

tioned have, in exceptional cases, run as rapidly as a mile in a minute, with moderate loads. Such speeds are, however, uncommon in this country, and though a few locomotives were used a while here with drivers seven feet in diameter, they were all changed, and the prevailing size is now from five and a half to six feet for passenger traffic. In England, however, where the average speeds are higher, locomotives have been made with drivers nine and ten feet in diameter, and many are still running which are seven feet and upward.

In order to attain a given power a large driver requires proportionately large cylinders, and consequently great weight. The general introduction of the link with its incidental steam cushioning, and the more general understanding of the principles involved in balancing the reciprocating parts, have made it possible to greatly increase the number of strokes per minute made by locomotive engines. This permits the use of smaller drivers, but at the same time makes it difficult to obtain a desirable area of port to prevent excessive back pressure. A port area one tenth that of the cylinders give excellent results for a piston speed of 600 feet per minute. It is difficult to make the ports larger than this, for the reason that the length can scarcely be more than the diameter of the cylinder, and an increase of width involves tremendous wear on the valve and links; so occasionally the above proportion of port has been used for piston speeds of 1,000 feet per minute, and the attendant disadvantages are believed by many engineers to be less than in the system based on very large drivers.

SCIENTIFIC INTELLIGENCE.

PREPARATION OF STRONTIUM.

Benno Franz prepares larger quantities of strontium by decomposing strontium amalgam at a low red heat in a current of dry hydrogen gas. It is best to perform the reduction in an iron Rose crucible with a perforated cover. To prepare the amalgam, heat sodium amalgam in a saturated solution of chloride of strontium to 194° Fah. (90° Cen.), and repeat the operation several times. Collect the product and dry between layers of blotting paper. The amalgam of strontium is more rapidly decomposed than the corresponding sodium or barium compound, and must therefore be carefully sealed up until ready for use.

Prepared in this way, strontium is a faintly yellow metal, similar to barium, and can be easily hammered to thin leaves. It oxidizes in the air very rapidly; if held in the hand it evolves heat to such a degree that it soon becomes necessary to drop the metal. It burns in the air with intense light and remarkable scintillations. It fuses at a gentle red heat, and is not volatile at a clear red heat. The specific gravity of the metal is 2.4.

RED DYE FOR LEATHER, IRON, WOOD, ETC.

M. Pushner recommends picric acid for this purpose. Dissolve 4 grammes picric acid in 250 grammes boiling water, and add, after cooling, 8 grammes aqua ammonia. For the second bath, dissolve 2 grammes of crystallized fuchsine in 45 grammes alcohol, and dilute with 375 grammes hot water, and finally add 50 grammes of ammonia. As soon as the red color of the fuchsine has disappeared, mix the two baths and immerse the articles to be dyed. For ivory and bone the bath ought to be made slightly acid with nitric or hydrochloric acid. On adding gelatin to the bath it can be used as a red ink.

RECOVERY OF OXALIC ACID FROM MADDER.

Madder contains considerable oxalic acid in combination with lime, which is set free by the hydrochloric and sulphuric acids employed in the extraction of the coloring matter. By conducting the acid after the removal of the dye into water saturated with milk of lime, we shall obtain a voluminous precipitate of the oxalate of lime. This can be again decomposed, by an equivalent proportion of sulphuric acid, and after filtering off the sulphate of lime, the oxalic acid can be recovered by evaporating in leaden pans and afterwards purifying by successive crystallizations.

IF THE EARTH WERE TO STAND STILL.

If the revolution of the earth on its axis were to be suddenly stopped, the temperature of everything would be raised to such a degree as to be incapable of existing in any other form than vapor. When a bullet strikes the target it becomes so hot that it cannot be held in the hand. Its velocity is at the rate of 1,200 feet a second, but what must be the heat produced when a body like the earth, moving at the rate of 90,000,000 feet a second is suddenly arrested! It would soon be converted into a sea of fire and all life would become extinct.

It is not probable that this catastrophe will take place in our generation, but as the light of the sun is said to be due to the combustion of worlds in its atmosphere, our time may sometime come to add fuel to the flames.

PURIFICATION OF GLYCERIN.

To purify glycerin which has been for sometime in use, add 10 pounds of iron filings to every 100 pounds of the impure liquid; occasionally shake it and stir up the iron. In the course of a few weeks a black gelatinous mass will collect on the bottom of the vessel, and the supernatant liquid will become perfectly clear, and can be evaporated to remove any excess of water that may have been added to it.

