned and polished with pumice stone, putting on the final polish with rottenstone. Irregularly shaped pieces are filed and ground, then smoothed with pumice stone and water, and finished with rottenstone. The rottenstone is sometimes mixed with sulphuric acid full strength, or slightly diluted, to heighten the polish. 2. Rough shells are polished by first grinding them on a coarse stone, then smoothing them with pumice stone and water on a buffer wheel or with a hand polisher, and finishing with rottenstone.

(10499) A. N. M. asks how to color meerschaum. A. Ordinarily the pipe is boiled for coloring in a preparation of wax which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerschaum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather. 2. Fill the pipe and smoke down about one-third, or to the height to which you wish to color. Leave the remainder of the tobacco in the pipe and do not empty or disturb it for several weeks, or until the desired color is obtained. When smoking, put fresh tobacco on the top and smoke to the same level. 3. When once burnt the pipe cannot be satisfactorily colored, unless the burnt portion is removed and the surface again treated by the process by which meerschaum is prepared. The coloring is produced by action of the smoke upon the oils and wax which are superficially on the exterior of the pipe, and are applied in the process of manufacture.

(10500) A. G. H. asks for rules for calculating speed of pulleys. A. The diameter of the driven being given, to find its number of revolutions. Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven. Example.—Twenty-four inches diameter of driver × 150, number of revolutions, = 3,600 ÷ 12 inches diameter of driven = 300. The diameter and revolutions of the driven being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time. Rule.—Multiply the diameter of the driver by its number of revolutions, and divide the product by the number of required revolutions of the driven; the quotient will be its diameter. Example.—Diameter of driver (as before) 24 inches × revolutions 150 = 3,600. Number of revolutions of driven required = 300. Then 3,600 ÷ 300 = 12 inches. The rules following are but changes of the same, and will be readily understood from the foregoing examples. To ascertain the size of the driver. Rule.—Multiply the diameter of the driven by the number of revolutions you wish to make, and divide the product by the required revolutions of the driver; the quotient will be the size of the driver. To ascertain the size of pulleys for given speed. Rule.—Multiply all the diameters of the drivers together and all the diameters of the driven together; divide the drivers by the driven; the answer multiply by the known revolutions of main shaft.

(10501) A. L. W. asks for a simple rule for calculating the horse-power of steam engines. A. Multiply the square of the diameter of the cylinder in inches by 0.7854, and this product by the mean engine pressure, and the last product by the piston travel in feet per minute. Divide the last product by 33,000 for the indicated horse-power. In the absence of logarithmic formulæ or expansion table, multiply the boiler pressure for ⅝ cut off by 0.91, for ½ cut off by 0.85, ⅜ cut off by 0.75, 3-10 cut off by 0.68. This will give the mean engine pressure per square inch near enough for ordinary practice, for steam pressures between 60 and 100 pounds, always remembering that the piston travel is twice the stroke multiplied by the number of revolutions per minute.

(10502) B. G. I. asks how to preserve India rubber. A. 1. In the opinion of Hempel, the hardening of vulcanized India rubber is caused by the gradual evaporation of the solvent liquids contained in the India rubber, and introduced during the process of vulcanization. Guided by this notion, he has made experiments for a number of years in order to find a method for preserving the India rubber. He now finds that keeping in an atmosphere saturated with the vapors of the solvents answers the purpose. India rubber stoppers, tubing, etc., which still possess the elasticity, are to be kept in vessels containing a dish filled with common petroleum. Keeping in wooden boxes is objectionable, while keeping in air-tight glass vessels alone is sufficient to preserve India rubber for a long time. Exposure to light should be avoided as much as possible. Old hard India rubber may be softened again by letting the vapor of carbon bisulphide act upon it. As soon as it has become soft, it must be removed from the carbon bisulphide atmosphere and kept in the above way. Hard stoppers are easily made fit

for use again in this manner, but the elastic properties of tubing ca not well be restored.—Ber. Chem. Ges. 2. In order to prevent India rubber materials from hardening and cracking, they are steeped in a bath of melted paraffin for a few seconds, or several minutes, in accordance with the size of the articles, and then dried in a room heated to about 212 deg. F.

