locking the movable tool on grasping the hand-lever employed in reciprocating it.

VENEER-CUTTER.—E. BECK, New York, N. Y. This mechanism is designed for cutting veneers from a log. Machines in common use are used which revolve in one direction and are large in size, and reduce the number of veneers. If thinner saws are used they tend to cut into the grain to lead from the path of truth, thereby injuring the veneer and saw. The invention overcomes such difficulties and inconveniences and provides means enabling an increased number of veneers to be cut from a log.

MACHINE FOR PRODUCING ORNAMENTAL SURFACES OR FLEECED FABRICS.—C. H. FRENCH, Canton, Mass. The invention relates to cloth-finishing machines; and its object is to provide a machine for producing ornamental surfaces on fleeced fabrics—such, for instance, as shown and described in the application for Letters Patent of the United States, formerly filed by Mr. French, the machine being arranged to provide permanent ornamental surface in the form of alternating transverse stripes of coarse and fine texture.

FOLDER ATTACHMENT FOR HEMMERS.—E. F. GIBBONS, Jersey City, N. J. The object of the present invention is the provision of an attachment for sewing-machines affording means for folding the material before presenting the same to the hemmer, the general purpose being to dispense with hand operators, who fold the goods in the same manner.

MOLDING APPARATUS.—L. HANSEN, Oshkosh, Wis. In this instance the invention is an improvement in molding apparatus adapted for the manufacture of roofing-tiles and similar products from concrete or other plastic medium. The machine may be employed for making bricks, slabs, building-blocks, or other suitable objects of the above named materials.

Prime Movers and Their Accessories.

DRAFT-REGULATOR FOR STEAM-BOILERS.—A. J. SNOW, Fromberg, Mont. This invention is an improvement in draft-regulators for steam-boilers, more especially boilers for locomotives or the like, and has for an object, among others, to provide automatic means to prevent the suction of cold air by the exhaust of the engine through the fire-box and boiler-flues when the fire-box door is for any purpose open.

STEAM-ACTUATED VALVE.—E. A. MENKING, Pittsburg, Pa. The object of the invention is to provide a valve, more especially designed for steam-pumps and like machines and arranged to insure an easy and automatic shifting of the valve for controlling the admission and exhaust of steam to and from the cylinder. It relates to valves such as shown and described in Letters Patent of the United States formerly granted to Mr. Menking.

COMBINED AIR AND GAS ADMISSION VALVE FOR EXPLOSIVE-ENGINES.—H. LENTZ, Berlin, Germany. The invention relates to valves of explosion or internal combustion engines supplied with a mixture of air and gas or hydrocarbon vapors; and the object is to provide a valve consisting of a single member combining in one part the air and gas admission valves.

Railways and Their Accessories.

CAR-WHEEL.—T. L. HAWKINS, Pittsburg, Pa. The invention relates to railroad and mining cars having the wheel mounted to rotate loosely on the axles. The parts are readily assembled and by the use of the bearing balls engaging the recesses in the journal and the hub the car-wheel is held against longitudinal movement on the journal and without undue friction or binding of the parts. In case the journal and the bushing become worn to a considerable extent it is only necessary to replace the worn-out bushing by a new one, so that the axle as well as the car-wheel can be used. The improved renewable bushing, closed hub, self-oiling, and dust proof car-wheel are adapted to mine cars only.

Pertaining to Recreation.

DUST-PROTECTOR FOR POOL AND BILLIARD TABLES.—L. J. DIRAND, Torrington, Conn. The purpose of this invention is to improve the protective cover for which Letters Patent were formerly granted to Mr. Dirand, which improvements tend to simplify the construction and render the attachment adjustable to different heights of table, enabling the cover to lie close to the upper marginal portion of the table, and, further, to so construct the attachment that when not in use it may be dropped to occupy a position out of the way of the players.

TOY.—W. V. GILBERT, 30 Lonsdale road, Wanstead, N. E., London, England. Mr. Gilbert makes use of a flexible or spring device, which forms the subject of his application for patent formerly filed by him. It is formed from a resilient plate bent into such shape that by compression and release from compression it alternately projects and retracts the eyes. Means provide for its appearing to spring or jump, and this being accompanied also by retraction or return to original position of certain movable parts the simulation to a living animal is rendered more complete.

AMUSEMENT DEVICE.—E. N. CHAMBERLAIN, Natchez, Miss. This sounding toy is adapted for attachment to the foot beneath the arch of the same in front of the heel, it being in practice made of normally greater vertical diameter than the height of the heel, so that when the foot is pressed down or rests upon the floor or other surface the bulb will be compressed and a sound emitted.

Pertaining to Vehicles.

AUTOMATIC WAGON-BRAKE. — E. F. VEATCH, Palco, Kan. This brake may be easily applied to an ordinary wagon and may be used with or without the bed, being equally efficient in both cases. It is simple in construction and entirely automatic in action and is not liable to get out of order easily. Since considerable strain is brought to bear on no part, danger of breakage is reduced to a minimum.

