neath the car, thereby enabling him to use both hands to drive the bit, or else use one to drive the bit and one to produce lever pressure. It has removable handles and removable pressure-sustaining devices so that one side may be free from any lateral projections.

CRANE.—J. A. SUESS, Shreveport, La. This crane will operate to raise a load to a considerable height, and includes an auxiliary lifting device which can be released independently of the main lifting device so as to enable the load to descend a short distance. In this way the convenience of the crane in raising and depositing objects in a shop or factory is greatly enhanced. It is especially useful in ice plants for raising the cans and for moving them to the dump, and then to the vaults.

LOADER.—V. LANDHOLM, Westpoint, Neb. The purpose of this inventor is to provide means which may be adjusted to the fly wheel of a loader of the normal type, by which a drum may be shifted to be rotated by the fly wheel to lift the load or which may be moved against a stationary member which serves as a brake either to hold the load suspended or to permit it to descend slowly.

EXPANSION CUTTER-HEAD FOR BORING-BARS.—C. M. BUCK, Huntington, W. Va. The cutter head is such as used on boring bars and similar devices for performing boring operations. It is intended especially to be used in boring the hubs of car wheels, though it is capable of use for other purposes. The object of the invention is to produce a head having simple means for mounting and adjusting the cutters therein.

POLISHING AND CLEANING MACHINE. M. FORSBERG, New York, N. Y. The machine is for use in hotels, restaurants, shops and other establishments, designed for grinding or cleaning and polishing various articles and implements such as knives, forks, spoons and the like and arranged to permit minute adjustment of the polishing and cleaning wheels according to the nature and form of the articles under treatment.

### Musical Devices.

LEAF-TURNER.—J. F. YOUNG, Morristown, N. J. An object of the inventor is to provide a simple music or other leaf turner which is inexpensive to manufacture, and in which the leaf turning arm is provided with a magnet adapted to engage metal clips carried by the leaves, whereby the danger of tearing or injuring the leaves in turning is obviated.

PICKER FOR STRINGED MUSICAL INSTRUMENTS.—E. J. SCARLETT, Chickasha, Okla. Mr. Scarlett's invention relates to attachments for use in stringed instruments whereby the playing of such instruments is facilitated, without detracting in any manner from the quality of the musical sounds produced thereon, and it consists in means that enable an unskilled person to produce results expected by ordinary methods after considerable practice.

STRINGED MUSICAL INSTRUMENT.—S. W. BUERCKLIN, Prague, Okla. The device comprises a hollow resonant body, a sound body at the smaller end of the resonant body, a bridge supported by the sound box and provided with an extending portion engaging the side of the box, means for adjusting the extended portion with respect to the box, a tail piece and a neck supported by the body on opposite sides of the bridge and strings connecting the neck and tail piece and resting upon the bridge.

### Prime Movers and Their Accessories.

VALVE-GEAR.—H. LENTZ, 123 Kurfürstendamm, Halensee, Germany, and C. BELLENS, 43 Rue de Chézy, Neuilly, Seine, France. The valve is operated by a cam shaft, and it is characterized particularly by the fact that the shaft is located in a fixed casing, formed with sockets having an external diameter equal to or slightly greater than the largest diameter of the cams to allow of the passage of the same, to the end that by fitting and introducing the shaft into a tubular sleeve it is rendered oil, steam, and dust tight, without assistance of stuffing boxes or like devices.

VALVE-GEAR.—E. L. BOWEN, McComb, Miss. The invention pertains to locomotive engines and other double reversing engines, and its object is to provide a gear arranged to utilize the motion of the cross head of one engine to positively actuate the valve of the other, to provide a constant lead independent of the main traveling movements of the valves, to reduce the effects of angularity to a minimum and to allow of conveniently applying the gear to double reversing engines of different styles.

### Pertaining to Vehicles.

LAP-ROBE.—H. T. VON FRANKENBERG, New York, N. Y. The invention relates to lap robes or lap coverings, and more particularly to a robe extensible at the lower portion so that even though the upper portion be tightly folded about the body, the lower portion will permit a certain amount of freedom of movement of the feet to facilitate the operation of the brake, clutch, or the like, of a motor vehicle.

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.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of March 13th or will be sent by mail on request.

(12086) J. C. says: If two equal currents flow in the opposite direction in the same circuit will there be any work done? By this I mean, for instance, if I have two cells connected in a circuit with an electric bell, and the wires connecting these cells are from zinc to zinc and from one carbon through the bell to the other carbon, will the bell ring? A. If two equal currents flow in opposite directions in the same circuit, no external work will be done. The resultant current will be zero. If two cells are connected oppositely to the same circuit there will usually be a slight current in the external circuit because the two cells do not exactly balance each other, that is, one of them has a little more electromotive force than the other and also a different resistance from the other. Very rarely two cells are exactly alike. The difference may not be enough to ring a bell, but it would be indicated upon a sensitive galvanometer.