The employment of glycerin to improve the taste of wine is now very extensive. It is preferred to sugar for the reason it cannot be fermented. Hence the necessity of having a perfectly pure article.

OZONE.

This mysterious element appears capable of many uses, and a way to make it in large quantities and at reasonable rates, would be welcomed by a large class of manufacturers.

At a recent meeting of the Lyceum of Natural History in New York, Mr. Loew exhibited a method by which it was claimed that ozone could be obtained in any quantity. He assumed that during a certain stage of the combustion of gas, ozone was generated which was afterwards destroyed in the upper part of the flame. By tapping the cone of light at the right point, we can draw off the ozone. This was accomplished by blowing through the flame of a Bunsen burner and collecting the product in a long glass jar. In this way sufficient gas was collected in the jar to show by its odor and by the usual tests that ozone was present. This method of obtaining ozone is entirely new, and if it should prove to be practicable, will be an important discovery.

It has recently been discovered that if picric acid be projected into a jar of ozone, an instantaneous explosion takes place. This is certainly a curious and unexpected reaction and may lead to new applications of ozone as an explosive agent for powders prepared for the purpose. The whole question of the existence and properties of ozone is still very obscure, and now that the author of the leading researches upon it, Professor Schoenbein, is dead, we must patiently wait for some new investigator to take up the subject.

PATENT OFFICE DECISIONS.

SEED PLANTER.

In the matter of the application of D. W. Hughes for the extension of letters patent granted to him for improvement in hand seed planters No. 20, 1869.—Applicant is the inventor of a cheap, simple, and useful device for planting seed by hand.

The novelty of this device is satisfactorily established, and the utility is evident. During the seven years that applicant made use of his invention by manufacturing and selling the planters, he realized a net profit of some \$12,400. It appears that a large number of machines have been manufactured without his consent, the royalty upon which, at the rates which he established would amount to about \$22,000 more. If the seven years, during which time he received nothing from his patent, had been diligently employed, and proper precautions had been taken against infringers, the patentee would doubtless have been able to realize a profit of from between \$50,000 and \$100,000 from his invention. The years of the war were the harvest time of the manufacturers of agricultural implements. As starved farmers were metamorphosed into soldiers, wood and iron were transmitted into farmers.

The applicant now seeks an extension of his patent for seven years, in order to regain the seven lost years of his original term. It becomes important, therefore, to inquire how these seven years were spent. Since the patent was never sold, but has been, from first to last, in the hands of the patentee, the burden is on him to show that the benefit which he might have derived from the use of his patent during half of the life time of his patent was not lost through any fault or neglect of his.

Applicant was a machinist. He resided in Palmyra, Missouri, and carried on the manufacturing of these implements. In 1866, he sold of these planters 100; in 1857, 500; in 1853, 1,500; in 1852, 2,000. Here was a rapid increase of sales, and every indication of a growing and prosperous business. In 1859, however, applicant concluded to abandon this business, and to go into mining in New Mexico. This he did, leasing his patent to a firm in Palmyra for one year.

Upon the breaking out of the war, he returned to the States, to make some purchases for his mines. He appears to have made no inquiry after his lease or his business; but shortly afterward, under pretense of a desire to communicate with New Mexico via Texas, he voluntarily left, by way of St. Louis, Louisville, and Nashville, to Memphis, Tenn., which city was at that time in the hands of the enemy. At that place he went to work in a gun factory, but presently departed for Jackson, Miss., where he was engaged "most" of his time "in making, altering, and repairing patterns of different kinds, such as cotton presses, machinery, ordnance pieces, cannon castings," etc., understanding that he was, by virtue of his employment, exempt from conscription.

About six months before the taking of Jackson by the United States forces, applicant went to Montgomery, Ala. His principal reason for leaving was, that he "expected Jackson would be taken, and there would be some fighting." He adds, "I feared getting hurt." In Montgomery, he engaged in manufacturing machinery on his own account, and by his machinery making castor and peanut oil. Subsequently he manufactured artificial limbs. After the war, there being no more danger of getting hurt, he returned to Jackson, where he remained until 1867, when he came North, and in 1868 and 1869 again made and sold his planter.

Once, and once only, during the war, he attempted to leave the South. He walked up the railroad, how far he does not say, when the line he crossed, not within the enemy's lines, exchange their currency for United States notes, he "turned back, and concluded to remain, until the war was over."