VEHICLE-WHEEL.—P. E. DAWSON, Hancock, Md. In the present patent the object of the invention is the production of a wheel which shall be distinguished by great resiliency, strength, and durability of its rim portion, the same being a punctureless elastic tire and air inflation being dispensed with.

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.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

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

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(10462) H. L. O'B. asks how to make citric acid from fruit. A. Citric acid is generally manufactured from lemon juice, which is imported in a concentrated state produced by evaporation by heat. It consists of citric acid 6 to 7 per cent, alcohol 5 to 6, and the remainder water, inorganic salts, etc. By some manufacturers it is allowed to partially ferment for the purpose of evaporating the clear liquor from the mucilage, or it may be clarified in the usual method by the use of albumen in the form of the white of an egg. Carbonate of lime in fine powder is gradually added, and stirred in so long as effervescence continues. Citrate of lime forms, and after being separated by drawing off the watery liquor, is well washed with warm water. It is then intimately mixed with strong sulphuric acid diluted with 6 parts of water. After some hours the citrate is decomposed, the sulphuric acid having taken up the lime and formed an insoluble sulphate, setting the citric acid free. This, separated by decanting and filtering, is evaporated in leaden pans till it attains the specific gravity 1.13. The evaporation is afterward continued by a water or steam bath till the liquor begins to be sirupy, or to be covered with a thin pellicle. It is then removed from the fire, and put aside to crystallize, the mother liquor after a few days being evaporated as above, and again set to crystallize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystallized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about 8 ounces of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which any one about to go into the business can best judge.

(10463) C. L. G. asks how to make koumiss. A. 1. Fill a quart champagne bottle up to the neck with pure milk; add two tablespoonfuls of white sugar, after dissolving the same in a little water over a hot fire: add also a quarter of a two-cent cake of compressed yeast. Then tie the cork on the bottle securely, and shake the mixture well; place it in a room of the temperature of 50 deg. to 95 deg. Fahrenheit for six hours, and finally in the ice box overnight. Drink in such quantities as the stomach may require. Be sure that the milk is pure; that the bottle is sound; that the yeast is fresh; to open the mixture in the morning with great care, on account of its effervescent properties; not to drink it at all if there is any curdle or thickening part resembling cheese, as this indicates that the fermentation has been prolonged beyond the proper time. 2. To a quart of new milk add a sixth part of water, and to this mixture add, as a ferment, an eighth part of the sourest buttermilk that can be got. In future preparations, a similar quantity of old koumiss will better answer the purpose of a ferment. Cover the vessel with a cloth, and allow to stand in a place of moderate warmth for twenty-four hours, when a thick substance will be found collected at the top. Stir well until this substance is thoroughly mixed with the liquid portion beneath, and allow to stand for twenty-four hours more, when, having filled a bottle two-thirds full, and again thoroughly mixed by shaking, the preparation, now called koumiss, may be used at once, or the bottle tightly corked and kept in a cool place for future use. Always shake the bottle well before using.

(10464) P. D. asks how to make imitation leather. A. A mixture recommended consists of 16 parts gelatine and 5 parts glycerine. A coloring matter is then added as may be required—caoutchouc to give elasticity, and boiled linseed oil to render the whole sufficiently flexible. This composition is spread upon linen while hot, printed with any pattern desired. The surface is then treated with a solution of alum, sulphate of iron, copper, or zinc. These saline solutions may likewise be mixed with the composition before it is spread on the linen. The surface is lastly varnished, and may be bronzed or gilt. Another composition is obtained by boiling linseed oil with quicklime and borax, which forms a liquid that, on cooling, becomes a thick paste. It is then mixed with rasped cork and more quicklime.

(10465) B. M. L. asks how to make kindlings. A. 1. Save the corn cobs for kindlings, especially if wood is not going to be plentiful next winter. To prepare them, melt together 60 parts resin and 40 parts tar. Dip in the cobs and dry on sheet metal heated to about the temperature of boiling water. 2. Dip the wood in melted resin. The following composition is sometimes used: 60 parts melted resin and 40 parts tar, in which the wood is dipped for a moment. Or, take 1 quart of tar and 3 pounds of resin, melt them, then cool; mix as much sawdust with a little charcoal added as can be worked in. Spread out on a board and when cold break up into lumps the size of a hickory nut, and you will have enough kindling to last a good while.

(10466) R. N. P. asks how to smooth parchment. A. To smooth parchment which has become wrinkled, place the parchment face down upon clean blotting paper. Beat up to a clear froth, with a few drops of clove oil, the whites of several fresh eggs, and with the fingers spread this over the back of the sheet and rub it in until the parchment becomes smooth and yielding. Then spread it out as smooth as possible, cover with oil silk and press for a day. Then remove the silk and cover with a linen cloth and press with a warm iron.

