cians in that particular town how to solve such a simple problem in proportion. Furthermore, the chances are that the best mathematicians in that town do not comprehend your statement and solution. The solution is as follows (three known and one unknown quantity): Woman is to man as man is to woman and pig.

Therefore $139 : 160 :: 160 : 139 + x$.

For convenience call $139 + x$ simply x.

$$\text{Then } x = \frac{160 \times 160}{139} = 184\frac{24}{139}.$$

$$184\frac{24}{139} - 139 = 45\frac{24}{139} \text{ pounds.}$$

45 pounds and nearly 3 ounces weight of pig. A. We have received many letters concerning the man and woman who weighed the pig without scales, by balancing on a pole laid across a rail. Most of them are critical, and charge that we give too long a solution. The solution above is a sample of these claimed to be better than ours. If that is the sort of thing any one wants, as Mr. Lincoln said, it is just the sort of thing any one would want. We submit that it does not explain itself at all. If any one could solve the problem, he would not require it; and if he could not solve the problem, this solution would be of no assistance to him in his effort to do so. It gives no reason whatever for any step taken. Every solution for the use of one who is to be instructed by it, ought to make clear each step, and lead the learner along from step to step clearly. The problem is one of a lever with unequal arms balanced about a fulcrum. Our solution recognizes that fact, and not one of those sent in by our critics makes any mention of the principle upon which their solutions are based.

(10526) J. M. B. writes: In Notes and Queries 10439, in your issue of March 16, you published a problem and answer relating to the properties of the lever or arm and fulcrum. I think that you have kindly and obliging feelings toward your readers when you take notice of such, as it does not seem to me to be in your line. I discovered a rule bearing on the matter while investigating the same properties. I have never seen it published, and think that it is a new one, although I may be mistaken; however, it is a simple one, and may be useful to some of our friends who are not posted in algebraic formula. I inclose it herewith, as you may think it available for publication. Proposition: If an arm is balanced on a fulcrum by unequal bodies on each end, the weight of each being known, if on reversing the position of the bodies it is required to be known how much to add in weight to the lesser body to preserve the balance. Observe the following rule: Let the value of the arm be put = 1. This value of the arm in this rule is arbitrary and is the exception; let x = the weight required. Then it will be: As the sum of the weights is to the difference of the weights, so is 1 to the difference of segments of 1; and by rule ½ ± ½ of the quotient will give the segments. Then the difference of the weights ÷ the lesser segment will = x, the weight required. This rule is constant and invariable, and the proof of the work is found by the fundamental rule that the product of the weight and segments of each side are equal to each other.

(10527) E. A. P. says: I have a "Brownie" camera No. 2, and have taken eighteen snapshots (three films). When I came to develop them, the pictures were all black, so that I could not see anything. Can you tell me what it was that made them so black? I am sure that I developed them right. First: I put the pictures in the water. Second: In the hypo-soda. Third: In the developing powders. Fourth: In water to rinse. A. You began at the wrong end. If an exposed film is placed in hypo first, then in the developing solution, it will blacken over. The rule is to moisten the film first with water, then place it in the developing solution, then rinse with water, and lastly put it in the hypo-soda fixing bath until the creamy white portions are entirely dissolved out. Then it is washed in water for half an hour and hung up to dry.

(10528) B. & Co. say: Will you kindly give us the horse-power that a heavy-duty horizontal Atlas engine will develop with inside diameter of cylinder 12 x 18 inches, running 175 revolutions per minute with 100 pounds steam pressure? A. The horse-power which a steam engine will develop depends entirely upon the point of cutoff, when the size, boiler pressure, and speed are given, or in other words, upon the fraction of the stroke during which steam is being admitted to the cylinder. It is possible to have the cutoff so early that the average pressure in the cylinder during the stroke will be approximately equal to zero. With the cutoff at about one-third the stroke, the boiler pressure 100 pounds, and the revolutions equal to 175 per minute, the horse-power of your engine would be approximately 85.