It is only necessary to state, in order to complete this story, that applicant's father and brother, finding this abandoned invention lying idle, took it up on their own responsibility, and manufactured about one thousand machines per annum and made money at it, while the owner of the patent was turning gun barrels, and repairing patterns for ordnance stores and cannon castings, and manufacturing artificial limbs for his country's enemies.

He now asks that that country may be taxed for seven years more, to enable him to recover the profit which he has lost, and that he is endeavoring, to the extent of his ability, to destroy the Government whose favor he invokes. The novelty of the demand to be paid, in this form, for his services to the enemy, is only equalled by its effrontery.

The extension is refused. SAMUEL S. FISHER, Commissioner.

PAVEMENT.

In the matter of the application of Louis S. Robbins for letters patent for improvement in street pavements.—This invention is alleged to consist in a new form of block for wood pavements.

Before the invention of applicant various forms of block had been used, the purpose of which was to provide a channel between the blocks at the top, and extending about half way down, which should be filled with concrete, and, by interrupting the surface of the pavement, form a foothold for the feet of horses.

One of these forms was made by cutting a piece from the upper half of the block on opposite sides, so as to form a shoulder, and so that, when two blocks were laid together, the shoulder of one would be united to form a solid foundation, while a channel would be formed between the upper halves of double the width of the shoulder upon each of them. This was illustrated in Stead's English patent, and Perkin's rejectable application.

Another form was that shown in the patent of Nicolson. Long blocks and short blocks were laid in alternate rows, so that the space was solid, and while a channel was formed between the upper portions of the long blocks.

Applicant forms a shoulder upon one side of the block only. His block is one half of Stead's block, or Stead's block represents two of his placed back to back. He places the blocks in rows, so that he obtains the usual solid base and channel on one top.

In these forms of block, the blocks are laid upon the solid shoulder; or, as in Nicolson's case, upon the top of the short block. The space between the blocks is, in Stead's case, in the center of the channel; in Nicolson's, on both sides of the channel; and in applicant's, on one side only.

There are slight differences in construction, but identity of principle. All of these blocks accomplish the same purpose in the same way, or substantially in the same way.

This is not the case of a difference of form involving a new mode of operation. It is a mere difference in the mode of constructing a channel, which, when made, is of the same form as those already well known. The duplication of a channel in the block would not have been an invention, and do not think the omission of one shoulder involves more thought, or a higher quality of thought, than the addition.

The decision of the Examiner-in-Chief is affirmed. SAMUEL S. FISHER, Commissioner.

UMBRELLA.

In the matter of the application of R. O. Lowry for letters patent for improvement in umbrellas.—The applicant states as follows: "The object of my invention is to produce an umbrella that will neither absorb water nor lose its colors. To accomplish this, I first make my umbrella water-repellent and fast-colored, or either, by means of the application thereto of soap, or of soap and gelatin, in combination with alum, or sulphates, or acetates alone, or with salt or other substances having a saline quality."

"The applicant claims that the soap becomes dried, or a compound is formed insoluble in water, which renders the umbrella water-repellent. He argues that the aluminous soap referred to in the reference is so vaguely described as to be incapable of identification, and insists that if it was a soap as stated, it must have been soluble in water, and must have attracted the water instead of repelling it; that the language, 'put through a solution of what is known as aluminous soap,' in the way described, his process, nor could such manipulation have produced the result at which he aims."

There would be great force in this position if applicant had described his process in his application as he does in his argument. I am inclined to think that the term "aluminous soap" in the reference, does not import a treatment of the fabric first with soap and then with alum, nor do I believe the result of the two modes of treatment would be the same.

But applicant, in the actual description of his process, is as wide of the mark as the English specification. The substance of his entire description is that he makes his umbrella water-repellent by means of the application thereto of soap, in combination with alum. Now, would any one infer from this language that he meant to treat his umbrella first with soap, and then with alum? I think not. If sufficient alum were added to curdle the compound, before application to the umbrella, it could not be applied at all. The only fair inference would seem to be, that so much alum only was to be combined with the soap as not to destroy the quality of the article as soap; in other words, to use "aluminous soap" like the Englishman.

In view of this description of the process, I think the reference was pertinent. The decision of the Board of Examiners-in-Chief is affirmed. SAMUEL S. FISHER, Commissioner.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON ASIATIC CHOLERA. By C. Macnamara, Surgeon to the Calcutta Ophthalmic Hospital. London: John Churchill & Sons, New Burlington street. Calcutta and Bombay: Thacker, Spink & Co.