(10467) M. J. L. asks how to ascertain the area and square inches and pounds upon the seat of an inch and one-half safety valve, that blows at 80 pounds, and how the decimal 0.7854 is got, and what kind of measurement for getting same. A. The area of the safety valve is the square of the diameter multiplied by 0.7854, which is the proportion of the area of a square to a circle of the same diameter. The area multiplied by 80 pounds is the total pressure. See Le Van's book on the safety valve, $2 by mail, which gives full details and computations for pressure, weight and its place on the beam.

(10468) W. N. P. asks: What metals will expand and contract the most with heat, and at what temperature and to what extent? A. Of the commercial metals, lead, magnesium, and zinc expand most for a given change of temperature. Lead and zinc expand 29 millionths for a change of 1.8 degrees Fahr., while magnesium expands 27 millionths. This is at about 100 degrees temperature. Of course the contraction upon cooling is the same as the expansion on heating.

(10469) L. B. asks how red printing ink may be removed from paper. A. Soak pieces of blotting paper in benzine, turpentine, or ether and apply successively, using each time a fresh clean piece of the blotting paper; this is preferable to rubbing with these solvents, as rubbing tends to spread the ink and also to loosen the fibers of the paper.

(10470) J. J. K. writes: Some plates for flat feet are made of spring steel covered with leather. The sweat of the feet soon rusts the plate. I have used paint and shellac, but they do not do much good. Please let me know what I can do to prevent rusting. A. Try a good copal coach varnish. If it can be done, an enamel baked on the plates will give the best satisfaction.

(10471) L. A. H. writes: I have some fine copper gas fixtures which have been finished with a bright thin coating called antique finish. This coating or polish has been destroyed to some extent by flies and other agencies. I would like to know of a process for restoring this polish to its original condition. A. Thoroughly clean the fixtures with benzine if necessary, and polish with any one of the usual polishes in the market. Then lacquer with the best quality of lacquer to be had, applying it in a thin coat with a soft brush.

(10472) G. L. Writes: Can acetylene gas and oxygen be burned together in a calcium jet for lime light, the same as hydrogen and oxygen lime light? And if not, why not? And if so, is it any more dangerous or explosive? A. Acetylene and oxygen can be used for the lime light. Hydrogen is now rarely used; ordinary illuminating gas is used, being sufficiently efficient and much cheaper. There is no more danger when using acetylene, provided the apparatus is in proper order, than with either illuminating gas or hydrogen.

(10473) G. C. asks for a formula for the making of a powder which extinguishes fire. A. Bicarbonate of soda mixed with 5 per cent to 10 per cent of mineral matter to prevent caking by absorption of moisture from the air, is useful. A mixture of dry bicarbonate of soda and dry sal ammoniac, if kept in a dry place, is still more effective. In confined spaces, as closed rooms, a different type of extinguisher is effective. It is based on the principle of fighting fire with fire. The following formula is good: Niter 60 parts, sulphur 36 parts, and charcoal 4 parts.

(10474) F. V. N. wishes a formula for producing a rich, red color on copper, for umbrella mountings. A. A gradually increasing temperature in a hot-air bath will give a series of colors as follows: Light-burnish orange, red-burnish orange, rose red, violet, steely white, light yellow, dark yellow. Both duration of heating and temperature affect the color obtained. As soon as the desired tint is produced, cool rapidly in air or by plunging into cold water. Colored varnishes are also used, but their effect is not permanent. There are various chemical ways of producing red browns, but none for a "rich red."

(10475) W. H. T. asks: How is gas made from water? Is there a book that would enable a foundry foreman to learn how to make an analysis of the iron in his castings? A. Briefly described, water gas is produced by blowing steam through a layer of brightly glowing coal; the water is decomposed, and the coal is consumed; the gases coming off are a mixture of hydrogen, carbon monoxide, and hydrocarbons, with small amount of carbonic dioxide, and variable amount of nitrogen. When the coal cools off too far to further decompose the water vapor, this is shut off, and air is blown through until the coal again burns brightly and is ready for more steam. While the air is blown in, the gases are allowed to escape up the chimney, as they have no value as illuminant, and in fact would not burn at all. The water gas as it comes from the producer has very little illuminating power. This is imparted to it by enriching with benzine.—There is no book which would explain to anyone not a chemist how to determine the amount of iron in brass or other castings. Such work must be done by a chemist. All books on analytical chemistry of the metals describe methods for this, but would be unintelligible to any person except a regular chemist.

(10476) R. G. P. asks: Are there any chime music boxes with a set of bells on them? How does the word chime get its name? A. The word chime comes from a Latin word, meaning bell, and also cymbal. Music boxes are made with sets of bells in them.

(10477) E. G. P. asks: How can a scratch be removed from the top of an oak table (highly polished)? A. If the scratch is only a slight, superficial one, it can usually be removed by rubbing with a rag soaked with crude oil. If a deep scratch, it will be best to rub down the whole top of the table with powdered pumice and crude oil, and then revarnish.