(10529) L. L. L. says: If a pipe 2 inches in diameter, connected to a larger pipe carrying a pressure of 100 pounds to the square inch, had a nozzle put on it with a 1-inch hole in it, would it discharge as much water as the pipe would before the nozzle was put on? If the water would not have a greater pressure at the nozzle, but have an increased velocity? Where does the lost pressure go to if it is not in the velocity? How can we increase the velocity of anything without increasing the pressure? A. We would say that there would be a smaller quantity of water discharged through the 1-inch nozzle than would be discharged through the 2-inch open pipe, but the velocity would be greatly increased, and the pressure in the 2-inch pipe would also be increased by this use of the nozzle. It is impossible to increase the velocity of a liquid flowing from a nozzle without increasing the pressure at the same time.

(10530) W. P. D. says: I am informed by an experienced miller that in the running of his turbine wheels he always has to turn off part of the water at dark to maintain a uniform rate of speed of his millstones. Is this a scientific fact noted and established in the working of water-power wheels? If so, why? A. We would say that we do not know why the miller has to turn off part of his water supply at the time you mention, but it is probably for some other reason than because of darkness. It does not make any difference whether it is daylight or dark, the same energy has to be expended to do the same amount of work. 2. Also I have frequently noticed (as well as being asked by others who have noticed it) that in riding a bicycle during twilight or after dark the machine appears to require less power than during daylight. Is this real or imaginary? If real, why? A. The reason that it seems easier to ride a bicycle after dark, especially upon a road which is familiar to the rider, is that the rider cannot see the road over which he is riding, or the stationary objects along the road, as plainly as he does in the daylight, and consequently does not seem to realize that he has exerted or is exerting as much energy as he would be exerting if it were daylight, in riding over the same road. He seems to be moving faster than he really does, and thus feels that little exertion is required. 3. In your issue of March 16 you work a problem regarding the weight of a pig by algebra. To the majority of your readers, who like myself do not work algebra, your solution is lost. Here, however, is a solution to it in ordinary arithmetic, by a rule we used to call "position" or "supposition": First suppose the plank to be say 12 feet long. This multiplied by the weight of the man, 160 pounds, and divided by the combined weights 160 + 139 = 299 pounds, would give 6.4214 feet, which subtracted from the 12 feet, would give 5.5786. These two numbers give the relative lengths of beam from the point of balance. Now as the man (160 pounds) is to be on the long end of the plank next time, 160 × 6.4214 ÷ 5.5786 will give the weight required on the short end. This is 184.17 pounds; that is, the woman and pig, 184.17 — 139 leaves 45.17 pounds, the weight of the pig. A. We would say that your method of solving the problem described is correct. There are several ways of arriving at the correct result of the problem, we believe; and the method used, either the algebraic or "supposition," is dependent upon the principle of solving an equation for unknown quantities, whether these quantities are represented by letters or "supposed" figures.

(10531) D. L. M. says: Will you kindly answer through your Notes and Queries the compound used for brazing cast iron? A. We would say that the flux used in brazing cast iron is powdered borax. The spelter used is prepared especially for brazing cast iron, and is generally in a granular form, the grains averaging perhaps the size of coarse sugar. The composition of this spelter depends upon the nature of the iron to be brazed, or rather the heat which the iron will stand, as the spelter must melt and flow readily at a temperature below that of the melting point of the iron. The brazing metal is made of copper and zinc in the proper proportions.

(10532) B. W. H. asks how to make tracing paper. A. A German invention has for its object the rendering more or less transparent of paper used for writing or drawing, either with ink, pencil or crayon, and also to give the paper such a surface that such writing or drawing may be completely removed by washing, without in any way injuring the paper. The object of making the paper translucent is that when used in schools the scholars can trace the copy, and thus become proficient in the formation of letters without the explanations usually necessary, and it may also be used in any place where tracings may be required, as by laying the paper over the object to be copied it can be plainly seen. Writing paper is used by preference, its preparation consisting in first saturating it with benzine, and then immediately coating the paper with a suitable rapidly drying varnish before the benzine can evaporate. The application of varnish is by preference made by plunging the paper into a bath of it, but it may be applied with a brush or sponge. The varnish is prepared of the following ingredients: Boiled bleached linseed oil, 20 pounds; lead shavings, 1 pound; zinc oxide, 5 pounds; Venetian turpentine, ½ pound. Mix, and boil eight hours. After cooling, strain, and add 5 pounds white copal and ½ pound sandarac.