This work is a large octavo, embodying conclusions drawn from fifteen years' experience and practice in the endemic area of cholera. The work commences with a definition and description of the disease, its various forms, and the modes by which it is transmitted. This is followed by an historical account of cholera, containing particulars of the most destructive epidemics on record, with their bearings on the etiology and mode of propagation of the disease. The geographical distribution of the disease is next given, with the countries hitherto exempt from it. The important subject of meteorological influences, as influencing or retarding the spread of the disease is next discussed, and forms a most interesting and valuable portion of the work. The characteristic features of Asiatic cholera, post mortem conditions of the bodies of those who have died at various stages of the disease, the etiology of cholera, and, finally, its symptoms and treatment are discussed at length. The latter discussion includes the consideration of preventive measures, based on the laws of communicability of cholera, quarantine, purification of water, and disinfection. This work is an important one, and will, doubtless, become an accepted authority upon the subject of cholera.

TOWNSEND'S FOLDING GLOBE. Patented February 16, 1869. Manufactured and sold by Dennis Townsend, Felchville, Windsor county, Vt.

This is a novel and ingenious invention and publication, designed to place a cheap and convenient substitute for the revolving globe. The surface is composed of ellipsoid segments, the edges of which are attached to each other by tapes, and the whole may be flattened together so that it may be placed within the covers of a book. When it is desired to use it by drawing upon small rings inserted at the poles the whole assumes the globular form, presenting to view seas, mountains, continents, and other geographical features of the globe.

NATURAL HISTORY OF THE HUMAN RACES, with their Primitive Form and Origin, Primeval Distribution, Distinguishing Peculiarities, Antiquity, Works of Art, Physical Structure, Mental Endowments, and Moral Bearing. Also, an Account of the Construction of the Globe, Changes of its Surface, Elevations of its Mountains, and Subsidence of Land; together with other interesting matter. Illustrated by Colored Plates of each Type. With numerous Engravings representing their varied forms. By John P. Jeffries. One volume, 8vo; pp. 380; cloth. Price, \$4.00. Published by S. R. Wells, 389 Broadway, New York city.

This book contains a great deal of rare and valuable information concerning the history of our race, and in respect to which the mass of mankind know but very little.

THE MEDICAL ADVISER. A Full and Plain Treatise on the Theory and Practice of Medicine, especially adapted to Family Use. By Rezin Thompson, M. D., Member of the National Medical Association, and author of "Thompson on Fever," etc. Chicago: Jones, Jenkins & Co.

We have received from the National Publishing Company specimen pages of this book. It promises to be a hand-book of useful sanitary information for domestic use. It is to be illustrated with engravings representing parts of the human anatomy, botanical specimens, parasites peculiar to certain diseases, etc., and gives plain and simple directions for the treatment and prevention of ordinary diseases.

PHOTOGRAPHIC MOSAICS FOR 1870. Philadelphia: Benerman & Wilson.

We advise every photographer to supply himself with a copy of this admirable little book. It is a complete record of the progress made in the art during the past year, and contains many valuable recipes and instructions.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WOOD-BENDING MACHINE.—James W. Martin, Philadelphia, Pa.—This invention relates to a new and useful improvement in machines for bending wood, designed more especially for bending handles of umbrellas, parasols, and canes, but applicable to many other purposes.

STEAM ENGINE.—J. E. Culver, Hudson City, N. J.—This invention relates to a new high pressure engine, which can be worked either by steam alone or by water and steam combined.

COMBINATION TOY.—Robert Went, Williamsburgh, N. Y.—This invention relates to a new and useful improvement in a combination toy, and consists in operating (on two wheels which revolve on an axle) a revolving swing and revolving horizontal tables, both swing and tables being designed for any figures representing children, birds, or animals.

MACHINE FOR FORGING AUGER BITS BY MEANS OF ROLLS.—James Swan Seymour, Conn.—This invention relates to a new and useful improvement in a machine for forging or forming the tips or cutting ends of auger bits.

PUMP.—Morgan P. Hall, Gayville, Ill.—This invention relates to a new and useful improvement in pumps for raising water and other liquids.

SELF LOCK FOR BASEMENT GATE.—James A. Clark, New York city.—This invention has for its object to furnish an improved lock for basement gates, which shall be so constructed and arranged that it can not be opened from the outside of the gate and will always lock itself when the gate is closed.