(12087) B. C. H. asks: Please advise me if in your opinion two cogwheels can be made of different sizes with equal number of cogs in each, the smaller to drive the larger. Say the smaller wheel is 12½ inches in diameter and the larger one 13 inches in diameter, with 36 cogs in each. Can the 12½-inch wheel be made to drive the 13-inch wheel? Could it be done with pinion between them, as indicated by the sketch herewith inclosed? It is intended to run very light machinery. A. We should say that it would be quite impossible to make two intermeshing cogwheels of different diameters with the same number of teeth on each, for the reason that the teeth must necessarily be of different sizes, so that the tooth on one wheel could not fit the space between the teeth on the other. Even with a small pinion between them, as shown in your sketch, the same applies. If the teeth of the pinion meshed satisfactorily with those of one wheel, they would not with those of the other. It is difficult to imagine any mechanical effect which could be obtained by such an arrangement, supposing it were possible, which could not be better obtained otherwise.

(12088) C. C. S. says: Will you kindly help me out of the following difficulty? I wish to electrically operate a set of twenty small bells, using an electro-magnet to each bell, and the number of bells to be sounded at one time varying with the style of music to be played. Can I accomplish this with an electric current from one source of supply, or must I use a separate battery for each bell? Even if the current would equalize through, say, four coils, the E. M. F. necessary for their proper operation would to my mind then be too strong in case of one coil. In case one battery would be sufficient, is it possible to introduce a resistance coil in some way into the circuit to overcome the above difficulty? A. The best arrangement for your bells is to use one current for all with an E. M. F. sufficient for one bell. All the magnets should be wound alike or nearly so, or at least each magnet should be wound to take current enough to ring its bell. Connect all the bells in multiple as lights are connected to a multiple or parallel circuit. The keys or switches to bring a bell into action should be in the circuit from the line to the bell. There will be as many circuits as there are bells. One battery will be sufficient, but it must be strong enough to ring as many bells as will be called for at one time. A keyboard like that of an organ would be very simple and enable one to play any music which does not extend beyond the range of the bells.

(12089) I. W. H. says: 1. How far will the electrolytic wireless **receiver** described in SCIENTIFIC AMERICAN, volume 94, No. 26, receive messages? A. Any wireless receiver will receive signals from any distance, if they are strong enough to be heard upon it. The electrolytic receiver is very sensitive. 2. How does an operator at the sending station call the operator at the receiving station, with a receiving instrument like this, or any other where a telephone receiver takes the place of a telegraph sounder? A. Every wireless station in regular business has its own call letter which is used when it is wanted. Any one who has the list of stations can tell what station is being called. 3. (a) In the illustration at top of page I notice a "switch" mounted on the base. What is this for? (b) Are the binding posts on the base for connecting the telephone receiver? A. A switch is used with the receiver so that the aerial can be cut out and connected to the transmitter for purposes of sending messages. 4. Are there any parts of this receiver that need renewing after being used awhile? A. The wire used in the electrolytic detector is slowly worn away and will need renewing as well as the zinc and the acid. 5. How is the zinc amalgamated? A. Zinc is amalgamated by dipping it into dilute sulphuric acid and then into mercury. 6. Is Wollaston wire cheaper than platinum wire? A. Wollaston wire is extremely fine platinum wire covered with silver. It costs more than plain platinum wire, but is far better for an electrolytic detector. Coarse wire cannot be used for this purpose. 7. What size wire is used in making the connections for this receiver? A. Any convenient size of copper wire can be used for the connections for this detector. No. 14 will do. 8. How is a "pony" telephone receiver made? A. A pony receiver is one in which the magnet is bent so that both poles are used and have coil of wire upon them. It is more compact and can be attached to a spring and worn on the head. Its resistance may be very high, and it may be very sensitive. This quality is produced by the large number of turns of very fine wire which are wound into its coils.

