ENGINEERING INVENTIONS.

A car for inclines in mines has been patented by Mr. John Rosquist, of Park City, Utah Ter. There is provided a novel self-acting pawl attachment, whereby, if the rope or other appliance gives way, the pawl or pawls are made to automatically engage with locking racks on the track, to stop the car at any point.

A railway torpedo placer has been patented by Mr. Gilson W. Metcalfe, of Baltimore, Md. This invention relates to an improvement on a torpedo placer patented last year by the same patentee and Mr. M. F. Haber. It involves certain details of construction whereby the action of the wheel in placing a torpedo on a rail is made more certain and effective.

An automatic railway signal has been patented by Mr. Theophilus Arndt, of Florin, Pa. It provides for placing an extra rail at the side of one of the track rails, the extra rail being slightly higher and with sloping ends; there is an attachment to the locomotive, by which a lever is operated in passing over this extra rail, and thus the whistle is blown during the passage over the sloped rail.

MECHANICAL INVENTIONS.

A mandrel attachment for circular saws has been patented by Mr. Edward W. Johnson, of Waterbury, Conn. This invention provides for the fixing of a circular saw to a mandrel at any required angle, whether right or oblique, and enabling the operator to change the angle of the saw on the mandrel, so as to vary the width of the cut or groove to be made.

A screw driver has been patented by Messrs. George E. Gay and John H. Parsons, of Augusta, Me. The invention is an improvement on screw drivers in which the blade is fixed to the handle by a metallic plug in a transverse position, and has for its object to dispense with the flanges or screws in or upon such metallic plugs, thereby simplifying and cheapening the making of screw drivers.

A belt tightener has been patented by Mr. Frank Sager, of Pittsburg, Pa. In combination with screw threaded shafts and clamping rolls is a fixed and a movable cross bar, with an eye at each end, forming bearings for the shafts, the latter having collars and nuts at the ends of the eyes, and working in screw-threaded bevel-toothed nuts, operated by beveled cog wheels, a shaft, and a crank or handle.

AGRICULTURAL INVENTIONS.

A sulky plow has been patented by Mr. Benjamin S. Benson, of Baltimore, Md. This invention is designed to facilitate the more perfect guiding of the plow, and controlling the width of the furrow slice, which is effected by readily made adjustments of the various parts.

A sulky plow has been patented by Mr. Thomas T. Harrison, of Aubrey, Kas. This invention covers improvements on four former patents issued to the same patentee, and is for a manner of adapting plows to turn a square corner in passing around land, without it being necessary to raise the plows out of the ground.

An improved plow has been patented by Mr. Simeon A. Ware, of Danburg, Ga. The object of this invention is to promote convenience in adjusting plows and efficiency in operating them. A detachable landside is provided, in place of which a blade or cutter may be fixed to the side of the beam, to cut roots in the soil which would otherwise interfere with the working of the plow.

A pitman box connection for mowers and reapers has been patented by Mr. Charles Dixon, of Weedsport, N. Y. The invention provides for an improved construction to make a better working joint or fit of the socket portion of the box with the pin or ball which works therein, whenever, by irregularities from imperfect castings or otherwise, the same are liable to shake or jar and form an imperfect connection.

A horse hay rake has been patented by Mr. James M. Wishart, of Topeka, Kas. The teeth are attached to cross bars which form the head of the rake, one bar being under the upper or rear ends of the teeth, and one bar being over the teeth at a suitable distance forward of the rear ends to give sufficient space for the wheels on which the rake is supported to be located between said bars.

MISCELLANEOUS INVENTIONS.

A grain measuring machine has been patented by Mr. Joseph Nafziger, of Hopedale, Ill. This invention relates to a device adapted to be attached to and operated from the separator of a thrashing machine, for automatically measuring the grain as it is thrashed.

A stave and shingle sawing machine has been patented by Mr. William J. Henderson, of Naylor, Ga. The object of this invention is to promote convenience and accuracy in beveling and bilging staves, sawing shingles, laths, fruit crate slats, and other sawing.

A clamp for sheet holders has been patented by Messrs. Alfred P. Hayden and Francis Pickup, of Brooklyn, N. Y. This invention provides a device with peculiar construction and arrangement of parts for holding all kinds of loose sheets, as express receipts, check and note blanks, etc.