(10533) S. J. M. asks how to detect sulphuric acid in vinegar. A. We have received so many letters on this subject that we are compelled to decline publishing many good methods which our correspondents have forwarded. The following, however, will give housekeepers, and others to whom chemical processes are not accessible, an opportunity of testing the purity of the article. The following is Fresenius' test, simplified for general purposes: Put a wine glassful of the vinegar into a china tea cup, and let the cup float in water in a pint cup of tin or other metal that will stand heat. Boil the water till half the vinegar has evaporated, then drop into the cup a piece of (cane) loaf sugar about the size of a grain of wheat. Continue the boiling till the liquid in the cup has evaporated, when, if the vinegar contains free sulphuric acid, the dry residue will be found to be blackened. The charring of the sugar is due to free sulphuric acid.

(10534) A. P. W. asks how to deodorize petroleum. A. Mix chloride of lime with petroleum in the proportion of three ounces for each gallon of the liquid to be purified. It is then introduced into a cask. Some muriatic acid is added and the mixture is well agitated, so as to bring the whole of the liquid into intimate contact with the chlorine gas. Finally the petroleum is passed into another vessel containing slaked lime, which absorbs the free chlorine and leaves the oil sufficiently deodorized and purified.

NEW BOOKS, ETC.

Electricity as Applied to Mining. By Arnold Lupton, G. D. Aspinall Parr, and Herbert Perkin. Second edition, thoroughly revised and enlarged. London: Crosby Lockwood & Son. New York: D. Van Nostrand Company. About 190 illustrations; 8vo.; cloth; 320 pages. Price, $4.50.

Such wide use is made of electricity in mining, that there is need for a textbook on the subject. The volume of which we are now writing should meet the need very well. It contains descriptions of dynamos, ways of transmitting current, transformers, motors, and their application to the operation of mining machinery, systems of lighting, and the use of electricity in exploding blasts.

The Theta-Phi Diagram. Practically applied to Steam, Gas, Oil, and Air Engines. By Henry A. Golding. Second edition, revised and enlarged. Manchester, England: The Technical Publishing Company. 16mo.; cloth; 126 pages. Price, $1.25.

This work is a presentation, in as simple and practical a manner as possible, of the use of the temperature-entropy diagram and the various methods of drawing it for different heat motors. This most important subject has been too rapidly slurred over in the past, owing to the mathematical difficulties surrounding its study. Now, since the publication of Mr. Golding's book, these difficulties have been largely removed, and the science put in a form where all may readily approach it.

The Common Bacterial Infections of the Digestive Tract and the Intoxications Arising from Them. By C. A. Herter. New York: The Macmillan Company. 12mo.; cloth; 360 pages. Price, $1.50 net.

This volume embodies views recently presented by the author to the New York Academy of Medicine, in a lecture before the Harvey Society for the Diffusion of Medical Knowledge. The object of their publication in book form is to place before the notice of practitioners and investigators a number of important details, not suited for publication in a medical journal. The work is in no sense a popular treatise, but could be profitably read even by the layman, for there is no question of such vital importance as that of bacterial action in the digestive tract.

How to Build a Direct-Current One-Kilowatt Dynamo or a One Horse-Power Motor. By A. E. Watson. Lynn, Mass.: The Bubier Publishing Company. 16mo.; cloth; 100 pages; illustrated. Price, $1.

A complete set of directions for making and assembling the parts of a practical and up-to-date dynamo or motor. This book is not a "boy's handbook," but a technical work of merit and usefulness.

A Glossary of Terms Used in English Architecture. By Thomas D. Atkinson. New York: William T. Comstock. With 265 illustrations; 320 pages; 16mo.; cloth. Price, $1.50.

A very good glossary, limited to the historical aspect of architecture, yet devoting especial attention to that part of the subject which bears on social and religious life.

Race Culture; or, Race Suicide? (A plea for the unborn.) By Robert Reid Rentoul. London and New York: The Walter Scott Publishing Company. 8vo.; cloth; 182 pages. Price, $3.

