F. M. S. asks: In the manufacture of gun cotton, is the use of chemically pure acids impe tive? A. No. The commercial acids are frequent, tive? A. No. The commercial acids are inequently used. 3. What proportion and strength of acids hould be used? A. 105 parts by weight of sulphuric acid at 16° B., to 50 parts of nitric acid at 48° B. 3. Is gun cutton an article of manufacture or commerce to any extept, and has it been put to any practical use? A. It is used for projectiles, in the art of photography, and in sur gery. 4. Is there anymechanical arrangement by which the electric current of high tension can be reduced to a more voluminous one of lower tension? A. Yes.

G. A. P. says: I am running a grist mill with two sets of bevel gears, using about 30 horse power. I wish to throw the gears out and use a belt. Will a 20 inch belt be sufficient, if it be driven from a four foot to an eight foot pulley? The belt will run 725 feet per min-ute, on upright shafts. A. We think the belt will be large enough. We have already given rules by which the proper width of belt can be determined approxi-mately.

D. N. C. R. asks: About what size would a boller require to be to run an engine 300 revolutions per minute, the size of the cylinder being 5 inches stroke and 3 inches diameter? A. It would probably require from 35 to 40 square feet of efficient heating surface.

J. F. D. asks: How can I make small articles of india rubber? Is there a book on the subject? A. Hancock's "Manufacture of India Rubber" will give you considerable information on the subject : butprob ably you would best acquire the art by practical expe rience at a manufactory.

A.S.S. asks: Is this the correct way of find ing the actual horse power of a high pressure steam en-gine? Diameter of cylinder 7 inches, length of stroke 1_3^2 feet, revolutions per minute 80, with steam power on piston at 60 lbs. per square inch, and allowing $1\frac{1}{2}$ lbs. per square inch for friction: $7 \times 7 = 49 \times 55\frac{1}{2} = 28\%6\frac{1}{4}$. The length of double stroke is $3\frac{1}{3}$ feet $\times 80 = 266\frac{2}{3} \times 2866\frac{1}{2} = 764400 \div 42017$

= $18 \frac{8094}{42017}$ horse power. A. The solution is correct for the assumed data.

S. asks: 1. How thick would iron have to be to withstand a pressure of 30 lbs. to the square inch? A. It would depend upon the form of the vessel. 2. I have a small steam engine. Bed plate is $15\frac{1}{3}\log by S$ inches wide, with a 10 inch wheel. Cylinder is $1\frac{1}{3}$ inches diameter by S inches stroke. What would be the horse power, with 30 bls. of steam to the square inch and run ning as fast as possible without injury to the engine 3 A. Multiply the pressure on piston inpounds, by speed of piston in feet per minute, and divide by 33,000. 3. How can I calculate where to drill the hole where the shaft goes through in the eccentric, so as to give the right travel to the slide valve? A. Make the distance,

from center of eccentric to center of hole, half the travel of the valve. 4. What is the best way to seat or grind the slide valve so as to make it fit steam tight to the cylinder? A. Use a scraper to face off the valve and seat. 5. What is the best polish for iron castings which are tolerably smooth? A. Fine emery will answer well for the iron.

W. L. P. asks: 1. Who was the engineer of the Sucz canal? A. Ferdinand de Lesseps. 2. What is its length, breadth, and depth? A. About 100 miles long, 300 feet wile at the top. 100 to 150 feet wide at the bottom; average depth 24 feet. 3. In what years was it commenced and completed? A. Commenced in 1854, und completed in 1869. 4. What was its cost? A. About ninety million dollars. 5. Does it pay? A. It pays its expenses, but has not yet vielded anything to its original shareholders. See p. 119, vol. 30.