A flying target has been patented by Mr. James Jopling, of Oskaloosa, Iowa. The object is to provide a target of a form to prevent the shot from flying off, which shall sail well in the air, not be liable to breakage on the field, and so a large number can be safely packed in a small space for transportation.

A cotton press has been patented by Mr. John C. Allen, of South Sulphur, Texas. It is a horizontal press, with reciprocating follower worked by power, and arranged to receive cotton from a chute descending from a floor above, the construction being such as to make a very effective press without heavy or expensive fittings.

A grate bar has been patented by Mr. John Mailer, of San Francisco, Cal. In this invention the grate bars are fixed, and without vibrating motion; there are tongues on both sides of the opposite plates of each bar, in a staggered position, and beveled downward and inward to the plates, to insure a large air inlet, and not allow the passage of the lugs by each other.

A spring motor has been patented by Mr. James A. Wright, of Rockingham, N. C. This motor provides means whereby an elastic cord or other spring may be stretched to its full length and its contractile force utilized in a small space for such purposes as running sewing machines, churns, pumps, scroll saws, or for propelling bicycles, etc.

A cock and tank for drawing fluids of varying temperatures has been patented by Mr. James Byrne, of Cleveland, O. The invention provides for the division of an urn or tank into two compartments, and a faucet with a single outlet connected with both compartments, but so the flow of the liquid from both may be gauged as desired.

A glove fastener has been patented by Mr. Amedee Trouttet, of New York city. This is a cheap, novel, and practical device by which a glove may be fastened quickly and easily without button hook or other aid. There is a sliding buckle or fastener, with hooks, and a strap attached to the flap of the glove with suitable holes or eyelets.

A stocking supporter has been patented by Mr. George N. Buck, of Mattoon, Ill. An attachment is provided consisting of a single wire bent back and forth upon itself to form a series of separate parallel loops, as an elastic strap adjuster, and terminating in a spring pin and eye, or keeper, by which to attach it to a stocking.

A nut lock has been patented by Mr. John W. Haley, of North Hartland, Vt. In a fish plate, with lugs on its outer surface, is a frame or check nut, the frame being provided with diagonally opposite lugs adapted to catch on the lugs of the fish plate and prevent the locking nut from turning, the nut lock being very easily applied, and firmly fixing the nut.

A dash board has been patented by Mr. William E. Minshall, of Minonk, Ill. This invention provides means for securing dasher frames to their feet without holes in the frames, also for repairing broken dasher frames, and for fixing the whip socket to the dasher, in a more solid and economical manner than by present methods.

An apparatus for adjusting the beat of pendulum clocks has been patented by Messrs. George H. Brown and Henry J. Welteroth, of Blossburg, Pa. The invention provides means for adjusting the verge or pallet relatively with the escapement and pendulum rod, so the clock may be set in perfect beat when resting on an unlevel surface or support.

A saw envelope has been patented by Mr. Frederick Schluchtner, of East New York, N. Y. A fastening strap is provided at one or both ends with a cross head to engage with slits in the envelope and fasten it in place upon a saw; in the side of the envelope is an aperture to display the figure indicating the number of teeth to an inch in the saw.

A cigar mould has been patented by Mr. Remsen Appleby, of New York city. This is an improvement on a former patent issued to the same patentee, intended to prevent the point of the cigar from being packed and badly drawn, and provides for the cutting off of the surplus tobacco without packing the point, while at the same time the tips are made secure and the work is accurate.

A rock dredge has been patented by Mr. Isaac Du Bose Seabrook, of St. Helena Island, S. C. This invention is intended to better accomplish the disintegration and recovery of the phosphate rock deposits of river bottoms than is at present possible, the device provided giving greater flexibility of action, thereby accommodating itself more perfectly to the irregularities of the river bed.

An easel has been patented by Mr. Delbert K. Woodward, of Lordstown, O. This invention relates to certain improvements on an easel for which a patent was granted last year to the same patentee. The easel frame has a short rear leg or legs attached to a cross bar near the center of the easel, and there is an adjustable shelf bracket, with several specially devised and ingeniously arranged parts.

A fire engine has been patented by Mr. William F. Baldwin, of Grayville, Ill. This invention has for its object to provide means whereby any number of cisterns may be adapted to receive the same pump and its operating gear, and the gear adapted to operate one or more pumps by hand or animal power, being much more economical and more quickly adapted to use than a portable engine.

