

Business and Personal.

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If you are obliged to crowd your engine with work over its rated capacity, try what the Hutton Governor will do for you.

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Agents wanted to sell Territory in the States of Ohio and Michigan.

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For Sale—Patent for Stopcock. Will hold Gasoline without leakage.

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All Blacksmith Shops need a Holding Vise to upset bolts by hand.

Parties desiring Steam Machinery for quarrying stone, address Steam Stone Cutter Co.

Cabinet Makers' Machinery. T.R. Bailey & Vail. Painters and Grainers by the thousand.

For Hand Fire Engines, Price \$300 to \$2,000. Address Rumsey & Co.

Over 800 different Style Pumps for Tanners, Paper Mills, and Fire Purposes.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability.

Brown's Coal Yard Quarry & Contractors' Apparatus for hoisting and conveying material.

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them.

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Five different sizes of Gatling Guns are now manufactured at Colt's Armory.

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers.

Gauge Lathe for Cabinet and all kinds of hand-races. Shaping Machine for Woodworking.

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All Fruit-can Tools, Ferracut, Bridgeton, N.J. For Steam Fire Engines, address R. J. Gould.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills.

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Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street.

For the best Endless Bed or Farrar Suracer, address Davis, Hatch & Co.

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Spur and Bevel Wheels and Spindles, of great durability, cast to order by Pittsburgh Steel Casting Co.

The Berryman Steam Trap excels all others. The best is always the cheapest.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps.

Absolutely the best protection against Fire—Babcock Extinguisher. W. W. Farwell, Secretary.

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The best Lubricators, Oil Cups, Gauge Cocks, and Oil Cans, are "Broughtons."

R. H. Gillmore, Keokuk, Iowa, wants best carriage gate, to be operated from carriage.

Lathes, Planer, Shaper, Shafting, 30 Boilers, Engines and Stock of Machine Shop, for sale very low.

Arrangements are being made to manufacture a small oscillating engine for the use of farmers and others requiring a little power.

For Sale—A set of the Patent Office Reports (mechanical) from 1847 to 1869.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal).

Williamson's Road Steamer and Steam Plow, with rubber Tires. Address D. D. Williamson.

Steel Castings "To Pattern" from ten lbs. upward, can be forged and tempered.

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Notes & Queries

A. P. asks how to temper steel dies and punches.

F. E. C. says: How can I make translucent cloth for hotbed frames?

E. F. S. asks how to prevent soft metals such as tin, lead, etc., from clogging files.

W. M. asks: When and where were bolting machines first introduced for bolting flour?

S. A. L. asks: What kind of leather is generally used in making blacksmith's bellows?

M. C. asks: Can a card be saturated with phosphorus and preserved for use, and will it be flexible?

P. R. R. asks: Can any of your readers describe a process for tempering steel springs by compression?

A. L. asks: What is the best wood to make insect cabinets of, and what is the best form for the same?

W. H. H. asks: Can you tell me how to make a pickle for taking sand off castings, such as small gear wheels, etc.?

J. F. A. wishes to know with what material he can coat the inside of tin cans, to prevent ink and other fluids from being affected by the tin.

E. D. R. asks: What is the best method of mixing fresco colors, and what ingredients are used to make them now freely and cover well?

C. M. asks: How can the glue joint between the back and sides of a violin be undone without injuring the instrument or spoiling the varnish?

E. B. asks for a recipe for making dextrin or a substitute for the same, say 50 lbs. at one time. He wants to use the dextrin for sticking purposes.

W. S. B. asks: What is meant by summer and winter strained lard oil? What process does the lard go through to keep it from congealing?

C. B. asks if there is any method of toughening or preparing wax for flower making so that it will not be liable to soften in warm and harden and crack in cold weather.

J. D. asks for a recipe for a waterproof liquid cement, to be used for putting patches on bags, in the place of thread. It would be very useful to thousands of farmers.

G. M. D. says: How can I mark or print letters and figures on metal that has been finished and plated with silver? I have seen such work, but cannot tell how it is done?

A. P. asks: Will the power of a 10 horse engine drive a machine or machinery 100 feet away from the engine as easy as it would 10 feet away? The machinery is to be driven by a belt or belts from the line shafting.