SPOKE-SMOOTHING MACHINE.—Horatio Keys, Terre Haute, Ind.—This invention consists of an improved arrangement of apparatus for slowly moving the spoke held in centers at the end lengthwise along, and turning it in contact with a polishing belt moving rapidly across it, the said apparatus being guided by a pattern to move the spoke to or from the belt according to the variations in the shape of the said spokes, so that the pressure against the belt will always be the same and the effect thereby rendered uniform. The invention also comprises a certain means for reversing the movements of the spoke carrying devices, for moving the spokes longitudinally back and forth; also, certain means for throwing the spokes away from contact with the belt at the end of each longitudinal movement, and for automatically stopping the longitudinal movements at the end of the same in each direction.

FLOUR SOLT.—A. J. Bibble, Franklin, N. Y.—This invention consists in the substitution of coarse oil cloth at the tail end for the silk commonly used thereat for separating the tailings from the bran, and in the addition hereto over the said wire cloth and on an enlarged portion of the reel, of

course silk cloth, such as commonly used in the place where the wire is placed in this case, so as to provide a space between it and the wire, and designed for the reception of the coarse bran or feed which will thus be separated from the hulls of buckwheat when grinding this grain, and be delivered into a receptacle over which the hulls are chuted and discharged to another receptacle, the object of which is to provide a bolt by which feed may be obtained separate from the hulls, which are injurious to animals, and which will, at the same time, be suitable for bolting the meal of other grain.

PACKING THE PLUNGERS OF STEAM PUMPING ENGINES.—John Clark, Harrisburgh, Pa.—This invention is intended to be an improvement upon the well-known Worthington & Baker steam pumping engine, and consists in the application of an adjustable packing, constructed so as to compensate for wear, to the central transverse partition of the barrel of such an engine, through which the plunger passes.

METALLIC ABUTMENT FOR BRIDGES.—A. Wheelock, Fert Wayne, Ind.—This invention relates to a new metallic abutment for bridges, constructed in a novel and improved manner.

NUT LOCK.—Maurice Langhorne, Washington, D. C.—This invention has for its object to prevent the turning back spontaneously of a nut after it has once been screwed on its bolt or axle as tightly as may be necessary in order to clamp the material through which the bolt or axle passes.

STEAM PUMPING ENGINE.—William H. Roberts, Mauch Chunk, Pa.—This invention has for its object to make the stroke of the piston of a steam pump uniform as to speed throughout.

KINDLING WOOD ELEVATOR.—James E. Kelsey, Brooklyn, N. Y.—This invention has for its object to furnish an improved elevator, designed especially for elevating kindling wood in the factory where it is prepared for market.

ADJUSTABLE PLOW BACK BAND HOOK.—John Seaman, New York city.—This invention has for its object to furnish an improved plow back band hook, which shall be so constructed that the length of the back band may be easily adjusted according to the size of the animal upon which it is to be used or to regulate the pitch of the plow, and which shall, at the same time, be so constructed that it will not become accidentally unhooked or catch upon the trace of the other horse.

RUBBER MOLDING.—William Miller, Boston, Mass.—This invention has for its object to furnish an improved rubber molding, which shall be so formed as to adapt it for use around windows, doors, etc., as weather-strips, to prevent the wet and cold from finding their way in around said doors and windows.

MEDICAL COMPOUND.—George V. Sheffield and John A. Sheffield, North-bright Center, Mass.—This invention has for its object to furnish an improved medical compound, simple in its composition and preparation, and effective as a blood purifier, and a sure remedy for many diseases, such as scrofula, salt rheum, dyspepsia, liver complaint, worms, jaundice, etc.

SHINGLE MACHINE.—Wm. H. H. Palmer, Rockville, R. I.—This invention relates to certain improvements in that class of shingle machines in which the blocks to be cut are held in a rotating frame, and exposed to the action of horizontal circular saws. The invention consists in various details of construction, whereby the blocks are brought into the proper alternate inclined positions, and caused to be firmly clamped while being sawed.

SKEIN WARPING MACHINE.—Samuel Campbell, Palmer, Mass., and Duncan McFarlane, Troy, N. Y.—This invention relates to a new machine which can be used to lay the yarn in skeins or in separate threads around the section-beam. The invention consists chiefly in the application of a traversing bugle or guide, which collects all the threads into a single skein, to apply the same to the section-beam. This bugle, however, and its appurtenances are removable, and when they are taken off, the machine may be used to apply the yarn in separate threads, as on the ordinary warping machine.