A combined extension saw horse and scaffold has been patented by Mr. John W. Phillips, of Oakdale, Neb. An extension top piece and extensible legs are hinged to a hinged head block, and there are also intermediate extensible legs hinged to the top piece, so the saw horse can be lengthened or shortened, or made higher or lower, to adapt it for use for various purposes.

A velocipede has been patented by Mr. Christian F. Riley, of Philadelphia, Pa. This invention covers improvements in means of coupling the guiding or steering and driving axle of a hand crank velocipede with the reach or bed frame of the hind axle, and also devices for steering or guiding the driving wheels by the feet of the driver, the object being to make the machine simple, efficient, and durable.

A shingle sawing machine has been patented by Mr. Patrick O'Connor, of Tallman, Mich. The machine has a stationary frame and a rotary annular frame divided into compartments by stationary and hinged bars, and provided with stationary and with movable dogs operated by spring pressed jointed bars and cam guides, and adjustable tilting tables, the whole to facilitate the sawing of shingles and promote accuracy.

A hoisting apparatus has been patented by Mr. Pentecost J. Mitchell, of Dragoon Summit, Arizona Ter. The drum shaft is contrived to be lifted with its bearing at one end for disengaging the gear from the driving gear on the main vertical shaft to which the power is applied, and there is a friction brake device to control the lowering load when the gears are disconnected, the whole making an easily worked and safe machine.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

THE TABOR STEAM ENGINE INDICATOR. By George H. Barrus, S.B. Ashcroft Manufacturing Company, Publisher.

This little book, arranged in pocket form, not only describes in detail the construction and manner of working the Tabor indicator, but, in well chosen terms, treats of the indicator in general. This useful device, revealing every idiosyncrasy of the steam engine and infallibly pointing to the proper remedy, should be used with judgment and skill, and each one of its peculiarities should be perfectly understood by the operator. The indicator diagram tells a complete and unvarnished story to those who are able to interpret it. The author has dealt with these questions from an eminently practical standpoint, and has succeeded in compiling one of the most accurate, concise, and plain expositions of the indicator we have seen.

A "Directory of the Iron and Steel Manufacturers of Great Britain" is published by our contemporary, the *Iron Trade Exchange*, London, being a careful compilation by its editor, Mr. Herbert W. Griffiths. The names and addresses of the manufacturers are given, the brands by which their goods are known, and the various kinds of products, in the iron, steel, tin plate, galvanized iron, and tube trades.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) N. P. asks: What is the difference between crucible steel and cast steel, also what is the difference between common spring steel and spring cast steel, and how can the difference be told? Also about books treating on the general nature of steel and on spring making? A. Cast steel, such as is used for tools and similar purposes, is made from a particular grade of iron which is rolled into bars of one half inch by three inches, or thereabouts, and these are packed in an oven with charcoal dust and lime and kept at a red heat for seven or nine days. When they come out the bars are covered with blisters—hence the name "blister steel." They are as brittle as glass when cold, and are broken up into lumps of half a pound to one and a half pounds, and melted in plumbago or in fire clay crucibles—hence the name "crucible" steel—and poured into moulds of cast iron in convenient shapes for the afterward rolling or tilting (hammering). Other steel is also cast, as Bessemer, which is made from a certain mixture of irons in a cupola or "converter," and a blast of wind is sent through the melted iron, burning out the excess of carbon. When "converted," this steel is also cast in iron moulds, and so, in one sense, it is "cast" steel. But it differs materially from crucible cast steel, and is unfit for edge tools. Steel is also made from iron on the open hearth, and partakes largely of the qualities of Bessemer steel. To make a flat spring that will not set, crucible cast steel must be used and the spring must be heated and hardened and then drawn to a spring temper. Bessemer or open hearth steel will not harden or temper. Some of the most valuable practical papers on the nature and working of tseel will be found in the back volumes of the SCIENTIFIC AMERICAN SUPPLEMENT. The working of steel at the forge or the tempering bath can be learned only from the practical master—not from books.