(12090) R. A. B. says: Please to explain how the velocity of light (186,300 miles per second) was determined, and how this applied in calculating the distance of the sun (499 x 186,300 miles with a possible error of 25 seconds). How is the distance of the moon measured? How far? Is it always the same, and if not, is it known for each day of the month, and what is the mean distance? A. The velocity of light is found by measuring the time required for light to pass over a measured distance. The first determination was made by Romer, who found that light required 499 seconds to come from the sun to the earth. This was done by observing the eclipses of the moons of Jupiter. This work is described in the text books of astronomy. See Moulton's "Astronomy," which is sent for $1.75 postpaid. The best determinations of the speed of light were made in America by Prof. Michelson, and by Prof. Newcomb, independently. They found results differing by only five miles a second. A distance of some six or more miles was used, and the light passed over this distance twice, out and back. There is little doubt that the velocity of light is known to a much greater certainty than 25 miles a second. The velocity of light multiplied by 499 will give the distance of the sun from the earth. The velocity of light may be taken as 186,330 miles per second, which, multiplied by 499, gives the mean or average distance of the earth from the sun. For the experimental determination of the velocity of light see our SUPPLEMENT No. 557, price ten cents. The average distance of the moon from the earth is found to be 238,840 miles. Its distance varies from 221,600 miles to 252,970 miles. The distance of the moon from the earth is determined by simultaneous observations taken at two observatories as far apart north and south as possible. The Cape of Good Hope and Greenwich are observatories thus situated. The method employed may be found in the text books of astronomy. The calculation involves the knowledge of the radius of the earth. Since the shape of the moon's orbit is now known, the distance of the moon from the earth at any hour can be calculated for any time in the future.

(12091) G. S. O'B. says: About four years ago I read the description in the SCIENTIFIC AMERICAN, or its SUPPLEMENT, of a contraption (the name I have forgotten), which would so magnify sound, so it stated, that a fly walking over it sounded like a horse walking on a board floor. My recollection is that it was constructed out of a dry-goods box. It may be that George M. Hopkins was the contributor. I desire to get full description of this sound magnifier. Have you it in SUPPLEMENT form? A. The device about which you inquire is the microphone. It is found in every telephone transmitter and has for many years been used for transmitting speech. It depends for its action upon the fact that the resistance of carbon varies with the pressure upon it. If two pieces of carbon are pressed together the resistance is reduced and more electric current can flow. The sound waves in the voice press upon the carbon in the transmitter and the current fluctuates so as to cause the receiver to reproduce the sounds at the other end of the line. We have published many articles upon the microphone, and can send you any number up to ten for 10 cents each.

(12092) C. A. H. asks: On two occasions I have come across brief references to a device in the form of a tube fitted with a polarizer of tourmaline, whereby the glare of reflected light from water may be eliminated, or at least considerably reduced, so that hidden rocks or other obstructions may be seen when traveling toward the source of light, as when the sun is nearing the horizon. It appears to me that such a device would be very valuable to those who, like myself, run a motor boat in waters obstructed by reefs and shoals. If it is a legitimate request, may I ask you to kindly let me know the address of some firm who could supply the article, and the approximate price of each? A. We do not know any apparatus employing tourmaline for cutting off the glare of sunlight shining from a point dead ahead, nor do we see how polarizing the light could help in that way. Light from the sky at an angle of 90 deg. from the sun is polarized, and tourmaline would disclose that fact and cut down the seeing power, but this is not the case near the sun. It seems to us that smoked glasses would be quite as efficient as polarizing apparatus.

### NEW BOOKS, ETC.

THE WAY OF THE WOODS. By Edward Breck. New York: G. P. Putnam's Sons, 1908. 16mo.; 436 pages. Price, $1.75.

Dr. Breck's book is a practical field manual, intended to form a part of the kit of every camper, fisherman, and hunter. It contains concise yet thorough and authoritative information on every subject connected with life in the North Woods, such as outfitting, fishing, shooting, canoeing, tenting, trapping, photography, hygiene, the protection of nature, etc. A unique feature of the volume is that the author tells his readers not only what they should have, but where to find it and what it costs.

SHORT CUTS TO CARPENTRY. By Albert Fair. New York: Industrial Publishing Company, 1908. 90 pp.; 12mo.; ill. with sketches and working drawings. Price, 50 cents.

Much of the matter of this book has appeared in the "Practical Carpenter," where its popularity led to its reproduction in book form, revised and considerably added to by the editor. He starts with the aim of explaining the principle of each of the short cuts explained, generally mathematical but most simply explained, so that the young carpenter may learn the reason for the method and more successfully apply it to "jobs" a little different from the illustrations. The best methods of performing practically every operation required in the carpentry of building and fitting a house are clearly described, and the book should be found very useful either by professional beginner or amateur.

PHRENOLOGY, OR THE DOCTRINE OF THE MENTAL PHENOMENA. By J. G. Spurzheim, M.D., of the Universities of Vienna and Paris, and Licentiate of the Royal College of Physicians of London. With an introduction by Cyrus Elder. Revised Edition from the Second American Edition, in Two Volumes, published in Boston in 1833. Philadelphia and London: J. B. Lippincott Company. 8vo.; pp. 459.