N. J. J. asks: What kind of fish would be best to raise in a lake one mile in diameter? The water is eight feet deep, and the lake has no visible inlet nor outlet. The water is at all times bright and clear and has an agreeable taste.

J. R. says, in regard to R. and W.'s query about the balance wheel: Supposing that W. is right, will he be kind enough to explain the action of the gyroscopic governor, illustrated and described on page 134 of the current volume of the SCIENTIFIC AMERICAN?

C. E. C. says: Can some one give instructions for annealing gold so that it can be conveniently worked into rings, drawn into wire, etc., without cracking? I am often troubled with gold coin and good scraps, which are as brittle as cast iron.

J. C. K. asks: What is the best preparation for setting a thimble on axles? I use the drops of paint heated over a slow fire to the consistency of a batter. Is there anything better? In large wagon factories, how do they cut out the hub for the thimble box?

G. D. N. asks: Is there any work published treating wholly or in part upon electro-magnetic motors? Where can it be obtained? Is vulcanized rubber or dentist's hard rubber a conductor of electricity? What is the necessary size of a battery to ring a bell? It must be active for a month.

P. L. says: We use equal parts of first quality clay and ground brick in the manufacture of our retorts for distilling phosphoric acid; and yet they sometimes crack over the heated furnaces. We manufacture them in a warm room, fire the kiln with care, and subject all to the same charges, heat of flame, etc. What is the cause of our trouble?

D. H. E. says: I have lost the sliding weight to my platform scales, commonly called the P. The lever is graduated from 0 to 100 lbs. In half pound notches, and there are additional weights, 100, 200, 300, and 400. There is a cup at the end to put shot in to keep the balance; but it has been emptied also, otherwise I could easily put on the platform U. S. standard weights and make my new lead P. of the right weight. Please tell me how to get it to the proper weight.

H. A. B. asks: What proportion of burnt clay should be mixed with quicklime to form a hydraulic cement? The lime is to be measured before slacking, the clay after ginding. Should the clay be burned in a very hot fire and how long should it be exposed to the heat? Or soft magnesian limestone and American chalk, which would make the best lime, and what would be the relative quality of each?

J. R. has read Professor Young's lecture on our present knowledge of the sun, and asks for explanation on the following point: The professor asserts that a contraction of the volume of the sun, equal to 240 feet of its diameter, would account for all the heat it gives off. "If we freeze a pall of water, it gives off heat while it is freezing, but the thermometer will indicate no fall of temperature, until it is all frozen." The greatest density of water is at a temperature of 39° F.

J. R. asks: What are the limits of expansion in an engine provided with an ordinary D valve in the steam chest? The admission of steam is cut off by a plate valve (sliding over the opening which admits the steam into the steam chest). The D valve is connected in the same way as in an ordinary engine; the plate valve, however, is worked by a crank pin of a wheel which makes twice as many revolutions as the shaft of the engine. The main valve has 1-16 of an inch lead and 1/4 inch outside laps. The steam port and the said opening are 1/4 of an inch wide and both valves have 2 1/2 inches throw.

D. F. says: We use what is called a gas pump in our oil well to draw gas up through the large casing between it and the tubing. What will be the difference in the amount of vacuum created by a ten inch cylinder and by a fourteen inch? They are piston pumps. How many lbs. per square inch would the vacuum be for each pump? They would both be acting on a tight vessel.

T. K. B. says that polished steel becomes in a mannerscaly, after being hardened, by the cold air striking it. "I use soap to coat the steel with, still it does not overcome the difficulty perfectly. I am told there is a liquid for coating steel, while heating it, in such a manner that the cold air does not strike it. I would be obliged to you or some of your readers for a process better than the soap."

ANSWERS TO CORRESPONDENTS

T. P. says: In your answer to F. E. D. as to fitting up cones so that the band will be equally tight on all the pulleys, you say that the sum of the diameters of all the pulleys will be the same. In my experience I find that steps in cones made all the same will not do. Please explain. Answer: For crossed belts the sizes will be the same. This is what we there stated. Read the reply more carefully.