The increased complexity of modern social conditions is forcing a very disagreeable question before our notice; namely, the question of race perpetuation with regard to race improvement. In America we are somewhat ahead of Great Britain, yet Dr. Rentoul's book has many suggestions that we might profitably apply to our conditions over here. His plan imposes less hardship upon the class it deals with than any other that has been put forth up to date, while, at the same time, it seems to offer the desired cure for the evils it is intended to do away with.

Fire Assaying. A Practical Treatise on the Fire Assaying of Gold, Silver, and Lead, Including Description of the Appliances Used. By Evans W. Buskett. New York: D. Van Nostrand Company. 16mo.; cloth; 105 pages; illustrated. Price, $1.25.

A very good short work on assaying, containing directions and descriptions of apparatus. It is especially to be recommended for those who have had the practical experience without the technical education.

Experimental Zoology. By Thomas Hunt Morgan. New York: The Macmillan Company, 1907. 12mo.; 448 pages; cloth; 25 illustrations. Price, $2.75 net.

A collection of the results that have been obtained in the field of experimental zoology during the last fifteen years. Many details that an exhaustive treatment would demand have been omitted, as only such cases have been selected as are the most typical and the most instructive. The chief stress of the work is laid upon the determination of the conditions under which changes in form occur. The book should appeal to all intelligent readers who are interested in this fascinating subject.

Boiler Waters, Scale, Corrosion, Foaming. By William Wallace Christie. New York: D. Van Nostrand Company. 8vo; cloth; 77 illustrations; 235 pages. Price, $3.

This work is intended to furnish steam users with information regarding water, its use, and the troubles arising from the presence of impurities in it, as well as with their proper remedies wherever possible. Analyses of various boiler waters are given, and the effects of the dissolved substances discussed in each case. Means of detecting the more common scale forming and injurious compounds are presented, enabling the engineer to make his own preliminary tests without calling in a chemist.

A German Science Reader. With Notes and Vocabulary. By William H. Wait, Ph.D. New York: The Macmillan Company. 12mo.; cloth; 321 pages. Price, $1 net.

It is the aim of this work to give to those who desire a knowledge of technical and scientific German a conveniently arranged collection of articles covering the principal sciences. The selections are so chosen that a specialist in one subject can profitably read the portions of the work devoted to the sciences which are related to the one he is chiefly interested in.

An Elementary Treatise on Theoretical Mechanics. By J. H. Jeans. New York: Ginn & Co. 8vo.; cloth; 364 pages, illustrated. Price, $2.50.

Although quite young, Prof. Jeans is regarded as the physicist of the greatest promise of the present day. In the realm of mechanics he is particularly at home, especially from the theoretical standpoint; so that the present book, intended to furnish a short course for beginners, is of double value. The subjects dealt with are the general principles of dynamics, the laws of motion, statics, dynamics of a particle and of rigid bodies. The treatment aims at elucidating physical principles rather than at elaborating a mathematical theory. Care has been taken to illustrate all principles and results by a series of practical examples and applications. The amount of mathematics in the text has been reduced to the minimum which is consistent with giving the student exact ideas and the knowledge necessary for performing exact calculations. A great many exercises and problems are inserted for solution by the student, and especial care has been taken to make these as representative and as illustrative as possible.

The Book of Vegetables and Garden Herbs. A Practical Handbook and Planting Table for the Vegetable Gardener. By Allen French. New York: The Macmillan Company. 12mo.; cloth; 312 pages, 144 illustrations. Price, $1.75 net.

An alphabetically-arranged list of vegetables suited to cultivation in the northern United States, with the best times for planting them, and the conditions and methods of cultivation most favorable to their growth. To all who own gardens this book will come as a great help, giving, as it does, not only practical advice in how to plant, but assistance in choosing what to plant in order to obtain the greatest yield.

Inorganic Chemistry for Schools and Colleges. By James Lewis Howe. Being a second edition of Inorganic Chemistry According to the Periodic Law, by F. P. Venable and J. L. Howe. Easton, Pa.: The Chemical Publishing Company, 1907. 12mo.; cloth, 409 pages, 70 illustrations. Price, $3.00.