(2) J. B. C. writes: If a man has a certain continuous work to perform which requires the power of ten horses, he naturally decides to get a ten horse

power steam engine. That is, he will procure an engine which with 70 lb. of steam will do the work, and with it a boiler which will furnish continuously that amount of steam. His power will then be just equal to his necessity. Is this the most economical thing to do? If he will get an engine of fifteen horse power, with proportional boiler, the work could be done with less steam and without strain. But the larger machinery would not only cost more as a plant, but the fuel and running expenses would be heavier, of course. What is the proper allowance for economy? In other words, what per cent increase of power beyond actual need would be wise and economical, and above which would be wasteful. It is probable that this subject has often been argued, and perhaps settled, but steam uses are becoming more numerous every day, and such questions are, I take it, generally interesting. A. There are no general rules or standards to apply to this problem—each case is surrounded by its own conditions, in respect to both engine and boiler, and in the application of the power.

(3) J. A. B. asks: 1. How to make steel castings smooth? A. You cannot make steel castings as smooth as gray iron castings, because, with the same care in moulding and dressing or facing the mould, the steel has to be poured hotter than the iron, and burns into the sand. 2. And what is the alloy silicide of manganese, and what percentage of it do they use? A. Certain of the peculiarities of metallic manganese have been attributed to the presence of a small quantity of silicide. Its condition of combination in the metal has been called silicide of manganese. Also, it is likely that the same term is applied to a similar condition existing in steel produced by the Bessemer and other improved processes. 3. How can I analyze for carbon in steel the quickest and simplest way? A. The estimation of carbon in steel is an extremely delicate process, and requires considerable manipulatory skill. Eggertz's method, which is a colorimetric determination, is based on the fact that when steel containing carbon in chemical combination is dissolved in nitric acid, a soluble brown coloring matter is formed, varying in intensity according to the amount of carbon present. The solution is composed with known standards, and so the percentage determined.

(4) H. L. B. asks: What kind of wood is the most suitable for building the top of a violin? A. The tops of violins are made of the larch. Spruce may also be used.

(5) C. H. R. asks: How are steel tools tempered for turning and finishing chilled castings? Is there a mixture of chemicals used, and if so, what is it? A. Tools for chilled rolls require to have square cutting edge, should be of the best steel, and hardened in sulphuric acid at the very lowest heat that it will harden at. Do not draw the temper—cut very slow.

(6) A. G. L. asks: Is a 5 in. steam pipe large enough for a 20 in. bore by 36 in. stroke engine, running 100 revolutions per minute? The main fly wheel 16 ft. diameter, made in 6 sections, bolted to 6 straight arms. Rim 4 in. wide by 8 in. deep. Will it be safe to run it 100 revolutions per minute? A. Your pipe should not be less than 5½ in. You do not give the size of the arms, nor how they are connected, hence we cannot make the necessary calculations; but assuming the wheel much like ordinary fly wheels, we doubt the safety of running it at so high a velocity.

(7) J. W. P. asks why a twist or coil is made in the small steam pipe attached to steam gauges? Have been able to get only contradictory statements from engineers and others who ought to know. A. To provide a receptacle for the condensed water, so that there shall be a stratum of water between the steam and spring of the gauge, so the latter may not be affected by the heat of the steam.

(8) G. H. M. asks whether it injures the speaking qualities of a telephone (bells being rung by battery) to allow the batteries which are not used when speaking, to pass through the receiver, or should only the induced current from the induction coil be used? A. The current from the induction coil is sufficient. If the battery current pass in the proper direction to augment the power of the magnet, the current will do no harm.

(9) G. T. W. asks: 1. Would there be any perceptible difference in the velocity of the wind blowing from the west at 75 miles an hour and that blowing from the east at the same rate, or does the atmosphere move around with the earth? A. You probably mean to inquire whether the force required to produce a velocity of 75 miles an hour would be the same in both instances. We think it would, as the atmosphere may be considered as the earth, revolving with it. 2. Can you tell me the address of some lumberman publishing house, "in the East," where I can purchase a lumberman's hand book of inspection and grading? A. Write booksellers who advertise in our columns.

(10) H. C. writes: 1. If a small balloon or kite were attached by a non-conductor to a wire, as in Franklin's experiment, would it be possible to conduct enough electricity from the clouds to be of any service in lighting or to be used as a motive power? A. We know of no commercial use for lightning. It is not available as a motive power. 2. Is coal oil a conductor of electricity, or can it be charged as water? A. It is not a conductor, and cannot be charged like water. 3. How long will brass hold electricity if it is insulated with glass and exposed to the air? A. It depends on the state of the atmosphere; but not long in any case. 4. How much heat would be generated in the discharge of the electricity produced by a thermopile of one cubic inch, from a source of heat about the intensity of an ordinary lamp burning for one hour? A. It depends entirely on the efficiency of the battery. The heat developed in any case would be only a fraction of that applied to the battery. 5. Which would produce the most heat—instantaneous discharge or a slow one? A. There would probably be no difference.