M. J. B. says: Please state which is the most perfect book on mineralogy, and where it can be obtained. What is the price of it? Answer: Get "Dana's Mineralogy" of your bookseller.

E. A. P. sends a description of parhelia and asks for explanation. Answer: This phenomenon was explained, on page 182 of our current volume, as due to floating crystals of snow or ice in the air; and the same explanation would apply in the present case. The prismatic effects at noon were probably not so fine as they would have been with the sun nearer the horizon.

A. G. F. says: I have occasion to run a hydraulic press at a distance of 250 or 300 feet from the power which runs the pumps. Can I not dispense with the shafting, place the pumps near the engine and use an enlarged pipe for connecting the pumps with the cylinder of the press, without material loss of power? Can I use a pipe 250 or 300 feet long, and if so, what should be the relative increase of size of pipe for 300 feet over the size required for 10 feet? Answer: You can dispense with the shafting and set your pumps near engine, using a pipe to conduct the water. You need not increase the size of the pipe. The supply of water is so small that an enlargement of the pipe is unnecessary for so short a distance as 300 feet.

J. F. C. says: 1. What convexity should a pulley have to allow a belt to run and adhere to its best advantage? 2. Is it best to run a thin and broad belt or a thick and narrow one? 3. Is it best to run one broad belt of sufficient capacity to convey the power of the engine, or would it be better to divide it and run two of half the width each? Answer: 1. One half inch to a foot in breadth of face. 2. A thin belt up to a breadth which will render it unmanageable. 3. That would depend upon the amount of power to be transmitted. For a thirty horse power engine, we should use a single belt of full width, if certain that it would be kept properly laced or otherwise well secured to take even strain across its full breadth.

A. T. Z. says: I have a turbine water wheel of 15 horse power driving a run of stones. Upon the top of the upright shaft of water wheel was a pinion 16 inches diameter and 2 inches pitch, with iron teeth, driving one of 2 feet diameter with wooden teeth on the stone spindle, giving proper speed to stones, but making a jarring noise in the teeth and shaking the building. Thinking the pitch too large for the diameter of wheels, I made, very correctly, new patterns, with 1 1/4 inches pitch and the same diameters as before, but found them work no better. Can wheels of above sizes be made to drive a run of stones and work smoothly? If so, what is the cause of the trouble with mine? Answer: We are inclined to think that your trouble is due to want of proper balance of your turbine. Wheels of the sizes mentioned can no doubt be made to run smoothly.

W. H. M. asks: If a pump of 2 inches diameter has a stroke of 3 feet, what amount of water in cubic inches does it draw, and what is the rule for finding the same? Answer: To find the area of a circle, multiply the square of the diameter by the decimal .7854. To find the cubic contents of the cylinder, multiply the area by the length. In your example 2x2x.7854x36=118 cubic inches of water and a little over, for each stroke.

H. R. asks: Can you inform me of what materials the elastic rollers used on printing presses are made? Answer: Glue and molasses. Increase the quantity of glue to make a stiff roller; you will need this in hot weather.

M. M. T. asks how glass becomes porous, if it ever is so. Answer: All glass is more or less porous. Some coarse bottle glass is so much so that it will not insulate for electrical purposes.

J. F. C. says that G. T. P. can make the best red seal wax by mixing 1 lb. shellac, 1 lb. Venice turpentine, 1/2 lb. chalk and 1/2 lb. English vermilion.

H. P. has an aquarium made of a wooden frame and glass sides, and wants a cement to make it watertight. Answer: Mix equal quantities of dry white lead and red lead in a paste with mastic varnish. Use as soon as mixed.

W. E. A. says: I have a plan for taking water through the surface condenser of a marine engine by which the motion of the vessel is made to perform the duty of the circulating pump now used. Is there, to your knowledge, any thing of the kind in use? Answer: The plan has been often suggested and more than once tried in various forms. Success has not been met with in any case in such a degree as to lead us to anticipate its general adoption.