WHIFFLETREES AND TRACES.—J. V. Norton, Plainville, N. Y.—The object of this invention is to provide a convenient construction of harness, whereby to connect the ropes of hoisting apparatus, such as derricks, horse hay-forks, etc., with the draft animals.

HARVESTER.—J. B. McCormick, Dayton, Ohio.—This invention has for its object to improve the construction of the kind of reapers which are so constructed that the grain may be bound before being dropped from the machine, so as to make them simpler in construction, and more effective and satisfactory in operation than when constructed in the usual manner.

SAW SET.—H. A. Harris, Center, Texas.—This invention relates to a new implement which can be used for setting the teeth of all kinds of saws, by hand, and without requiring any intricate machinery.

SPRINGS FOR CARS, ETC.—C. M. Banks, Roxborough, Philadelphia, Pa.—This invention will soon be illustrated in the SCIENTIFIC AMERICAN.

FEED CUTTER AND THRASHER.—Norman McLeod, Clio, S. C.—This invention relates to new and important improvements in the machine for which a patent was granted to the same inventor, November 10, 1863, No. 83,984, which said machine is designed for use either for straw or feed cutting, or for thrashing grain, and comprises certain improved arrangements of a feeding trough, feeding rollers, and revolving cutters, working across the end of the feeding trough, and in a large case for controlling the cut straw and delivering it through a spout.

NEEDLES.—Robert J. Roberts, 416 Broadway, New York city.—This invention relates to improvements in sewing needles, and consists in providing the said needles, which are commonly made of steel, which is very liable to damage by corrosion, with coatings of non-corrosive metal, such as gold, silver, copper, or tin; the said metals being applied to the needles after they have been otherwise finished, by the common and well-known methods of gilding, plating, or tinning.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at \$1.00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

W. M.—The Hudson River railroad is 144 miles long. There is a flagman for each mile, charged with the duty of examining the track after the passage of every train. It is one of the safest roads in the country. The resistance in moving a ton weight upon a level railroad is one four-hundredth of that load, or, say, 5 pounds. This is realized at slow speeds, and if the construction of track and wheels were mechanically accurate, the above resistance would be constant at all speeds. But so defective is the average construction that, at high speeds, the resistance is found to be 30 pounds and over. The reason why the Erie railway trains are so irregular, is because of the wretched condition of the track. The trains lose from two to five hours on the schedule time in passing over the whole length of the road.

R. C. P. B., of Pa.—No exact ratio between the diameter of a circle and its circumference has ever been discovered. The ratio of 7 to 22, is, however, near enough for many purposes.

A. S., of Iowa.—Annealing depends, like hardening, on molecular changes not yet fully understood. The why of many things cannot yet be answered.

S. W., of Ind.—Bricks do not increase in weight by the process of burning.

H. W., of N. Y.—A good rule in setting boilers in regard to the distance of the bridge walls, is to have the extremities of each 3 inches from the boiler. Then let the bridge walls retreat from the boiler uniformly, so that their distances from the boiler measured halfway between the extremity and the middle of the wall, multiplied into the entire length of the curve, shall give an area of 36 square inches for each square foot of grate surface for the first bridge wall, 24 square inches for the second bridge wall, and 20 square inches for the third. This when three bridge walls are used. In all cases the last bridge wall should be at the same distance from the boiler, so that if one is omitted it is the one giving the greatest area; if two, the ones giving the two greatest areas.

E. B., of Mass.—The Portland cement concrete made in the same proportions as the concrete for building, will make a good cellar bottom. There will be no danger of fire from the registers of a hot-air furnace, unless they are closed so that no air passes through. In such cases they may sometimes communicate fire to the surrounding wood-work. The registers of a furnace should never be all closed at once when a fire is burning. An iron tube well sunk near the foundations of a heavy building, would, we think, if the water flow and demand were large, be apt to cause sinking of the foundations.

M. H. S., of N. Y.—The widths of belts to drive a given horse power depends on their velocity and the surface of contact of the belt with the smaller pulley. These data you do not give, therefore your question cannot be answered. We know no such wheel as a pitch-back water wheel. The power required to drive a saw depends upon many conditions not one of which you give. You might just as well ask "how large is a piece of chalk?" You ought to secure the services of a practical mill-wright if you wish to save money and time.