(10478) G. P. O. wishes a process for galvanizing such as is done on the base boards for stoves. A. The article to be galvanized is first thoroughly cleaned by dipping in weak muriatic or sulphuric acid, and is then thoroughly dried. After this it is plunged in a bath of molten zinc, wherein it becomes coated with a layer of zinc, being what is known as galvanized. The surface of the molten zinc must be kept clean by sprinkling with powdered sal ammoniac and skimming off the dross from time to time.

(10479) G. G. G. asks: How can I gild or mottle edges of books, to resemble as nearly as possible those gilded by publishers? A. To gild the edges of books, they are first trimmed smooth, then sized with egg albumen (white of egg) and gold leaf then applied. When dry it is burnished with agate burnisher. For mottling, a very thin solution of gum arabic is prepared in a tray, and the different colors are then shaken in or combed in. A half dozen or so of the books are held securely and evenly together, and the top, bottom and front edges are successively dipped in lightly, and the excess of color is each time blown off. Successful mottling is quite expert work.

(10480) W. J. D. asks: 1. Is there any method by which soft coal can be made into brick or lump form by mixing with other substances or by itself? A. The powdered or crushed soft coal can be pressed into bricks and then be partially coked to give strength. If the coal alone will not adhere sufficiently well on pressure, it can be mixed with pitch, and then partially coked. 2. Can the ordinary 150 deg. test kerosene oil be clarified to prevent

the strong smell while burning in a lamp or wick oil stove? A. A good quality of kerosene will not give much odor in burning in a lamp or wick oil stove, if care be taken to keep the wick well trimmed, and to adjust so that it will burn without smoke. There is no way of further purifying kerosene oil, as to make it burn without odor.

(10481) B. E. Co. asks: What kind of solder can be used to solder iron to iron that will in no way be affected by contact with quicksilver? Are there any other cheap metals besides iron that quicksilver will not affect? A. We know of no kind of solder which would not be more or less affected by mercury. Zinc and lead, which are the only other cheap metals, are both affected by mercury. Copper likewise.

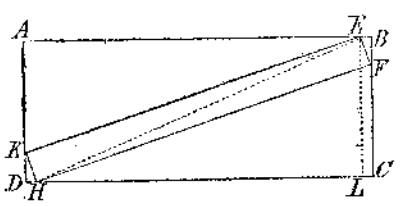
(10482) J. E. R. inquires whether or not a current water-wheel under a 3-foot hydraulic pressure, with paddles 10, 12, or 16 feet long by 3 or 4 feet wide, will run a 12-inch centrifugal pump, elevating water all told 12 feet (total lift 12 feet). The average fall of the stream is 10 feet per mile and it has a velocity of 6 feet per second. The diameter of waterwheel any size you may suggest. What would be the horse-power of a current water-wheel, length of paddle 14 feet long by 4 feet wide, and 16 feet in diameter? A. The 14-foot wide current wheel as described should give you 36 horse-power, and with a good centrifugal pump should raise 6,000 gallons of water 12 feet high per minute.

(10483) S. R. D. writes: Some time ago you published a formula for softening steel. A. To make steel very soft, heat to a full red for a few minutes, let it gradually cool until it turns black, then quench in warm water.

(10484) W. L. L. writes: In connection with my planing and lumber mill I have hundreds of tons of sawdust and shavings from the planers that I would like to utilize, but lack the necessary knowledge as to how to do it. I have been informed that you can give me the desired information as to what kinds or forms of petroleum or other material, and what kinds of machines, and where obtained, that it would be necessary to use in working this refuse up into marketable fuel. A. Mill shavings and sawdust have been compressed with coal tar, resin, or anything that will make the material stick together, but have been found too expensive unless other fuel was at very high price. In woodworking factories in the Eastern and Middle States, the whole product of the mill is burned under the boilers by enlarging the fire chamber by lowering the grate. Sawdust drawn to a bin by a fan blower, and wet by a water spray just enough to fix the dust, is shoveled directly into the fire chamber. Clean shavings are much utilized by baling and selling to stables for horse bedding.