C. E. C. asks how to mend rubber boots. Answer: See page 155 of our volume XXVI.

J. H. W. says: I have seen it stated somewhere that the workmen in deep mines were entirely unaware of the occurrence of the severe shocks of earthquake which were felt last fall in California; and, as so many theories have been promulgated to account for these phenomena, I have been expecting some of the scientists to base—if this statement be correct—a more probable theory upon it. If true, it would indicate, of course, that these disturbances are created upon or very near the surface, and the old doctrine of internal commotion (gaseous or otherwise) causing upheaval of the crust, a doctrine still held by many, would be untenable. Answer: The statement that the workmen in deep mines were unaware of the shocks and undulations taking place on the surface would require the concurrent testimony of numerous witnesses before any scientific men would put any confidence in it. It sometimes happens that, owing to great geological faults and fissures, the earthquake waves are not propagated over small districts of country; they remain like islands in the raging sea. This fact has several times been noted, but in such cases there is no motion either on the surface or in mines. That there should be wave motion on the surface and none at a moderate depth below, is in the highest degree improbable; on the contrary, animals living in caves and holes are the first to perceive the shock, and often give note of an approaching earthquake by rushing to the surface.

J. E. M. asks: Does heat or cold affect the power of a magnet; also whether the movement of a piece of steel would be more rapid towards a strong magnet than towards a weak one, provided the same piece of steel be placed at the same distance away from each? I think that the stronger magnet would attract a larger piece of steel than the weaker one; but under the above named conditions, the movement of a piece of steel would be just as rapid towards the weaker as towards the stronger one. Am I right or wrong? Answer: Alternations of heat and cold, sudden contraction or expansion, and percussion are decidedly injurious to the strength of a magnet; and we should say that a powerful magnet would attract a given piece of steel towards it more rapidly than a weak one. Better try the experiment.

F. G. asks: How can I make a good and cheap electric battery? Answer: You can buy a battery cheaper than you can make one, but if you wish to try your hand at the business, we can recommend what is called Daniell's pattern as being easy of imitation. Make yourself a copper cup of the capacity of a pint measure, and a second cup, holding a gill, out of sole leather. In the copper cell, put a mixture of eight parts of water and one of oil of vitriol, saturated with blue vitriol, and pour some of the acid water without the copper into the leather cup. Cast a solid cylinder of zinc and amalgamate it; plunge this into the inner leather cup and connect it by a copper wire soldered to it with the outer cups. Several of these cups would constitute a battery. Now read about it in your school philosophy, and you will learn what further to do.

H. R. asks: 1. Is there any glue or substitute for the same that will stand exposure to wet weather? Answer: Take castor oil, 15 or 20 grains, chloroform, 2 fluid ounces; dissolve and add 1/2 ounce powdered mastic.

M. H. asks: What is the best way to fasten felt or any similar material to zinc? Answer: Try painting the zinc with a thick coat of white lead; let it dry and then use stiff hot glue.

F. W. D. says: Please enumerate the various colors of which white is composed, and the order in which they must be painted upon a circular disk, so that, when properly revolved, it will present a white surface. Answer: Divide your disk radially into five equal parts, and paint each of these with the seven colors of the solar spectrum, namely, violet, indigo, blue, green, yellow, orange, red. Put these colors on radially. Paint a black bull's eye in the center of the card, and blacken the circumference. Revolve rapidly, and you will see only a grayish white instead of the colors.

F. C. asks if the borax treatment for preserving meat is detrimental. Answer: No.

J. H. J. Your plan for steam engine is old. Watercolors are used for theatrical scenes.

A. P. should send his volumes for binding to our office. Charge, \$1.50 per volume.

A. C. asks: 1. Who designed and built the Thames tunnel (England)? 2. Who designed and built the Great Eastern? Who launched her? Answers: 1. Sir Mark Isambard Brunel. 2. Isambard Kingdom Brunel, son of the former. Built by John Scott Russell & Co.

Z. asks how to preserve natural flowers with wax. Answer: Take paraffin, melt it and dip the flowers in very carefully.

D. F. T. says, in reply to O. K., who asks if it is advisable to drive a 4 1/2 feet millstone with a quarter twist belt from the driving shaft to spindle: From experience, I should say no, unless you use a long belt. Your belt should be 9 or 10 inches if you want it to do any work. (In our reply to O. K., we originally advised a long 8 inch belt. The figure was by mistake, printed 5 inches.—Eds.)