Whether or not we agree with Dr. Alfred Russel Wallace that phrenology "should take its place among the recognized sciences," thereby elevating it to the dignity of a science, we must admit that whatever there may be of science in the study of the conformation of the human head was certainly brought out by Dr. Kaspar Spurzheim. Whether or not we take phrenology seriously, the new edition of this authoritative book seemed more or less necessary, inasmuch as it had been out of print in England for sixty years. Mr. Cyrus Elder has endeavored to remove what he considers prejudices against phrenology in an analytical introduction, in which he replies to criticisms made long ago by Spencer. To us it seems that the physiological psychologists, whatever Mr. Elder may think of them, are more likely to add to the science of the human mind than a serious study of Spurzheim's book, inasmuch as whatever is really scientific in phrenology has been incorporated in physiological psychology.

HANDBUCH FÜR HEER UND FLOTTE. Enzyklopädie der Kriegswissenschaften und verwandter Gebiete. Unter Mitwirkung von Zahlreichen Offizieren, Sanitätsoffizieren, Beamten, Gelehrten, Generalleutnant Z. D. Mit zahl- Herausgegeben von Georg von Alten, Generalleutnant Z. D. Mit Zahlreichen schwarzen und farbigen, Tafeln, Tabellen, Karten, Planen, und Textillustrationen. Berlin, Leipzig, Stuttgart, Wien: Deutsches Verlagshaus, Bong & Co.

This is the third installment of the Handbook of the Army and Navy, which we have previously had occasion to mention. The present volume starts with *Adlerflügel*, and ends with a biography of *Eugen Albori*.

DESIGN AND CONSTRUCTION OF INDUCTION COILS. By A. Frederick Collins. New York: Munn & Co., 1909. 8vo.; pp. 295; 160 illustrations. Price, $3 net.

Collins's "Design and Construction of Induction Coils" is a timely work. Until the discovery of the Roentgen ray in 1896, the coil was chiefly employed for the exhibition of high-voltage effects—beautiful, but of no practical value. Many colleges did not possess one of any considerable size. The Roentgen ray was closely followed by the invention of wireless telegraphy, and thus other new demands were made upon the induction coil. It was also found that these new duties required new forms and proportions. The induction coil is the result of experiment. The new demands **required** new experiments to develop a coil which could fulfill these requirements. This book is the result of several years of work in such experiments. No one can turn the pages without being impressed with its practical character. The paper is firm and soft so that it takes the ink perfectly. The type is large and distinct, the print open and well-spaced, the typography is in every way attractive. Closer examination only confirms the first impression. The book commends itself to the mechanician and the scientific man alike. It does not proceed by the deduction of mathematical formulas for the calculation of the

different parts of a coil, since such formulas have proved a very poor reliance when applied to an actual case. Slight differences in quality of material and sizes, or in thickness of insulation may lead one astray in the rigid application of a formula. Mr. Collins has taken up each part of an induction coil by itself and has discussed its size, construction, and adaptation to the other parts in a most complete and satisfactory manner. The best proportions are given for a series of coils giving a spark of twelve inches and under. Higher than this it is not necessary to go, since one requiring more energy than can be converted by a coil giving a spark twelve inches long will use a transformer and not an induction coil. The different uses of a coil are also considered and such variations as are necessary to adapt a coil to Roentgen-ray or wireless telegraph work are given. Of course these differences are principally in the secondary winding, where will be found in separate columns the data for these two services. This is a very important advantage of this book over other books recently published upon this subject. One cannot but notice the care with which small details are worked out. The numerous cuts show every separate piece in fullness and completeness. The volume contains 160 illustrations, while a single illustration may contain as many as 21 cuts as does the one on page 101, illustrating the construction of an interrupter. The data furnished in the form of tables are quite as full. Of tables there are 122, containing the sizes and dimensions of every detail of every part of an induction coil, and also the prices of every kind of material to enter into it. It is difficult to see how any one with the slightest skill in the use of tools can fail to build a good coil under the guidance this book affords. We believe it will displace all other books upon this subject.

THE MANUAL OF STATISTICS. Stock Exchange Handbook. New York: The Manual of Statistics Company, 1909. 12mo.; 1194 pp. Price, $5.

The thirty-first annual issue deals with railroad securities, industrial securities, government securities, stock exchange quotations, mining, grain, provisions, cotton, money, bank and trust companies. It is admirably printed and the maps are clear and numerous. The information conveyed is of exactly the nature which is of almost daily request in offices where financial matters are of any moment. It should be on the desk of every railway and bank official.