C. W. A. asks: 1. How many grains of chloride of gold will a given number of grains of me-tallic gold make? A. This is found by first adding to-gether the combining weights of chlorine and gold, and dividing the result by the combining weight of gold

alone. Thus Cl=35.5, Au=196, Au Cl=231.15. $\frac{231.5}{196}$ =

1.1S+. Therefore one grain of metallic gold will make 1.18+grains of chloride of gold, 2. Are iodide and bromide of potassium soluble in a mixture of equal por-tions of absolute alcohol and ether. sulph. com. to what is the process? A. This is a question which you can determine by experiment. Agitate the powdered bromide or folder in the mature?

E. R. W. asks: What two substances, ele-ments or compounds (ice and snow excepted) possess the least amount of friction when brought into contact with hard substances? A. It is not possible to answer this question in its present very general form, because it is necessary in the first place to know how the sub-stances are to be brought in contact, and secondly, what the hard substances are, for much depends upon the adaptation of lubricating materials to the circumstances under which they are to be used. The softer greases as oil, hog's lard, etc., diminish the resistance under small pressures more than under high pressures The harder greases, as tallow, soft soap, and mixtures of grease and plumbago, produce less effect with small pressures than with large ones.

J. H. S. asks: What do the words sin., cos., and tang., and the sign \sum , in algebra mean? A. Sin. = sine of an arc or angle. Cos.= cosine. Tan.= tangent. $\Sigma =$ the sign of the summative, and means that terms of a

F. H. B. asks: What will remove ink and fruit stains from paper, linen, etc., without injuring the fabric? A. For ink, rub the spot with a weak solution of oxalic acid. For fruit stains, make a mixture of ½ lb, chloride of lime and 3 pints water, add 7 ozs, crystal lized carbonate of soda discolved in 1 pint of water. Mix thoroughly, allow to settle, and pour off the clear liquid. This will remove fruit stains from linen.

J. F. asks: What is the correct theory about the formation of ice? Does it form from the bot tom of the water or from vapor escaping and congeal ing on the top? A. It forms at the top, by the produc tion, at the freezing temperature, of innumerable crys-tals, which interlace one with another until at lastthere resultsa solid mass.

W. H. W. M. asks: 1. Can sugar and sirup be made from rags and sawdust by the aid of sulphuric acid? A. Yes. 2. By pouring sirup into the tea, the tea turns a black color; does it denote that the sirup is made from rags.etc.? Would the action of the acid in the sirur operate on the tannin in the tea, and produce the black color? Will not good sirup without acid affect the tea in the same manner? A. It is more likely that there was a trace of iron present, which formed a tannate of iron and caused the inky appearance. Sirup manufactured in a proper manner will not blacken tea. 3. The following is another test: Mix the sirup with a solution of muriate of baryta. If there be any acid in the sirup, its presence would be denoted by a white precipitate. This is reputed to be a sure test. I have tried the teat est myself, and it became of such a black color that I could not see the bottom of the saucer. A. It is true that a solution of muriate of baryta will detect the slightest trace of sulphuricacid, and form with it an insoluble white compound.

C.O.E. asks: 1. How can I silver plate tron? How can I make the best silver solution for iron; A. Wash in weak lye to remove grease. Dip into weak aquafortis to remove rust. Scour with a hard brush andfine sand. Then, having fastened to a wire, dip in and ne sand. Then, naving fastened to a wire, dip in strong nitric acid and, as quickly as possible, afterwards in the sliver bath. This may be made by dissolving sliver in pure *aqua fortis*. Afterwards a solution of cyanide of potassium is added until nothing more is thrown down. The liquid is poured off, fresh water adaed and poured off several times until the cyanide of silveris well washedfrom the acid, and then solution of cyanide of potassium is added until it is all dissolved again. A silverplate is used for the other pole of the hattery. 2. How can I get different colors of gold by galvanic plating? A. The process is too complicated to be published in these columns. Consult a good book on electroplating. 3. How can I plate iron with nickel? A. Make a bath of $\frac{1}{2}$ lb. of the double sulphate of nickel and ammonia to agallonof hot water. Use a Smee battery. The articles to be plated require, according to the power of the battery, from six to ten hours, but the average will be eighhours. Afterbeing plated.they are washed with hot waterandpolished on a cloth buff with crocus, rouge, Vienna lime, or other pollshing powder, and oil. Two points must be at-tended to: 1. To have the solution always kept neutral; 2. to clean the iron perfectly, which may be done with muriatic acid.