J. B. T. asks for a recipe for bluing gun barrels. Answer: See page 10 of our volume XXV.

W. T. B. says in answer to D. F. W., who asked how to cut a crack in a bell clean, to stop the discorancy: I have used a circle of common soft Russian stove pipe iron, runni at a velocity of 5,000 revolutions, to cut teeth in a large saw. I could do it very quickly, but the under side of the saw was so hard that it could not be filed. It would cut the whole length of a twelve inch flat file in 1 1/2 minutes.

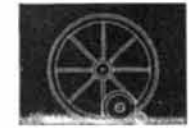
J. W. K. encloses a mineral specimen found in limestone, and a black mineral, and asks what they are. Answer: The black mineral is very soft bituminous shale. The other is flint.

B. O. M. asks how to bronze cast iron brackets. Answer: Read Byrne's "Practical Metal Worker's Assistant."

C. S. asks: Will you please send me the name of any work treating in detail on the construction of balloons? I wish to know of what quality of silk, the kind of varnish, formula for cutting the segments, etc.

W. G. C. asks: Would it take more power to prevent water escaping by a 1/4 inch hole at the bottom of a pipe, 6 inches in diameter and 100 feet high, filled with water, than it would require to prevent water escaping by a 1/4 inch hole at the bottom of a pipe, 1/4 of an inch in diameter and 100 feet high, similarly filled?

M. R. asks: 1. Will a horse pull a heavy load up hill easier on low or on high wheels, and why? 2. Weight of vehicle being the same, which pulls easier, a load divided over 4 wheels or over 2 wheels, and why?



There would be a tendency to raise him from his feet, and thus to prevent the effective application of his strength, which might, in extreme cases, more than compensate for the anticipated gain.

H. B. J. sends a mineral. "I took it from a lump of quartz which was full of small seams and pieces. The specimen was originally larger than an egg. Is it copper?"

E. C. D. sends us a stone, and asks what it is and if it is an indication of coal in the vicinity. Answer: The specimen is carbonaceous shale, but it does not promise the existence of coal in the neighborhood.

I. P. H. sends us a mineral specimen found in hematite. He asks what it is, and if it will affect the iron in the blast furnace. Answer: It is an infusible argillaceous rock, and will simply increase quantity of slag.

C. G. C. encloses two samples of minerals and wishes to know what they are called in geology and of what they are composed. Answer: Both specimens are feldspathic products, the soft, pliable one being kaolin, much used in porcelain manufacture.

H. D. asks: 1. What is caustic ammonia and how is it prepared? What is the expense of it? 2. What is the cheapest way to manufacture hydrogen gas for balloon purposes?

T. H. P. says: Last spring we put up a small 7 x 12 engine, the boiler being an upright one, 6 feet high and containing 37 flues. We fed with cold water until winter, when the freezing of the pipes caused us to adopt another plan.

J. T. B. asks: 1. What is the proper rule for determining the sectional area for the rim of a fly wheel suitable for any power of engine? 2. What is the rule for determining the sectional area of a lever crank of any length, suitable for any given power or pressure on piston?

J. T. B. asks: 1. What is the proper rule for determining the sectional area for the rim of a fly wheel suitable for any power of engine? 2. What is the rule for determining the sectional area of a lever crank of any length, suitable for any given power or pressure on piston?

C. S. C. sends a mineral specimen and would like to know its value and what it maybe used for. Answer: It could be used in making brick and coarse pottery.

E. P. C. encloses four mineral specimens for examination. Answer: No. 1 is indurated clay. No. 2 is the same, but purely argillaceous. No. 3 is compact limestone. No. 4 is siliceous limestone, containing minute crystals of pyrites.

E. B. asks: 1. If the spectrum of iron shows 65 lines, does this indicate that iron consists of sixty five terrestrial elements? 2. Can it be ascertained what particular line the color substance of flowers and leaves will throw in a spectrum, by burning leaves, etc., in a fresh state?

H. N., Jr. asks: What will remove red ink from writing paper? Answer: The red ink is readily removed by hydrochloride of soda, which can be purchased under the name of "Javelle water."