R. J. P. G., of N. H.—The nature of magnetism is not yet understood. Nobody knows why certain bodies are magnetic and others are not, or why bodies under certain circumstances become magnetic and again lose their magnetism. The most that is known is that magnetic phenomena uniformly occurs under certain circumstances. All beyond this remains yet a terra incognita.

J. S., of Pa.—The cement called "marine glue" will unite leather to gutta-percha and is impervious to damp. It is made by dissolving by the aid of heat, one part of india-rubber in naphtha, and when melted, adding two parts of shellac, and melting until mixed. Pour it while hot on metal plates to cool. When required for use melt and apply with a brush.

J. H. B., of Mass.—We recommend a wire of aluminum bronze as combining in the greatest degree the qualities of strength, ductility, and cheapness. We do not think it is made in this country, but if you understand wire-drawing, and have facilities, you can make it for yourself. The alloy is nine parts aluminum and ninety parts copper.

R. L. A., of N. C.—The old idea of caloric as a material substance pervading bodies and enveloping their atoms, has been long abandoned by scientific men. You will find more modern and philosophical views in the writings of Tynhall, Grove, Helmholtz, and many others upon heat. We respectfully decline your communication.

E. C. C., of N. Y.—Any well-tempered spring not overtaxed will retain its strength an indefinite length of time. No spring should have a load sufficient to permanently "set" it. Flat coiled springs are the most convenient for driving wheel work.

H. R. A., of Conn.—The spring and the weight are the only mechanical depositories of power which retain their power for indefinite periods, and when released expend it, if we except such as require chemical action to release their imprisoned energy.

C. D. S., of N. Y.—Tin and lead in equal parts makes a good soft solder. Easier of fusion is a solder made of equal parts of tin, lead, and bismuth. For soft soldering brass tinfoil may be used and makes a good joint. Care should be taken not to employ too great heat.

C. B., of N. Y.—An excellent cement to mend cut leather is as follows: 1 pound gutta-percha; 4 ounces india-rubber; 2 ounces pitch; 1 ounce shellac; 2 ounces of oil. Melt the ingredients together and use hot.

C. C., of N. Y.—The periods of artificial incubation of different kinds of eggs are the same as when incubation is performed by the parent bird.

B., of N. Y.—Ornamental iron bars with spiral or undulating lines, are made by rolling between a pair of rollers, the axis of one roller being set at an angle to the axis of the other.

S. C. S., of Mass.—We know of no process by which you can make the rusty heads of screws bright again without injury to other parts of the screws, except by repolishing.

W. S., of Iowa.—Your letter and diagram of circles observed about the moon are interesting, but possess hardly enough novelty to warrant publication.

E. C. A. of N. Y.—Black pins are made black by japanning. The japan is made by mixing drop ivory black with anime varnish. The pins are dipped in this and the coat is baked on in an oven.

G. C. H., of Mass.—We know of no cement which will unite leather while damp and hold it strongly.

B. H. H., of Ind.—Boilers do not always explode at the top. Neither, in our opinion, do they burst from the generation of gas other than steam, which is a gas to all intents and purposes. Boilers may doubtless be sometimes strained almost to bursting by unequal expansion, but in the majority of cases steam does the work of destruction on boilers weakened by neglect or inherently weak from faulty construction.

W. D. Beecher, of Mass.—You should introduce your blower about half way between the bottom of the ash pit and the grate of your boiler furnace. If the blast is properly introduced into the chimney, provided the volume of air is sufficient, it will add about one half to the draft, but it will be much more efficient applied under the grate.

M. M., of Va.—Mink and other skins are dressed in this country before being made up. We presume this is done more or less by all large fur dealers, but we are not acquainted with any furrier that makes it a specialty.

R. A., of N. C.—A steam engine may be made to assist a water wheel when water is low by belting on to a pulley on the first line of shafting, but the water wheel would hardly take the place of a fly-wheel.

J. S. D., of N. H.—We cannot adopt your suggestion to star each new advertisement. All advertisements must be treated alike, and we wish our readers to read the advertising columns each week from beginning to end.