A. B. C. asks: How can I make a cheap and efficient induction battery for medical use? A. By wrapping a coil of stout insulated wire around a core of softiron, and connecting the ends of this wire with a galvanic battery. Around this coil another coil consisting of fine insulated wire is wrapped, and of much greater length. The ends of this wire are the poles to be used. An arrangement like a toothed wheel must be introduced somewhere in the circuit for making and breakingthe connection.

D. B. W. says: In the SCIENTIFIC AMERI-CAN, December 3,1873, I find a recipe for making a rubber cement by dissolving rubber in benzine, which fails to work; the rubber does not dissolve. Can you tell what the difficulty is? A. Try pure unvulcanized rubber and stirthe ingredients well together frequently, with a stick or knife. The benzine must be highly rectified and pure. Sulphide of carbonis also a solvent of rubber.

E. B. asks: Is there a sure and simple test for distinguishing between genuine and artificial but ter? A. There are sure tests, but they are too complicated for anyone but a practical chemist to apply. For answers to your other questions, consult a stationer.

H. W. J. savs: 1. I wish to make a telescope with a fourinch lens, 72 inches focus. What must be the size of myeycpiece? What can I see with such a telescope? A. You can apply an eyepiece of one inch cousts but unless the object glass be achromatic you cannot employ the full sperture, nor in any case have a very satisfactory field of view. 2. How can I polishar-ticles that I have silver plated, and how many Callaud cells will be necessary? A. You can polish silver with fine chalk, applied with chamois leather or a soft wool enrag. For plating a few small objects, one or two cells are sufficient.

P. H. M. asks: Is the cause of the existence of the Gulf stream known? If so, what is it? It is caused by the heating of the waters of the Atlantic ocean under the equator, which makes them lighter, and sauses them to flow over the top of the water lying to the northward, this water flowing in below towards the equator.

F. C. B. asks: Is there any process to re-store blackberry wine or any other liquid that has be-come musty by putting it in a musty barrel? A. Mustix'''+ ctc. 2. Would it be profitable to construct a winged steam valve, so as to give the engine power from the valve instead of requiring power from the profit seed is occasionally used for the same purpose

S. asks: What colored light is best for per sons to read by, and how can I impart that color to iamp chimneys? A. Blue. It can be painted over with thin coat of Prussian blue.

H. R. R. asks: 1. How can a handsome purple color be made for druggists' show bottles? A. Make a solution of permanganate of potash in distilled

water. 2. Can I make two different colors in the same bottle, that is, two colors that will not mix, as, for instance, red and green? A. Aqueous solutions alone will not answer. Dissolve some sulphate of nickel for the green, and upon this pour some oil colored with co. chineal.

F. P. C. asks: Is there any satisfactory way of testing adulteration of linseed oil with cotton seed oil? If so, what? A. We are not aware of any reliable experiments on this point. Consult some good practical chemist.

W. says: I have bought 100 square inches of water, to be taken from the raceway under a 2 feet head. When the water is used, the surface in the pord and raceway lowers about 4 inches. If I draw my water through a 10 inch square hole, how deep must I put my flume, so that I can get my 100 inches of water and nomore? A. See article on "Friction of Water in Pipes,"p. 48, vol. 29.

V. T. asks: How can I make a fuse that will burn at the rate of about 200 feet per minute, and that will take fire at a temperature of about 150° or 200° Fah.? A. Consult the specifications of the recently patented fire alarms.