(10503) C. N. asks how to bottle horseradish. A. Six tablespoonfuls scraped or grated horseradish, 1 tablespoonful white sugar, 1 quart vinegar. Scald the vinegar; pour boiling hot over the horseradish. Steep a week, strain, and bottle. Exposure to the air will discolor.

NEW BOOKS, ETC.

POCKETBOOK OF AERONAUTICS. By Major Hermann W. L. Moedebeck, in collaboration with O. Chanute and others. Translated by W. Mansergh Varley, B.A., D.Sc., Ph.D. London: Whittaker & Co., 1907. 14mo.; pp. 426; 140 diagrams and illustrations. Price, $3.25.

This book is a comprehensive *résumé* of the entire subject of aeronautics. It is written by a well-known German authority, and bas been brought up to date by the various collaborators. The book contains sixteen chapters dealing with such subjects as physics of the atmosphere; meteorological observations in balloon ascents and the computation of results; the technology of gases; the theory, practice, and technique of ballooning, and ballooning from a military standpoint; kites and parachutes; animal flight; artificial flight; airships; flying machines; motors and air screws. All of these subjects are treated in detail. The section of the book dealing with balloons and ballooning is very complete, and includes a brief history of military ballooning in all the different countries. The question of firing projectiles at and from balloons and airships is also discussed, and there is an interesting chapter on balloon photography.

The section on artificial flight is divided into three parts. The first of these is historical, and the other two, by Otto Lilienthal and Octave Chanute, respectively, treat of this subject from a practical standpoint, and describe the various machines of different inventors with which experiments have been made, besides giving the theories of the action of the air upon plane and curved surfaces. The book contains reproductions of a number of excellent photographs of Lilienthal and the Wright brothers in gliding flight. A letter of the Wright brothers, written November 17, 1905, in which they detail their final successful flights with a motor-driven aeroplane, is reproduced. Chapters XIII. and XIV. on flying machines and on motors (by Major Hermann Hoernes) treat very elaborately of the laws of air resistance found by various experimenters, the fundamental laws of aerodynamics, aerodynamical calculations, etc.; and of all kinds of motors such as electric, steam, and gasoline, that come useful to the aeronaut. The Major also has a chapter on air screws, which will be found valuable. The book also contains a list of the different international aeronautical societies, of which there are over a score throughout the world. An Appendix gives many valuable tables and formulæ.

TUNNEL SHIELDS AND THE USE OF COMPRESSED AIR IN SUBAQUEOUS WORKS. By William Charles Copperthwaite, M.Inst. C.E. New York: D. Van Nostrand Company, 1906. 4to.; pp. 390; 260 illustrations and diagrams. Price, $9.

This is an elaborate treatise on the tunneling shield and its use in subaqueous work. The book has been compiled from papers printed in the Proceedings of the Institution of Civil Engineers, and from descriptions of tunneling work that have appeared in technical journals. The author is a man of considerable experience in this line of work. He discusses the shield from the date of its invention in 1818 up to the present time, and illustrates all of the various types that have been designed and put in operation. The book contains a chapter on the use of compressed air in engineering work, with some notes on caisson disease. Another chapter discusses the use of cast-iron lining in tunnels. The shield which was the invention of Mr. Alfred E. Beach, one of the original editors and proprietors of this journal, and with which he constructed a tunnel beneath Broadway in 1869 is illustrated and described. The Greathead shield, which was invented and used about the same time in England, is also discussed in Chapter IV. Other chapters are devoted to the use of the shield in water-bearing strata and the use of the shield in masonry tunnels. Chapter X describes the recent tunneling work carried out in England and in France by means of a shield, or with compressed air. The final chapter of the book is a practical one on the cost of construction and operating a shield. The book is completed by two Appendices giving a chronological list of events connected with tunneling by means of a shield or compressed air, and also giving English patents relating to this manner of tunneling from 1818 to 1904 inclusive. This book is especially recommended to engineers or others wishing to become familiar with this fascinating subject.

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