J. H. S. asks: Where can I find a reliable mechanic's companion? Answer: See our advertising columns.

H. A. W. says: In this county, Edgcombe, N. C., there are many locations in which accurate surveying cannot be done in the ordinary way with a compass, on account of the great variation of the needle, due to local causes.

W. M. K. says: It is a well known fact that musical notes are produced by the regular vibrations of the air, so many vibrations in a given time producing a given note, and the higher the number of vibrations in a given time, the higher will be the note produced.

C. E. says: Will some surveyor, civil engineer, or astronomer please inform me through your columns the difference (by actual observation) between true north and magnetic north, for this year, in the city of New York?

W. C. A. says: When it is stated that a book is 8vo, how am I to know length and breadth in inches, thus impressing upon my mind the size of the book? Answer: Usual 8vo size is 9x6 inches or a little less.

G. B. L. asks: 1. Are inserted teeth, for circular saws for sawing logs into lumber, better than solid teeth? 2. Can the number of teeth in the saw be diminished, say to one fourth or one sixth of the number generally used, with good results?

D. M. C. says, in reply to H., whose horses are troubled with corns: I am a horse shoer and have had some experience with corns in horses' feet, and think the caustics the shoe bear ng too hard on the heel.

H. S. T. replies to A. H. S., who enquires for a rat and mouse proof filling for his walls: I have seen dry saw dust used with every success; the vermin soon get disgusted in trying to get through it.

A. W. T. says, in reply to H. J. H.: To give metallic articles a lustrous black coating. The inside bottom of a cylindrical iron pot, about 18 inches high, is covered half an inch thick with powdered bituminous coal.

W. G. W. says that S. W. P., who enquires on page 154 about learning phonography, should go to the fountain head for the surest instruction. The inventor's own pure and simple system is the easiest to learn, the most reliable in reporting, and is unmistakably legible in every word.

B. G. replies to J. S. L., who wants to know how to have good water in his well: I have the best pump water in the neighborhood; my plan was the following: Empty the well, suspend (by a string) a coarse canvas bag, with three or four good sized lime stones and one or two lumps of charcoal in it.

W. T. B. says, in answer to D. H. S., Jr., who asked how to remove the taste of smut from wheat: To remove taste and smell from smutty wheat, dry your wheat thoroughly, so that the dust of the mill, when broken, will not adhere to the grain.

W. T. B. says, in answer to O. K., who asked if a burrstone could be driven with a quarter twist belt direct from shaft to spindle: I have used the quarter twist belt direct from shaft, for running millstones, successfully.

P. A. B. says, in answer to F. C: Heat your screw driver to a cherry red heat, to two inches from the end. Dip in cold water one inch, then rub the point on a piece of brick or anything that will make it bright.

N. J. F. says, in reply to P., who asked how to make Grecian paintings: Mix equal parts balsam of fir and common turpentine (both should be colorless); shake well and put away in a warm place for a day or two, shaking occasionally.

A. S. says, in answer to S.'s question of making sulphate of nickel: Dissolve metallic nickel in a

glass flask nearly filled with a mixture of 8 parts of water and 1 part of sulphuric acid; set the flask in a sand bath apply moderate heat until a more or less dark green solution has been obtained, which, after settling and clearing, should be decanted off in a porcelain evaporating dish.

J. D. H. says: It seems clear to me that the answer to "J. L. B." question, why a glass jar on a wet cloth may be filled with hot liquids without breaking, is simply this: The water in the cloth retards the heating of the bottom of the jar and thus obviates that sudden unequal expansion of the parts of the jar which would otherwise take place.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

- On Our Present Knowledge of the Sun. By G. W. T.
On a Method of Supplying New York City with Salt Water. By J. P.
On the Transplanting of Trees. By A. K. S.
On Distinguishing Fibers in Mixed Goods. By C. S.
On the Government Works at Hell Gate. By M. G.
On the Collection and Reduction of Photographic Wastes, such as Silver and Gold. By C. L. L.
On Boiler Strains and Perpetual Motions. By J. C.
On the Laundry. By J. K. D.
On the Cause of the Gulf Stream and other Ocean Currents. By J. P. W.
On Positive and Negative Forces. By E. B.
On Phonography and Phonotypy. By E. B. S.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

February 25, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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