An excellent general and descriptive book, dealing with the theory of the subject from the modern physico-chemical standpoint. The author preserves a very just balance between theoretical and practical considerations, making the work of the greatest service for all but the merest beginners. A good text-book for higher schools and colleges.

QUESTIONS AND ANSWERS FROM THE GAS ENGINE. Cincinnati, Ohio: The Gas Engine Publishing Company. 12mo.; cloth; 278 pages. Price, $1.50.

A collection of questions and their answers compiled from the more interesting and valuable ones that have appeared in the "Answers to Engineers" column of the Gas Engine. Covering nearly every phase of this perplexing subject, they present in compact form information of great value.

ELECTRICAL ENGINEERING. An Elementary Textbook. Suitable for Persons Employed in the Mechanical and Electrical Engineering Trades, for Elementary Students of Electrical Engineering, and for All who wish to Acquire a Knowledge of the Chief Principles and Practice of the Subject. By F. Rosenberg. Translated by W. W. Haldane Gee and Carl Kinzbrunner. Authorized edition, revised and brought down to date for the American market by Edward B. Raymond. New York: John Wiley & Sons. 8vo.; cloth; 347 pages; 333 illustrations. Price, $2.

A simply-written elementary work for those who wish a clear textbook that is not crowded with mathematical formulæ. It covers a wide area, comprising, besides the fundamental phenomena of the electric current, dynamos and motors for continuous, alternating, and three-phase currents, accumulators and their apparatus, measuring instruments, and electric lighting. The work is especially noticeable for its full and lucid explanation of alternating currents.

STAR AND PLANET FINDER. By Leon Barritt and Garrett P. Serviss. New York: Leon Barritt, 1906.

The new star and planet finder is a decided improvement on the old planisphere—that indispensable adjunct of the amateur astronomer. To those who may be unfamiliar with the planisphere, we would explain that it is a star chart which may be revolved under a fixed cover to set positions for each hour of the day and each day of the year. An opening in the cover shows a map of that portion of the heavens that is visible on the day and hour for which the chart is set. Although excellent as far as it goes, the planisphere falls short in that it does not indicate the position of the planets, whose irregular apparent motions render them far more interesting to the layman than the "fixed" stars, which return to the same apparent position year after year with the regularity of clockwork. The improved planisphere of Messrs. Barritt and Serviss meets this need of the amateur by the provision of nine disks to represent the sun, moon, and planets. Each disk is formed with a central pin point, whereby it can be attached to the chart, like a thumb tack, wherever desired. The ecliptic, which is virtually the path of the planets, is shown by a red line on the chart and is marked off in degrees. A table which is furnished with the chart shows just where the disks should be applied on the ecliptic for successive dates covering a period of twenty years. Thus the progress of the planets may be studied, and the chart may be consulted at any time to show, within a few degrees, just where a certain planet is to be found. The chart itself is very clear, the constellations and principal stars are named, but to avoid confusion, no Greek letters are used. The stars are made large or small according to their magnitude, instead of indicating their brilliancy by means of the customary rays. Altogether, the new star and planet finder is a most valuable aid to the study of elementary astronomy.

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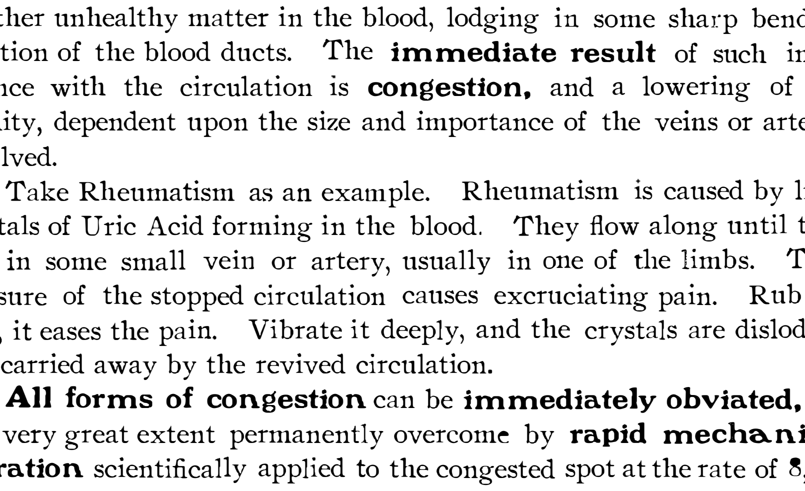