THE BANKING AND CURRENCY PROBLEM IN THE UNITED STATES. By Victor Morawetz. New York: North American Review Publishing Company. 12mo.

The author of this book, Mr. Victor Morawetz, is an authority on corporations and finance. His book is chiefly concerned with solving the problem of currency shortage, which seems to confront this country at recurring periods. He advances a plan for co-operation between the banks and the Treasury, which includes a note redemption fund to be elastic, regulating the uncovered volume of notes outstanding, and thus giving stability to financial institutions generally.

THE NEW BUILDING ESTIMATOR. A Practical Guide to Estimating the Cost of Labor and Material in Building Construction, from Excavation to Finish, with Various Practical Examples of Work presented in Detail, and with Labor Figured Chiefly in Hours and Quantities. A Handbook for Architects, Builders, Contractors, Appraisers, Engineers, Superintendents, and Draftsmen. By William Arthur, Box 482, Omaha, Neb. New York: Published by David Williams Company.

Probably no task requires nicer judgment on the part of the engineer or architect than the estimation of building costs. For this reason any book which will materially help him in solving the peculiar problems which are presented to him must be welcomed. Mr. Arthur in his previous edition has demonstrated the fact that he is certainly competent to guide the estimating engineer and architect. The new edition of his book brings the prices up to date and incorporates much new tabulated matter.

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### SOME NEW AMERICAN AEROPLANES.

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plane he has made use of eight of these propellers, and has arranged them in a line between the two planes, the idea being to give a propulsive effort throughout the entire width of the machine. It has also been proven that a number of small propellers will give a greater thrust per horse-power than one or two large ones. Mr. Kimball makes use of the same motor and wire-rope drive that he employed in his helicopter; but he has improved upon this drive by installing a friction clutch between the driving drum of the motor and the driven drum carrying the wire ropes. The clutch consists of a cast-iron floating ring, and also of a leather lining in these two drums. It allows a certain amount of slipping to occur at the start, so that the propellers are not strained and broken as before. It is also set so that it will slip with a 25 per cent overload. This improvement, according to the inventor, has made a rope drive for aeroplanes entirely practicable. The wire rope used is only ⅛ of an inch in diameter, and consists of six strands, each of which contains 19 wires. The rope has a tensile strength of 2,000 pounds, while the pull to which it is actually submitted is only 80 to 90 pounds. There are two endless cables, one for each set of four propellers. They are held under proper tension by a single idler for each one. The motor makes 1,900 revolutions per minute to 1,600 of the propeller, and the cable travels at the rate of 7,500 feet per minute, or about 86 miles an hour. The propellers have four blades each. They are 3 feet 10 inches in diameter, and have a pitch of 4 feet. The thrust obtained is about 175 pounds. The motor is a four-cylinder, two-cycle engine of an improved type, the cylinders being 4 x 4. It develops 50 horse-power at 2,000 R.P.M.

The main planes of the Kimball machine are 37 feet by 6½ feet, and they are spaced 4 feet 2 inches apart. They have a very slight curve of about 1 in 26, and their angle of incidence is about 5 deg. The rear edges project out 18 inches beyond the main plane and are rather flexible. The machine is provided with movable wing tips, 4 by 4 feet in size, on the ends of both planes. There is a double-surface horizontal rudder in front, 12 by 2½ feet in size, the planes of which are spaced 3 feet apart. This rudder is located 9¾ feet in front of the main planes. It is operated by a lever convenient to the right hand of the aviator, while another lever worked by the left hand operates the two sets of four vertical rudders each, placed on the rear of the movable wing tips. This lever also operates the front wheel, in order to steer when running on the ground.

The main features of the Kimball aeroplane are the use of multiple propellers and fitting of quadruple vertical rudders close to the main planes, near their extremities. If the inventor can run his propellers at a high enough speed to obtain from 300 to 400 pounds thrust, he will probably be able to get in the air; but at the present writing he has made only one attempt, which was unsuccessful in this respect.

### MAKING THE EYE OF SCIENCE.

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of the proper shape and curvature.

But, you will want to know, how does the workman know when the glass to be tested fits the test glass? It is in this "how" that the exquisite fineness of the test resides, for the beautiful phenomena of Newton's rings comes into play here. Any extremely thin and attenuated film will show diffraction colors—soap bubbles are common examples. Every child knows that the bigger the bubble, the more beautiful the colors, and the grown-up knows that the bigger the bubble, the thinner the film. When the glass to be tested is laid in the test-glass hollow, there is a thin film of air left between

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