J. B. asks: How is a person affected by laughing gas? Isitinjurious? How is it administered? A. Taken in moderate quantities, it exercises a strong influence upon the muscles which are brought into play when there is laughter : but in larger doses, of five gallons and upwards, it produces unconsciousness and in-sensibility to pain. When manufactured from pure ni-trate of ammonia, and washed by passage through water, solution of green vitriol, and solution of potash, it may be taken without danger by persons in good health, if administered in a proper manner. It is breathed through a stopcock which admits the gas from the bag to the lungs, but sends the gas issuing from the lungs out into the atmosphere.

N. S. asks: 1, How can I seal the ends of small glass tubes? A. Use a blowpipe. 2. What is the process of silver plating? A. See pp. 299, 315,, vol. 29.

E. C. M. as¹zs: 1. Are the Cornwall (Engand) the mines the only ones in the world? A. No. 2. Is ft true that one has been discovered in California? A. Yes. For answers to your other questions see books on metallurgy, frequently advertised in our columns.

W. R. asks: 1. How many figures denote a billion, and how many a trillion? A. A billion is 1,000, 000,000,000. A trillion is 1,000,000,000,000,000,000. 2. Has the earth two revolutions, one on its axis, the other round the sun? A. The earth rotates on its axis, and revolves round the sun. 3. Is the sun the center of the solar system? A. Yes. 4. Are the stars inhabited? A. Nobody knows. The approximate constitution and con dition of many of the stars has been determined by the spectroscope, and the results show that none that have yet been examined present the conditions necessary to supporthuman life. For example, our moon is found to be without wateror air and intensely cold. Saturn and Jupiterare red hot. It is thought some of the moons of this planet may possibly be inhabited.

F. H. S. says: 1. I want to cast a small steam engine of brass: what is the composition that the founderics use to put in their fasks? Can I melt brass in a common stove? A. A good composition is 7 lbs. copper, 3 lbs. zinc, 3 lbs. tin. Probably you will find a forge better for the purpose. 2. How much power would an engine cylinder 1½x4 inches, with 10 lbs. of steam have, and also with 50 lbs.? A. See article on Indicating Steam Engines," page 64, vol. 30. 3. Would a crank do instead of an eccentric for the slide valve? A. Yes. 4. Can you recommend me a good book on molding brass, and one on the steam engine? A. Byrne's Practical Metal Worker's Assistant," and Bourne' "Catechism of Steam the Engine." 5. How thick should a small boiler (about 2 feet x 1 foo!) be to withstand a pressure of 10 lbs. and also one of 30 lbs.? How thick wouldbrass have to be? A. Sufficient data not sent. 6. How does a steam gage tell the pressure in a boiler? Must the pipe leading to the gage be one inch? A. The gage is so graduated that a pressure of 1 lb. per square inchgives a corresponding indication. The size of the connecting pipe makes no difference.

G. N. K. says: We wish to heat a factory (30x80 feet and four stories high) with exhaust steam and are advised to put in 4 inch tin pipes, one tier in each room, painting those where the most heat is wanted somelight color, and where less heat is wanted, a dark color. Will this answer as well as iron pipes? Why will the tin pipe radiate heat when painted? A. A tin oriron surface covered with lampblack radiates more heat than the plain metal. When coated with white lead, it radiates about the same amount of heat. Tin is a fairconductor of heat, having about one third of the conducting power of gold.

C. V. asks: If an engine crank pin suddenly breaks, thereby destroying the connection between pistonand crankshaft, what will follow? A. The pis-ton would strike against the cylinder head; and if the latter be not strong enough to resist the blow, it would be broken

A. O. B. says: In answer to a correspondent,

"Erfinder," St. Louis,Mo.—Please send your

P. W. L. says, in reply to the query: "Can the four roots of the following equations be obtained: $x^2+y=7$, and $y^2+x=11$?" Certainly they can, and are as follows: x=2 and y=3, or x=3 131312+, and y=-2.805-118 +

H. D. M. says, in answer to N. F. T., p. 123, vol. 30: It is the soot on the bottom of the kettle that prevents it from burning the hand. It will prevent it only for a short time, probably until N. L. T. thinks it quits boiling. A bright bottomed kettle will burn the instant it touches the hand.