(10485) N. L. writes: In the SCIENTIFIC AMERICAN of March 2, page 199, question 1, No. 10409, your author has made so many glaring mistakes in his reply as to merit a severe calling down. An occasional error is always pardonable, but a series of misstatements, given out as authority, likely to mislead the uneducated, surely needs a correction. You say: "If a vessel begins to sink, it must continue to sink until it reaches the bottom. Water is not compressed to any extent at greater depths than it is near the surface. If anything can sink at all in water, it will go to the bottom before it stops." All three of these statements are at variance with all known authorities in hydraulics. A hundred demonstrations are known to the average schoolboy to the contrary. Is it not an established fact that any body sinking in any liquid will sink until it reaches a point where the weight of the liquid above it will just balance the weight of the body, at which point it will rest? Your statements are all at variance with the long and well known law of upward pressure or buoyancy or liquids. This reply to question 1 would not be worthy of any great notice were it not for the fact that it may mislead a great number who may be reading your replies for knowledge they expect to be absolutely correct. The question is an old one, and, as you say of question 2, it "has traveled for a century," but you must remember that every year brings forth a new set of uneducated readers. A new generation comes up seeking knowledge, and it is hardly fair to ridicule even the most common of questions, *as you frequently do*. A. We do not know what data our correspondent has for his very positive statement contradicting our answer to query 10409. The compressibility of all materials is given in the reference tables. The latest and, we think, the best at our disposal is the Smithsonian Physical Tables, published under the authority of the Smithsonian Institution, Washington, D. C., the last edition of which was issued in 1903. On pages 82 and 83 will be found the compressibility of liquids and solids, for one atmosphere. The compressibility of sea water is given at 0.000044. The compressibility of several metals is given: Copper, 0.000086; lead, 0.000276; steel, 0.000068. All these are for one atmosphere or 15 pounds per square inch. It is seen that steel is 1½ times as compressible as sea water. By compression it increases more rapidly in density than does sea water, as it sinks in the ocean. Steel is about 7.8 times as heavy as water at the surface of the ocean, and will grow heavier by compression as it sinks in the ocean faster than the water in which it is sinking. It will therefore be everywhere heavier than water. Now, how much heavier is water at the bottom of the ocean than it is at the surface? The depth of the deepest place yet found in the Pacific is off the Fiji Islands as given by Prof. Davis, of Harvard University, in his Physical Geography, and is 30,930 feet. The same most reliable authority gives the deepest sounding in the Atlantic as 27,366 feet. Allowing 34 feet of water as equal to an atmosphere, this depth will produce 910 atmospheres, and will compress sea water 910 x 0.000044 of its volume. This is 1/25 part, and a cubic foot of sea water, which weighs 64 pounds at the surface of the ocean, will at the bottom of the deepest place yet found weigh 66.56 pounds. Under the same pressure a cubic foot of steel, which weighs about 487 pounds at the surface of the ocean, will at the bottom of the deepest place yet found have its weight increased 0.002 part, and it will there weigh 517.29 pounds. At the deepest place in the ocean yet found a cubic foot of steel will weigh 450.73 pounds more than a cubic foot of water at the same place. Will steel sink in water at the bottom of the ocean? We think it will. Now steel is compressed less by pressure than other metals and materials, and hence other materials will be less likely to float somewhere between the surface and the bottom of the ocean than steel is. Finally, we may be permitted to quote Prof. Davis's words on this very point: "Although water is easily moved, it is very little reduced in volume even when compressed by great force. Hence, in spite of the great pressure of the upper layers of the ocean on those beneath, the ocean is of nearly uniform density from top to bottom. *Anything which is heavy enough to sink at the top will sink all the way to the bottom.*" We are content to be classed with Prof. Davis in making "so many glaring mistakes as to merit a severe calling down" by our esteemed correspondent. Now we wait for him to produce his "authorities in hydraulics." We do not know any demonstration to the contrary, and we have been teaching hydraulics for forty years. Will N. L. tell us some of his hundred? The question which he puts at the close of his letter we answer, No, nothing of the kind. A floating body sinks till it has displaced its weight of water. A body heavier than water, volume for volume, such as a stone, does not displace its weight of water anywhere. It displaces its volume of water; and as its volume of water weighs less than the stone itself weighs, the stone sinks, and will continue to sink to the bottom. So will our ship in five miles of water, since every ballasted vessel even of wood will be heavier than its volume of water if water gets into the interior and drives out the air from the ship. Now as to ridicule; we would ask our readers to refer to the answer and see if they can discern any attempt to hold the inquirer up for a laugh at his expense. We cannot see any attempt to make any sport upon the matter. Certainly there is no attempt to raise a laugh on the questioner. As to the frequent requests to answer questions whose answers have been in our columns within a year or so, we must say that our readers ought to keep their files of papers, and before sending in a question go through the papers and see if they cannot find the answer without requiring a separate letter written to them.

(10488) I. J. P. writes: I send herewith a solution to the problem asked for in Notes and Queries No. 10198, and would like the asker's address if it is all right to ask it. I have used algebra. I do not see how he could think to use calculus, since the required number is a constant, although more than one value, as may be noted by revolving the inner rectangle on its center or by the equation of the fourth degree.



Problem: In a given rectangle 10 × 20 feet inscribe diagonally a rectangle 2 feet wide, to find its length.

In given rectangle, A B C D, to inscribe E F H K, given the length of E F (= H K), required length E K (= F H).

Triangles E B F and F C H are similar and right triangles.