(11) H. M. D. writes: 1. I am putting up a telephone line (with ground connection), and I would like to know how to arrange the instrument with an ordinary electric bell, the telephone being used as transmitter and receiver? A. Connect your line at each end to the key bar of a back contact key. Connect the back contact of each key with a bell, and ground the bells. Then at each end of the line connect a battery with the bottom contact of each key and with the ground wire. The line is normally closed on the top of each key. Pressing down either key will ring the bell at the opposite end of the line. The telephone may be placed anywhere in the line. 2. What sized copper wire (cotton covered) should I use? A. For your line use No. 16 copper wire or No. 12 iron wire. 3. Could a wire be wound around a pipe to make a ground connection instead of being soldered? A. You can ground on the pipe without soldering if the contact between the wire and the pipe is good. 4. Should I use a closed circuit on a line three hundred feet long? A. You can use either closed or open circuit. If you prefer a closed circuit, you may place two or three cells of gravity battery at eitherend of the line, and the keys and bells may be placed directly. The telephones in this case should be arranged so as to be switched on to the line for use, owing to their great resistance.

(12) J. H. I. writes: 1. How can I make bayrum from bay oil, or where can I purchase recipe for making same?

A. Bay oil. .. ..10 fl. drms.
Pimento oil..... 1 "
Acetic ether..... 2 fl. oz.
Alcohol... ..... 3 gal.
Water... ..... 2½ gal.

Mix, and after two weeks' repose, filter. 2. What can I put into brick clay to make it burn hard? The purpose I want it for requires that it should be very hard. A. There are patented kilns in use which are extremely desirable for the purposes you are anxious to accomplish. The addition of any ingredient cannot very well be suggested, unless the precise composition of your clay be given as well as your process of manufacture. We would recommend to you the article on bricks in Ure's Dictionary of Arts, Manufactures, and Mines.

(13) W. B. asks how to clean and galvanize wire, and where he can get the tanks, etc.? A. The wrought iron tanks for galvanizing can he made by any boiler maker. The bundles of wire are loosened and boiled in water with caustic soda to remove all traces of grease, then dipped in a bath of one part hydrochloric acid to ten parts of water to clean. Then dip in a solution of muriate of zinc and sal ammonia, and dry; then put upon a reel and run through the melted zinc slowly to another reel far enough away to allow the zinc to become set before reaching the reel.

(14) E. C. S. asks why the bullets of the cartridges used in the Winchester repeating rifles are made flat on the end. Does this shape not cause great friction in the air? Would it not be better to have the balls pointed? A. The Winchester cartridges, as also other magazine gun cartridges, are made flat upon the head to prevent explosion in the magazine by the points striking the percussion primer. The primer is also recessed in the butt of the cartridge for safety.

(15) F. M. P.—For making soap with good lather take 30 pounds tallow, 10 pounds lard, 3 pounds resin. Boil them to a hard curd. After the lye has completely separated, the soap is carefully removed and placed in another vessel. Then seven pounds of cocoanut oil is put into a boiler and saponified with five pounds of potash lye of 30° B. When combination takes place, the curd is added and the whole continually stirred. Should the mass be too thick another five pounds of water is added, and the soap is boiled until it solidifies in a glass and is perfectly natural. The finished soap is filled into frames and perfumed. 2. The coloring of soaps is due to the addition of pigments; thus the red in Castile soap is produced by iron oxide, blue is obtained by adding ultramarine, gray results from the addition of manganese. For details of manufacture we must refer you to some of the technical encyclopædias, or to Dussauce, A General Treatise on the Manufacture of Soap.

(16) T. J. del C. asks: How can I make the so-called parchment paper? What strength of H_2SO_4 to use, and where I can obtain or how I can make the proper kind of acid for the purpose? A. Unsized paper immersed for a short time in a mixture of sulphuric acid and water (two parts of acid to one of water by bulk), and then washed with dilute ammonia, constitutes the so-called parchment paper. The acid can be purchased of any wholesale druggist.