E. says, in reply to M. who asked for a good etal for models : Melt 6 lbs. tea lead, ½ lb. tin, and X netal for models : lb. antimony. This will be a good stiff metal.

E. S. says, in further explanation of the board question, propounded by D. M. A. (see p. 91, vol. 30): Let W and w equal the two widths. Then will $\left(\frac{W^2 + w^2}{2} - \right)^{\frac{1}{2}} =$ the width of the board at the dividing point.

Application to your question: $(\frac{12^2+4^2}{2})^{\frac{3}{2}} = (80)^{\frac{3}{2}} = 8.9442$

+. This formula is simple, and applies to all cases.

MINERALS, ETC.-Specimens have been received from the following correspondents, and examined with the results stated :

J. A. S.-Rounded fragments of quartz, the one of a yellow color being ferruginous quartz.

J.C.-This product appears to be a fair specimen of lard. To determine whether it is adulterated or not will require a chemical analysis. Lard oil is a commer-cial product and burns well in lamps if the wick tube be kept cool. It is chiefly obtained as a secondary pro-duct in the manufacture of stearin.

S. B.-The shining particles are mica and are mixedwith rounded fragments of quartz.

M.McK.-It is white sand of superiorquality, and is seful for making glass.

COMMUNICATIONS RECEIVED.

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

On Healing Wounds by Charcoal, etc. By P.

On American Inventions in Europe. By H. S.

On Pavements. By S. S.

On Detecting Gold and Silver in the Earth. By (f.

On the Curvature of the Earth. By G.E.W: On the Thousand Feet Tower. By E. C. M. On American Silk Manufacture. By H.C.F.

Correspondents in different parts of the country ask : Where are cotton seed linters sold? Where can the seed and cuttings of sumac be obtained? Who sells machines for making broom handles? Who makes the machines for making broom handles? Who makes the best clothes wringer? Who makes waterproof gloves, for use in handling strong lyes, etc.? Who makes a cl-der press that will get four gallons of clder from a bushel of apples? Makers of the above articles will probably promote their interests by advertising, in re-ply, in the SCIENTIFIC AMERICAN.

Correspondents who wr!te to ask the address of certain manufacturers; or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions FOR WHICH

Letters Patent of the United States WERE GRANTED IN THE WEEK ENDING

February 10, 1874,

AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.]

Abdominal supporter, M.S. Larned	147,275
Air, navigating the. S. Francis	147,252
Air, cooling, J. Parisette	147,281
Axle clip, J. Ives	147,268
Bail esr, P. Miles	1.17,343
Bale tie, J. W. Hedenberg	147,262
Bale tie, cotton, H. Estes	147,380
Bale tie, cotton, H. Estes	117,381
Bale tie, cotton, J. E. Lea	147.270
Barrel hoop, L. Reed	147.284
Basket, H. C. Jones	147,328
Basket former, A. F. Scow, (r)	0.757
Bed bottom, T. S. Jadd	147,830
Bed bottom stretcher, II. D. Goldsmith	147.319
Bcd, sofa, J. F. Birchard	147.355
Bell, sleigh, A. Harrison	147.259

. As we understand this question, it would be very profitable, if it could be done.

L. P. C.—For replies concerning the as-signments you mention send your address to Munn & Co., and send ten dollars.

S. M. M. asks: Is there an instrument by which any mineral of value in or under the ground may be found? If there is anything of the kind that you know of, please inform me. A., The presence of iron ores below the surface of the ground can h many cases be determined by a magnetic needle; but there is no in strument for indicating other metals.