$\therefore EB : BF :: FC : CH$ or $\overline{EB} \times \overline{CH} = \overline{BF} \times FC$ in which

$$CH = CD - DH = CD - EB,\ FC = BC - BF$$

$$\therefore EB(CD - EB) = BF(BC - BF) \quad (1)$$

and $$\overline{EB}^2 + \overline{BF}^2 = \overline{EF}^2 \quad (2)$$

From (1) and (2) eliminate B F and arrange for E B.

$$\therefore 4\overline{EB}^4 - 4\overline{DC} \times \overline{EB}^3 + (\overline{BC}^2 + \overline{DC}^2 - 4\overline{EF}^2)\overline{EB}^2 + 2\overline{DC} \times \overline{EF}^2 \times EB - \overline{BC}^2 \times \overline{EF}^2 + \overline{EF}^4 = 0.$$

Given DC = 20, BC = 10, EF = 2, which substitute, and ÷ 4.

$$\therefore \overline{EB}^4 - 20\,\overline{EB}^3 + 121\overline{EB}^2 + 40\overline{EB} - 96 = 0.$$

$$\therefore EB = 0.7816258.$$

Draw E L parallel to B C. Draw E H and in right triangles E F H and E L H, $\overline{HF}^2 + \overline{EF}^2 = \overline{EL}^2 + \overline{LH}^2$, in which EF = 2, EL = 10, LH = DH − (DH + LC) = DH − 2EB = 20 − 1.5632516.

$\therefore HF^2 = 10^2 + (18.4367484)^2 - 2^2 = 435.9138916$, and HF = 20.88094566.

Giving the required length as 20 feet 10.57 inches.