(17) J. H. A. asks for a simple process for either making the ordinary lead very soft, or for securing a soft article of that kind from white lead, sugar of lead, or some other form of the metal, by chemical or some very simple treatment? A. The hardness of lead is due to impurities contained in it, such as antimony, copper, tin, arsenic, etc. These may be largely removed by the addition of alkaline nitrates, chlorates, and other bodies rich in oxygen, to the charge of molten lead; as they are removed, the lead becomes softer. If pure lead is obtained, it will be found quite soft. The addition of bismuth is also effective in producing the desired result. The other compounds mentioned are ordinary salts of lead, and their decomposition would only result in the production of the commercial metallic lead in its usual form.

(18) J. H. H. asks: 1. How can I clean and polish sea and fresh water shells? A. See answer to query No. 17, SCIENTIFIC AMERICAN, June 9, 1883. Dilute hydrochloric acid may also be used. 2. How to ebonize wood? A. Mix up a strong stain of copperas and logwood, to which add powdered nut galls. Stain your wood with the solution, dry, rub down well, oil, then use French polish made tolerably dark with indigo or finely powdered stone blue.

(19) H. W. asks: 1. Whether tartaric acid, when mixed with baking powder, is considered an adulteration? A. Tartaric acid need not be considered an objectionable ingredient of baking powder. 2. What constitutes baking powder? A. Powdered cream tartar, 30 parts; sodium bicarbonate, 15 parts; flour, 5 parts. All well dried, mix thoroughly, and keep dry.

(20) J. B. A. asks: 1. How can I prepare the double salt of cyanide of potassium and mercury used to flow the silver deposit on looking glasses? Dealers in chemicals do not keep it in stock. A. Cyanide of mercury combines with salts forming definite soluble crystalline compounds, which are obtained by evaporating the mixed solutions of the component salts. 2. I have mounted two 4-inch plano convex lenses in a brass cell, convex side together, and this makes the focus about 2½ inches. I wish to use them as a condenser for a magic lantern. Is there any danger of breaking on account of heat from the coal oil lamp, which must stand very near the condenser? The lenses are mounted loosely. A. There will be no danger of breaking the lens if you take the precaution to light up slowly, so as to give the glass time to heat evenly. You should use a glass chimney over the lamp. A naked light near the lens would not be safe, and does not make so intense a tight as an annular wick with a chimney.

(21) L. M. S. writes: 1. I wish to put up 4 flue boilers 28 ft. long, 42 in. diameter, with two 15-in. flues each. I have a chimney 42 in. square inside, 51 or 52 feet high. Will it be sufficient? If not, can it be made so by adding to it an iron stack, and if so, what diameter and what height? A. Your chimney is large enough, but would be better if height was increased 10 to 15 ft.; the chimney will probably bear carrying the masonry up that greater height. If an iron stack is added, it should be 46 in. diameter. 2. To set the boilers for Pittsburg coal, what grate bar surface is required—how long the bars and how wide? A. Bars 3½ ft. long and furnaces 15 ft. wide. 3. How many inches should there be between the grate bars and the boilers? A. Thirty inches. 4. How many from the brick pavement under the boilers to the boilers, just behind the furnace and at the rear end of the boilers? A. Depth of ashpit from under side of grates, 24 in. to 28 in.; at bridge wall 10 in., and at rear end 7 in. or 8 in. 5. Have you got a good book on caloric, one that is not too complicated? A. We think Barr on the "Combustion of Coal" would suit you.