G. S. D. asks: Is a process by which milk can be preserved for several weeks, the cream separat ed and churned at convenience into an extra quality of butter free from incident raneidity, therefore little prone to deterioration, patentable? A. Probably it is

 $E,\ L,\ asks:\ How \ or \ where \ are \ the \ wires concealed or put out of sight in connecting an electric hurgiar alarm with the doors and windows of a dwell$ ing house? A. In new houses, the wires are frequently placed behind the plastering. But ordinarily they run long the base boards of the spartments.

E. S. M. says: I am about to construct a effecting telescope, the mirror being formed by silver chemically deposited upon glass. Can you give me some recipe for a solution to deposit the silver in a proper form? A. There are various methods of de-positingsilverupon glass. Here is one which you may make available by practice: A solution of gun cotton in caustic potash is added to a solution of nitrate of silver, followed by sufficient strong liquor of ammonia to redissolve the precipitate. The resulting argentiferous liquid is applied to the glass which is then slowly heated over a water bath until effervescence ensues and the deposit of silver is complete. Let a chemist prepare the solution of gun cotton, which requires care in hand ling.

G. E. R. asks: What substances are used with extract of logwood to make a cheap red color? A. In a decoction of three pounds sumac, the goods are steepedover night, and then spirited at 2º Twaddle; wash and work through a decoction of three pounds Lima wood andone pound logwood for thirty minutes, then raise with a gill of red spirits; work for fifteen minutes more; wash out and finish.

but would like to know why they move about when placed in strong vinegar. A. We suppose it is on account of the generation of carbonic acid. For answers to your other questions, see "Friction of Water in Pipes," p. 48, vol. 29.

E. says: I have a double acting engine of one nominal horse power, speed 300 revolutious ute. What would be the proper width of beit to con nect engine to line shaft? A. Probably about an inch.

W. H. G. asks: Why is it that oxygen and hydrogen, when mixed in certain proportions and igni-ted, explode? The product is water, but does not an expansion take place? A. When these gases unite, the volume of the combination is much less than the original volume of the gases; so that a vacuum is produced, into which air rushes with great rapidity.

P. O. T. asks: Will a leaden ball, if thrown into the sea, sink to the bottom? If not, why not? Yes. 2. What is the depth of the deepest sea sound ings? A. About 30.000 feet.

H. T. L. asks: Is there any chemical compound that will unite with or dissolve the albumen on albumenized paper? A. If the albumen is that of the white of eggs, it may be dissolved in alcohol containing a little alkali in solution,

Belt clamp, Minnich & Lohnes 147,419
Blackboard, F. G. Huut 147,267
Blasting, G. Frisbee 147,254
Blasting plug. G. Frisbee 147.253
Boiler flue, steam, C. B. Stilwell
Boiler, sectional steam, J. Harrison, Jr 147,:391
Boiler, sectional steam, E. B. Jucket 147,405
Boiler, steam, M. W. Shapley 147,437
Boiler safety valve, E. F. Steele 147,292
Bolt threading machine, A. Wood 147,462
Book binding, C. S. Murphy 147,422
Boot heels, molding, Simonds & Emery 147,288
Boring machine, G. W. McCready 147,339
Bosom pad and protector, J. E. Hodgkins 147,264
Box for transporting eggs, etc., H. A. Knight 147,532
Box, letter, J. D. Stewart 147,445
Brush and mop holder, M. J. A. Keane 147,331
Brush, hat, F. Ilickman 147,393
Brush, marking, E. W. Hitchings 147,394
Brush, tooth, J. G. La Fonte 147,410
Buckle, harness, B. D. Jessup 147,404
Buckle, suspender, H. A. House 147,525
Burial casket, M. M. & S. G. Hersman 147,263
Burner, gas, C. C. Bingham 147,234
Butter package, F. A. Lane 1"7,274
Can, oil. K. Kittoe 147,2
Car axle. G. W e timore