H. M. & Co., of Ohio.—We do not think that arching over your boiler with brick so as to lead the flame and heated products of combustion over its entire surface, adds directly to the danger of explosion, but by concealing leaks and hiding from view the condition of the boiler, it does so indirectly. Besides, as a measure of economy, it is not good practice to so set a boiler. It is well to cover the top of a boiler with some non-radiating substance, easily removed when necessary, of which felt is undoubtedly the best though more expensive than some other substances that will answer quite well. Sand or coal ashes are used often, and there are some patented compositions in market which are quite cheap, and which are more or less effective.

Business and Personal.

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To Rent—East River water front, stores and vacant lots suitable for manufacturing or mercantile purposes, together or separate Daniel W. Richards & Co., 92 Mangin st.

Machinists and all others who use nice tools, should send for Goodnow and Wightman's Illustrated Catalogue advertised on last page.

Adam Brown's Patent (No. 98,023), animal trap. Purchasers wanted for every State and Territory not yet sold. For particulars, address Adam Brown, Bridgeport, Polk county, Oregon.

A half interest in the new and very valuable patent, Shackleton's System of Utilizing Exhaust Steam, for sale on reasonable terms. We give a few testimonials where it has been in use for some months. Moore & Sealy Brothers; Yates, Wharton & Co.; P. W. Vail & Co.; M. Gould & Son, Newark, N. J. Perth Amboy Fibre Co., 40 Broadway, N. Y. Tweedy & Co., and Randle & White, Danbury, Conn. Crane, Tubbs & Co.; A. T. Lum, and J. Y. Brokaw, Elizabeth, N. J., etc., etc. The above save from 35 to 50 per cent. For particulars apply to A. Carr, 45 Cortlandt st., N. Y., or address P. O. Box 19, Elizabeth, N. J.

Portable Pumping or Hoisting Machinery to Hire for Coffers, Dams, Wells, Sewers, etc. Wm. D. Andrews & Bro., 414 Water st., N. Y.

Best Decarbonized Cast Steel for armory uses, shafting, spindles, stay bolts, axles, set screws, keys, agricultural works, etc., 10 to 11c.; or in sheets, tough as copper, 9 to 12c.; ordinary gages. Offices: 42 Cliff st., N. Y.; 14 N. 5th st., Phila. Philip S. Justice.

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Benj. W. Thompson, of Williamsport, Pa., desires the address of Prof. L. I. Marcy, inventor of Sciopticon.

Wanted to manufacture light but useful articles of sheet or cast metal by contract or on royalty. A. F. Champlin, Toy Manufacturer, Westerly, R. I.

Wanted—A Thorough, Practical Machinist, one who has worked in an Oil Mill and who understands the machinery connected with the same. None other need apply. Address J. J. Powers, glass box 233 Vicksburg, Miss.

Crutch.—Chas. Wheeler, Mt. Gilead, Ohio, wishes to obtain the most approved crutch.

Two 60-Horse Locomotive Boilers, used 5 mos., \$1,300 each. The machinery of two 500-ton iron propellers, in good order, for sale by Wm. D. Andrews & Bro., 414 Water st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Anti-friction Horse-powers, for from one to eight horses. This power, as now made, is the easiest of draft for the amount of work done and we recommend it to all who want a strong machine. Prices reduced. Send for a circular to R. H. Allen & Co., Postoffice Box 376, New York.

American Boiler Powder—A safe, sure, and cheap remedy for scale. Send for circular to Am. B. P. Co., P. O., Box 315, Pittsburgh, Pa.

Steam Crane Cars, or Derrick Cars, wanted by Baltimore Bridge Co., 49 Lexington st., Baltimore, Md.

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See advertisement of Thomas' Lathes in another column.

For Hub-mortising Machines, address Exeter Machine Works, Exeter, N. H.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

G. W. Lord's Boiler Powder, 107 W. Girard ave. Phila, Pa., for the removal of scale in steam boilers is reliable. We sell on condition.

For best quality Gray Iron Small Castings, plain and fancy Apply to the Whitneyville Foundry, near New Haven, Conn.

Keuffel & Esser, 71 Nassau st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

Foot Lathes—E. P. Ryder's improved—220 Center st., N. Y.

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Mill-stone dressing diamond machine, simple, effective, durable. Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Glyn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. G. D. Fredricks, 587 Broadway, New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tanners, and workers of sheet metals read advertisement of the Parker Power Presses.

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[Compiled from the "Journal of the Commissioners of Patents."]

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182.—NEEDLES AND NEEDLE ARMS FOR SEWING MACHINES.—Mary P. Carpenter, San Francisco, Cal. January 20, 1870.

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