(22) H. J. G. writes: 1. Please inform me of the best cement for cementing a piece of leather to an iron pulley, and how made? A. Ask your druggist for Le Page's liquid glue. 2. How many revolutions per miuute should a Brown & Sharp circular saw make —2½ in. diameter and ⅛ in. thickness—cutting annealed steel? A. Thirty revolutions per minute would be a rapid rate for cutting small pieces; but for long cuts a slower rate should be employed. 3. Is oil preferable to water when tempering steel? A. It depends upon objects to be tempered. 4. Give very best practical means for softening and hardening of steel. A. The question is indefinite, but steel (cast steel) can be best annealed by packing in a closed vessel (cast iron box) with air slaked lime, and exposing to a red heat in an oven or furnace for twenty-four hours, and then cool gradually. Much easier and sometimes as effective methods are those of heating and plunging in dry ashes or sand, or of heating to a generous red, and cooling in the air. 5. What colors are needed for the drawing of taps and dies, springs, cold chisels, reamers, screw drivers, drills, countersinks, and lathe tools for the cutting of steel? A. Taps and dies should be drawn to a straw color—a light yellow. Springs, either flat or coiled, should be drawn to a low blue, or else blazed off with oil. Cold chisels should be drawn to the first blue, unless they are "stunt" and are to be used simply for cutting off purposes, when they should be left a "pigeon breast." Reamers (rimmers) should have the straw color, and so with drills and countersinks and lathe tools. Screw drivers should be drawn to a low blue. Of course, the relative sizes of the tools should be taken into consideration, and the work they may be called upon to perform; a quarter inch drill will not stand the height of temper that is right for a one inch drill, nor can the drill for wrought iron and steel be left at so high a temper as that for cast iron or brass.

(23) M. A. E. asks: 1. Would wire known as double cotton wrapped paraffined and compressed be superior to the ordinary magnet wire used in making electro magnets? A. No, the insulation occupies too much space. Use ordinary silk or cotton covered magnet wire. The covering may be paraffined. 2. How many 1 quart cells of the Grenet battery would it require to give sufficient power to illustrate electric light with a small incandescent electric lamp of platinum, small size costing about $5.00? A. Cannot say without knowing the resistance of the lamp. Probably six cells would answer. 3. In the "Scientific American Reference Book" mention is made of a freezing mixture consisting of sal ammoniac, niter, and water; in what way is it used, and also is there any danger in using the compound? A. A vessel of water is immersed in the solution while it is being formed. There is no danger in its use. It is too expensive for common use.

(24) A. E. D. asks: How can I renew a Leclanche porous cup battery? The battery is used for ringing the electric bells in my residence. The porous cups have been in use some time, and do not seem to give off much electricity, even when newly charged with sal ammoniac. What material is placed in the porous cups, and can they be refilled by me without much trouble? A. Remove the carbon plate and the black oxide of manganese from the porous cup. Wash the porous cup, and then soak it for an hour or so in warm water. Soak the carbon plate in like manner. Then replace the carbon plate and refill the porous cell around the plate with granulated black oxide of manganese. A mixture of equal parts of black oxide of manganese and granulated carbon is also used for filling the porous cell.

(25) W. R. L. asks: 1. What is superheated steam? A. Steam received from a boiler and passed through a coil or series of pipes heated higher than the temperature of the boiler receives a higher temperature, and is called superheated. The coil or pipe may be placed in the smoke chamber or under the rear end of the boiler, or may be heated by a separate fire. 2. What kind of steel is best for making springs for gun locks, and how are they tempered? A. Use spring steel for the springs of gun locks. Harden in oil; polish and draw to blue color, or dip in oil and heat until the oil burns, then dip in water.

(26) W. S. C. asks: 1. What speed ought to be obtained with a steel hull boat 33 ft. long, 6 ft. 6 in. beam, with keel bottom, and good lines fore and aft? Engine double, 4½ in. bore, 4 in. stroke. Wheel 30 in. diameter, 36 in pitch; hull, engine, boiler, wheel, and everything weighing about 7,800 lb. A. About 11 miles per hour. 2. Also what size steam ports had above engines ought to have? A. Steam ports, ⅜ x 3½ in.; exhausts, ¾ x 3½ in.

(27) L. A. Y. asks if coal tar or asphaltum can be prepared so as to make a good coating for paper roofing; if so, how prepared? Is there any other preparation better that I can make? If so, how? A. Coal tar is in common use for saturating the paper felt used for roofs. After the paper felt is laid it can be painted with a preparation of coal tar thickened with asphaltum, and then covered with gravel or sand, which makes a very durable roof. If you have no coal tar and can obtain naphtha and asphaltum, you can melt the asphaltum and stir in a little naphtha to thin it, and use it for saturating the paper felt, and use the asphaltum hot for the thick coat to take the gravel. The melting should be done away from the house, and guarded against taking fire.

(28) T. C. asks: What is the efficiency of those steam pumps that have a common piston rod and the steam and water cylinders in line, also how an injector ranks as a means of storing water in an accumulator at a pressure of say 100 lb.? A. We know of no direct tests of the efficiency of steam pumps, but we suppose about 80 to 85 per cent; but as a user of steam the ordinary steam pump is not economical, but we think it much better and more reliable for your purpose than an injector.