A. We give a correct solution to the problem of inscribing a rectangle of a given width in another rectangle. It is not our policy to give much space to the solution of mere mathematical problems. There are good mathematical journals devoted to that work. Some physical or mechanical problems are legitimate to our purposes, and to these we usually give attention, although we cannot spend much time in digging out puzzles. We add the remarks upon the solution of the problem above by Mr. L. Leland Locke, Adelphi College, Brooklyn, N. Y. He shows the impossibility of having more than one rectangle of the greatest length inscribed in another rectangle. The matter was referred to him since I. J. P. states in his letter that there may be more than one longest rectangle in this case. The solution of the problem given above is correct in principle. We have not verified the numerical work. This is not a problem of maxima as stated by the proposer of the problem in the original note, for the reason that there is but one rectangle which meets the conditions of the problem. If a rectangle of a given width be turned so that E and F, vertices of one end, remain respectively in sides A B and B C of larger rectangle, and point K with K E variable follows line A D, there is but one position in which H will be on C D; in other words, the path of H is a curve which cuts C D but once, and hence only one rectangle with a width of 2 feet can be inscribed in a given rectangle all of whose vertices are upon the sides of the given rectangle. This is also shown by the fact that the biquadric equation yields but one positive and real root. Its other real root is negative. If it were possible to revolve a rectangle of given width and variable length, keeping its corners on the sides of a larger rectangle, it would be impossible to secure a determinate equation involving its length.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending March 19, 1907,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Accounting mechanism, R. H. Little.... 847,672
Adding machine, Gancher & Zabriskie.... 847,759
Adhering round forms, method of and apparatus for, C. W. Munz 847,966
Adjustable chair, J. T. Hart..... 847,332
Air and the like, means for compressing, J. Gill 847,569
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Anchor, folding mushroom, C. E. Crane.... 847,320
Animal shears, W. P. Sparks..... 847,706
Annunciator, thermo-electric, S. O. Bestul.. 847,310
Automobile gearing, W. I. Crawford..... 847,914
Awl, sewing, S. Ansley..... 847,634
Awning, portable, J. R. Fitzgerald..... 847,327
Bag or envelope closure, J. B. Merkels.... 847,353
Bank, calendar, S. E. Creasey..... 847,652
Beam shear, C. L. Taylor..... 847,526
Bearing, annular ball, J. D. Maxwell..... 847,487
Bearing, shaft, J. F. Ayers..... 847,541
Bearing, spindle step, T. W. Morgan..... 847,803
Bed, W. H. Fritts 847,465
Bed, invalid, A. C. Taylor..... 847,619
Bed rest for invalids, G. G. Campion..... 847,550
Binder, loose leaf, R. F. Parry..... 847,364
Blue printing and similar apparatus, S. E. Flichtner 847,567
Board. See Ironing board.
Bobbin broach or creel pin, Boocock & Sutcliffe 847,638
Boiler furnace, steam, G. W. Phillips..... 847,365
Boilers, apparatus for facilitating the removal of deposits in locomotive, G. H. Pearson 847,435
Boilers, system of washing and filling locomotive, White & Otis..... 847,386
Boilers, system of washing and filling locomotive, W. White 847,387, 847,388
Boll weevil destroyer, cotton, B. Bergmann 847,887
Bolt retainer, J. Hartman..... 847,768
Book or pad, manifolding, B. C. Maxwell.. 847,991
Bookbinding machine, W. E. Blauvelt..... 847,891
Boring bar, R. F. Lace..... 847,788
Boring machine, N. A. Collins..... 847,908
Boring tool, J. Dowling..... 847,742
Bottle, J. Hemingway..... 847,334
Bottle cap puller, A. C. Booth..... 847,892
Bottle stopper, J. W. Lee..... 847,791
Bottle stopper, Liessem & Bommer 847,994
Box, J. D. Burns..... 847,314
Box cover detaching device, E. S. Savage.. 847,374
Bracelet, chain, and the like, A. C. Cockren 847,554
Brake beam, C. A. Lindstrom..... 847,671
Bread mixer, J. C. Hall..... 847,765
Brick machine, hand, F. W. Steinhoff..... 847,618
Buckle, A. K. Lovell..... 847,795
Buckle, A. Ritter..... 847,971
Buckle, suspender, M. Peller..... 847,811
Buffer, W. T. B. McDonald..... 847,357
Buffer, pneumatic, M. P. Hayward..... 847,941
Buggy top prop attachment, G. Lake..... 847,951
Building block, E. C. Hodges..... 847,476
Building construction, Reed & Stem..... 847,692
Burglar alarm, detonating, A. V. Todd..... 847,975
Butter in centrifugal apparatus, manufacture of, J. V. M. Risberg..... 847,697
Butter, treating, A. Fay..... 847,562
Button, A. E. Freeman..... 847,660
Calcium peroxid, making, O. Liebknecht.. 847,670
Can cap turning and arranging means, J. T. Wilmore 847,451
Can making machine blank feeding attachment, A. Velk 847,625
Candy spinning machine, R. E. Pollock.... 847,366
Car construction, A. E. Ostrander..... 847,503
Car construction, passenger, A. E. Ostrander 847,505
Car coupling, G. A. Hermanson..... 847,408
Car coupling, W. S. Schroeder..... 847,517
Car door shaft operating mechanism, Lindstrom & Streib 847,956
Car emergency brake, railway, P. W. Counselman 847,319
Car end sill, O. S. Pulliam..... 847,602
Car fender, W. Pickett..... 847,437
Car, flat, T. Wozney..... 847,716
Car, hand, J. W. Finch..... 847,927
Car lift, automatic, G. Holmes..... 847,411
Car, passenger, A. E. Ostrander..... 847,504
Car propulsion, street, G. G. Schreeder.... 847,515
Car replacer, W. Cook..... 847,732
Car roof construction, G. Steinmeyer, Sr.... 847,708
Car roof construction, passenger, A. E. Ostrander 847,500
Car roof side deck, passenger, A. E. Ostrander 847,502
Car shifting apparatus, F. I. Kimball..... 847,950
Car trap doors, binding for, O. M. Edwards 847,559
Car vestibule trap door and steps, passenger, A. E. Ostrander..... 847,501
Card package and cribbage board, playing, L. O. Granger..... 847,570
Card table, C. G. Davidson..... 847,655
Carriage curtain fastener, F. Marggraff..... 847,421
Carriage curtain fastener, F. A. Nelder..... 847,430
Carriages, water shedding attachment for, J. Phillips..... 847,814