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Car, convertible, J. A. Brill....... 852,767, 852,768
Car convertible, H. E. Haddock.......... 852,782
Car coupling, A. M. Knapp 853,017
Car coupling, O. P. Moncrief............ 853,023
Car door, J. Carr 852,925
Car door hanger, J. A. Myers............ 853,207
Car door operating mechanism, gondola, E. I. Dodds 852,936
Car dumping apparatus, T. H. Aldrich, Jr. 852,643
Car fender, T. J. F. Mueller............. 852,610
Car fender, T. J. Sayers................. 853,123
Car grain door, H. W. Richards.......... 852,906
Car, hopper bottom, A. E. Ostrander...... 852,845
Car lock, dumping, W. W. McKelvey...... 853,189
Car, metallic, W. M. Smith 852,808
Car, mine, F. C. Hockensmith............ 852,879
Car repairer's tool, D. W. Collins........ 852,704
Car, stock, Campbell & Wilson........... 852,417
Car wheel, A. S. Gustafson.............. 853,082
Cars, automatic curtain hook and release for vestibule, McCoy & Morton....... 853,188
Carbureter, Akeson & Anderson.......... 853,196
Carbureting apparatus, R. G. Speer....... 852,685
Carcass elevator, A. Hannaford.......... 852,785
Cardboard and manufacturing the same, L. Emerson 852,938
Carpenter's gage, B. O. Gudgen.......... 852,432
Carriage top, H. A. Hawes 852,434
Carriage wheel, child's, Marshal & Baker.. 852,667
Carrier. See Overhead carrier.
Cart, self-loading, Z. Whittemore......... 852,919
Cart, self-loading dump, Liverett & Hood.. 853,181
Casein and compound obtained therefrom, treating, J. Taluau 852,915
Casement adjuster, H. G. Voight.......... 852,477
Cash register, A. H. Green 853,011
Casting apparatus, H. G. Underwood.... 852,811
Casting iron and steel, metal mold for, McArthur & Darke 852,671
Catch, spring, T. Danquard 852,422
Cattle guard, C. Long 853,100
Cement, T. Jones 853,175
Cementing machine, O. A. Webber 852,861
Centrifugal machine, B. Ljungstrom....... 852,666
Centrifugal machine, G. Adt 852,865
Check, triplicate sales, S. S. Zelley....... 853,050
Checks and other papers, protecting, E. & M. Ilch 852,840
Chemical engine, Wottring & Sutphen.... 852,815
Chimney cowl and ventilator, combined, D. Whitehead 852,480
Circuit controlling mechanism for electrically heated tools, W. J. Barr....... 852,537
Circuit making and breaking device, S. Bouton 852,414
Clamp, W. B. Ruddick 852,681
Clamps, soft metal gasket for service, A. Schuermann 852,682
Clamping device, C. L. Simmons 853,128
Clasp knife, N. Sahlsten 852,524
Cleaning and polishing compound, H. B. Radford 852,903
Clip, F. A. Brownell 852,923
Clock, alarm, Stockton & Porter......... 852,859
Clock, electric alarm, J. F. Rodgers..... 853,119
Clothes line prop and holder, A. B. Greer.. 852,602
Clutch, E. Huber 852,956
Clutch, automatic, M. J. L. Towler...... 852,587
Clutch device for agricultural machines, L. A. Aspinwall 852,921
Clutch mechanism, R. E. Northway....... 852,798
Clutch mechanism for dumb waiters and the like, A. Svenson 852,469
Cock or valve, safety gas, Bennett & Ekern 853,053
Coin operated machines, coin actuated device for controlling the operation of, H. K. Sandell 852,848
Coin wrapping device, H. H. Norrington.. 852,574
Concentrator, centrifugal, C. T. Heisel... 852,558
Concrete block making machine, C. O. Brandell 852,764