(29) B. L. & Co. ask for the right proportions of gas and air for a gas engine, and at what point of the stroke is the proper place to explode it? A. The mixture may vary from one of gas to seven of air to one to ten or twelve. It depends much on the character of the engine. The explosion should take place at about one-third of the stroke.

(30) J. H. writes: We have a dispute here regarding power of a boiler, which is agreed to be left to your decision. 1. Boiler 8 ft. long, 3 ft diameter, 68 flues, outside 2 in. diameter, inside 1½ in.? A. Twenty horse power with good working draught. 2. Its safe working pressure? Sheet ¼ in. common; sheet single riveted, 2 in. centers, ⅝ in. diameter? A. By Government inspector's rule, 104 lb. per sq. in., if good iron and in good order.

(31) G. S. S. writes: What can I use to remove oil paint from house bricks without destroying or damaging the same? A. Use a mixture of three pounds common washing soda with a few ounces of potash dissolved in a gallon of boiling water. If laid on with a common paint brush, it will in a short time so soften the paint that it can be readily removed with a stiff scrubbing brush.

(32) M. L. D. asks: 1. Is there anything that will precipitate rubber in naphtha? A. We do not know of any means by which rubber can be precipitated from naphtha. The following may perhaps be equally as satisfactory: Filter the liquid beneath a bell glass, so as to prevent evaporation; the filter retains the foreign matters of a reddish-brown color, while the solution passes perfectly clear, and almost colorless. The filtered liquid, exposed to the air in a saucer, allows the solvent to escape and deposits the white gutta-percha in a plate of greater or less thickness, which shrinks gradually in proportion to the evaporation of the liquid. The above is given in connection with the use of carbon bisulphide or chloroform as a solvent, and is equally applicable to naphtha, except that the latter is not so volatile, so that a gentle application of heat could be used. 2. Also how to make watered varnish, composed of water and shellac? A. An emulsion is produced by cutting the shellac with ammonia and then adding water. The ammonia volatilizes, leaving the shellac on the article referred to.

(33) J. A. S. asks: 1. Is there any method by which freckles can be removed from the face? Have tried oleate of copper, as you prescribed in your paper, but found it useless. A. Dissolve 3 grains of borax in 5 drachms each rose water and orange flower water; a very simple and harmless remedy is equal parts of pure glycerine and rose water, applied every night and allowed to dry. 2. How can I remove flesh worms as are found in the faces of most young people? A. See "Comedones," page 52, SCIENTIFIC AMERICAN, Jan. 28, 1882. 3. Will you also have the kindness to give me a recipe for artificial port wine? A. Wine made from whortleberries as follows is said to be a good "factitious port wine:"

Ripe fruit .....4 lb.
Clear soft water .. ..1 gal.
Sugar.. .....3 lb.
Cream of tartar dissolved in boiling water. 1½ oz.
Brandy..... ... .2 to 3 per cent.
Flavoring as required.

The addition of an equal quantity of fruit and sugar increases the strength. The flavoring had best be purchased. 4. How is the fall of rain determined? A. The rain fall is determined by collecting the rain as it falls in a bottle or similar shaped vessel through a funnel of given diameter. See page 1606, SCIENTIFIC AMERICAN SUPPLEMENT, No. 101. For approximate purposes a tub or bucket with a thin edged mouth placed in a horizontal position to catch the rain, whose depth may afterward be measured by means of a graduated rod, may be employed, and if well constructed and used with care may fulfill most of the requirements of exactness.

(34) G. B. F. asks: 1. Is not the knocking at the crank pin of a steam engine a fault which should be remedied at the earliest notice? A. Yes. 2. Is there any practicable way or system to keep the air constantly moist in a factory? A. Yes, by permitting the escape of steam or vapor through small or fine openings in different parts of the room. You can use a hygrometer to indicate the moisture of the air in the room.

(35) T. M. De Z. asks: What kind of a cement can I make that will be steam and water tight and a non-conductor of electricity? A. Use rubber or vulcanized fiber.

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

C. N. S.—The specimen shows no evidence of mineral wealth, and is apparently a weathered portion of a sandstone rock. In order to determine the presence of metals, an assay will be required, the expense of which would be $5.00, and a quantity of the rock would be desirable.