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Case hardening, A. W. Machlet..... 847,588
Cash registers, etc., system for electrically releasing drawers in, A. G. Jackson... 847,479
Cask or vessel from which liquid is discharged under pressure, G. Lindner.... 847,792
Centrifugal separator, P. T. Sundberg..... 847,524
Chain, sprocket, R. W. Dull..... 847,983
Chair, Barker & Jackson..... 847,880
Chair iron, H. W. Bolens..... 847,979
Channel pins, manufacturing, H. H. Vaughan 847,710
Charts or the like, device for holding, P. A. O'Brien 847,434
Cheval glass and desk or the like, combination, W. La Hodny 847,342
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Chuck, B. M. W. Hanson..... 847,573
Chuck, drill, L. Larsen..... 847,790
Chuck, rock drilling machine, S. R. J. Maynard, et al..... 847,590
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Cigar holder, J. Knaff..... 847,341
Cigar mold, N. Du Brul..... 847,558
Cigarette making apparatus, W. F. Nowitzky 847,968
Circuit breaker, Smythe & Burrows..... 847,520
Cleaning systems, attachment for vacuum, Clements & Hostler..... 847,729
Clippers, G. Bowler..... 847,980
Clock, time limit, W. E. Porter..... 847,689
Closet seat, H. Michael..... 847,678
Clothes pin, P. W. Burleson..... 847,313
Clutch, fluid actuated, B. M. W. Hanson.. 847,572
Clutch, friction, B. M. W. Hanson..... 847,575
Cock, stop and waste, H. J. Geurink..... 847,406
Code apparatus, secret, M. C. Harlan..... 847,767
Coffee pots and similar articles, lid for, A. Schaefer..... 847,375
Coil bender, J. A. Burns..... 847,549
Coin pouch, K. G. R. Goodlett..... 847,467
Coin sorter, W. A. Ralston..... 847,438
Coke furnace, S. B. Sheldon..... 847,614
Collar attachment, horse, F. Hays..... 847,475
Collar fastener, J. A. Linn..... 847,346
Collar folder and shaper, turn-down, Stebbins & Bergstrom..... 847,521
Collar spreading device, apparel, F. M. Lilley 847,485
Collar supporter, C. I. Rankin..... 847,604
Color, lime, J. Ullrich..... 847,530
Commutator brushes, adjustable miter box for, W. S. Pollard..... 847,816
Computer, spring load, F. K. Caswell..... 847,904
Concrete block machine, J. H. Graham..... 847,764
Concrete structural work, metallic reinforcement for, C. Horix..... 847,577
Condenser, mercury, C. F. Brown..... 847,547
Condenser, steam, G. Rennerfelt..... 847,605
Condenser, steam, S. Thurstensen..... 847,709
Conveyor tripper or deliverer, Baldwin & Moss 847,309
Conveying apparatus, Riling & Sagee..... 847,509
Cooking and washing apparatus, J. B. Conger 847,761
Copper, treatment of silicate of, G. H. Waterbury 847,448
Corn and brush knife, Date & Kugelmann.. 847,321
Corn husker, J. Covert..... 847,734
Cornet key changing attachment, M. B. Kendis 847,340
Cotton chopper, R. T. Sterling..... 847,380
Cotton chopper and cultivator, R. C. Teel.. 847,447
Crate, covered box, E. F. Boesche..... 847,978
Cream or milk and butter, treating, A. Fay 847,563
Crimping machine, Newell & England..... 847,683
Culinary tongs, C. F. Smith..... 847,839
Cultivator, C. M. Bowen..... 847,398
Cultivator, W. H. Nesbitt..... 847,431
Cultivator, P. M. Sherman..... 847,836
Cultivator, C. H. Wheeler..... 847,868
Cultivator, A. M. Barker..... 847,879
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Current controller, R. Duckworth..... 847,743
Current interrupter, revolving mercury dip, Usher & Seoane 847,851
Current plant combined with storage battery, alternating, Schroeder & Muller... 847,974
Curtain fixture, H. E. Keeler..... 847,584
Curtain pole, H. A. Mailloux..... 847,589
Curtain pole and curtain shade roller bracket, combined, A. L. Rutherford..... 847,827
Curtain stretcher frame, E. Deach..... 847,556
Curtain supporting rod, L. C. Lazear..... 847,344
Cutter machines, clamp for cutters or bits of, E. T. Morris..... 847,680
Cylinder steam jacket, Wilson & Frawley.. 847,712
Dental handpiece, H. S. Miller..... 847,591
Detachable handle, J. C. Lowe..... 847,673
Dish washer, M. M. McKee..... 847,495
Display can or box, sheet metal, F. Rudolphi 847,441
Display can or box, sheet metal, Rudolphi & Brauninger 847,973
Display can, sheet metal, F. Rudolphi..... 847,972
Display stand, A. P. Hollinger..... 847,943
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Ditching machine, F. L. Schenefelt..... 847,703
Door check and tightener, E. Conklin..... 847,909
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Door, sheet metal, N. P. Sjobring..... 847,443
Draft and vent regulator, J. A. Sloan..... 847,378
Draft equalizer, W. Wilson..... 847,389
Draft rigging, tandem spring friction, E. W. Hartough 847,769
Dress shield or garment fastener, Raza & Frisbie 847,368
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Drying apparatus, O. Koepff..... 847,786
Drilling machine feed head, G. D. Williams 847,450
Driving mechanism, E. Rivett..... 847,440
Drop light, adjustable, H. T. Jacobsen.... 847,580
Drum, expansion, J. A. Strom..... 847,446
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Dust removing apparatus, D. T. Kenney, 847,947, 847,948
Egg case division plate, C. J. Voorhorst.... 847,854
Electric current interrupting and varying apparatus, E. Bachelet 847,877
Electric meter, C. W. Atkinson..... 847,540
Electric motor speed controlling device, T. W. Heermans 847,663
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Electrical grounding device, J. F. Golding.. 847,935
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Elevator safety device, J. J. Westbrook .. 847,867
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Envelope, vertical file expansible, C. M. Carnahan 847,648
Excavating machinery, A. R. Grossmith.... 847,331
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Fabric feeding and cutting apparatus, multiple, H. Zimmerman..... 847,536
Fabric rewinding apparatus, C. Lichtenstadt 847,418
Fabrics, paper, etc., feeding device for textile, A. & O. Buckmann..... 847,645
Fabrics, tension and regulating mechanism for traveling, J. A. Cameron..... 847,315
Fan and score card, combined, W. Steel.... 847,522
Fan, pressure, J. Keith..... 847,585
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Fastening means, G. O. Olson..... 847,359
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