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POWER REQUIRED TO DRIVE MACHINERY.

"How many pounds of steam does it take to turn your engine over without the machinery at work?" said one engineer to another recently.

"Well I don't know," he replied; "about ten, I suppose."

"I will wager," said the other, "you cannot pass the center with less than thirty."

He looked incredulous.

"To-morrow morning I will try it," and he did so.

He opened the throttle when the gages showed fifteen pounds and the crank was on the dead half center, but the wheels never stirred. He waited a little until the cylinder got hot; he blew the condensed water out and tried it again at twenty, but the crank never moved. At twenty-five pounds it made half a stroke but stopped on the center, and at thirty it barely turned over.

"I wouldn't have believed it," he said to himself.

This was a high pressure engine, 11 1-2-inch cylinder and 32 inch stroke, working at a boiler pressure of fifty-five and sixty pounds to the square inch. Nearly two-thirds of the pressure was absorbed in the friction of the belts, shafting, and machinery. This is not an isolated case. It is quite common, and few engineers are aware of the great loss daily incurred by simple neglect.

It is not difficult to account for it when we reflect that in many shops it is accounted of no importance if shafting is out of line, or belts laced up so tight that bearings heat; that it is of no moment whether the separate machines are in good order or not, and that one kind of oil is thought as good as another. To us it seems strange that men should be willing to pay tithes to carelessness—to waste means on nothing when money is so hard to get. It is certainly a small thing to line up shafting and to look after the other details. In the matter of oil, it is a well settled fact that the purest is the best, and that the use of cheap lubricants (so called) is a mistake. Shafting that is in line will work without any binders on the bearings, for the belts serve the same purpose, and no cap is needed except a slight cover to keep dust out.

By actual test with a dynamometer Bourne gives the following work done by an engine of 23 1-2 horse-power: Two pair of stones, 4 feet 8 inches diameter, grinding wheat; two of the same size grinding oatmeal; one dressing machine; one fanner; one dust screen, and one sifter. One set runs 85 revolutions

per minute, the other 90. The oatmeal stones run 120 and 140 revolutions per minute.

He also instances a cotton mill of 2,562 spindles, each making 2,200 revolutions per minute. The bobbins were 1 1/2 long, the thread portion being 2 3/8 long; there were also five turning lathes, three polishing lathes, two bobbin machines, two saws, one 22 inch, the other 14, and 24 bobbin heads. When all the machines were off except the spindles, the actual power required was that of 21 horses, so that each horse-power drives nearly 123 spindles. A small engine of 10-inch bore and 4-foot stroke, making 35 revolutions, with steam at 90 pounds, drove two muley saws of 34-inch stroke, cutting 30 feet of yellow pine per minute, 18 inches thick.

The friction of a steam engine in good order is variously estimated at from five to eight pounds to the square inch. Of course the proper way to find out the actual figures is to take a diagram with the engine and shafting in motion, and another with the engine alone—the difference of the two showing the effective pressure. Very few persons are willing to take the trouble to do this, but go on grumbling at the high price of coal and of the waste of fuel, when they alone are to blame.

If we are to have any radical change in the waste of power in manufacture, we must begin at the details. We have spoken of this so much that we fear our readers are almost as tired of it as we are, but when we reflect upon the immense losses through simple and sheer neglect, we cannot keep silent.

PETROLEUM AS FUEL FOR STEAM ENGINES TO BE TESTED.

Among the amendments to the Naval Appropriation bill which have been agreed to by both Houses of Congress, is one appropriating \$5,000 to test the value of petroleum as a fuel under marine boilers. It is to be hoped that this slice of the people's money will be entrusted to the hands of men who will expend it for the people's benefit—who will conduct their experiments in a fair and open manner, allowing all their steps to be made public as the experiments proceed.

There has been very general complaint among the engineers of the country, and manufacturers who are using steam power, that the costly experiments which are being made at the Novelty Iron Works, to test the economy of expansion, are withheld from the public. It is hinted that the conductors of these experiments, in forbidding the press access to the trial, intend to keep the public, who pay the expense of these costly private exhibitions, in blissful ignorance of the result until they can come out with a ponderous gilt-edged volume of reports, at another heavy expense, for their own glorification.

ZINC PLATES FOR PRESERVING BOILERS FROM CORROSION.

The statement seems incredible, that for forty-two years science has been in possession of cheap and simple means for completely protecting steam boilers from rust, and yet these means have never been made use of in the arts. The great Collins steamer *Baltic* is now lying in the East river, and on the wharf by her side is an enormous pile of iron rust, that formerly made up the tubes and tube sheets of her boilers. These boilers cost many thousands of dollars, and their condition is similar to that of hundreds of other boilers in this and other countries. Can it be that a few plates of zinc soldered to these boilers would have preserved them entirely from this decay? There is every reason, short of extensive practical trial, to suppose that they would.

In the year 1824, Sir Humphrey Davy announced his discovery that if a metal which is corroded in salt water is placed in contact with a second metal that is more easily corroded, the action is confined to the second metal, and the first is perfectly preserved. This principle is not limited to the action of salt water, but holds in regard to all corrosive fluids; the most easily corroded metal is called the positive, and the protected one the negative.

Sir Humphrey Davy proposed to protect the copper sheathing of ships from corrosion by attaching to it pieces of zinc, but the plan did not prove a practical success. It has been generally understood that the cause of the failure was the perfection with which the copper was preserved—it was said that the copper

was kept so bright that barnacles adhered to it, a slight coating of the poisonous oxide of copper being supposed necessary to drive these shell fish away. M. Becquerel says that this impression of Davy's was erroneous, that neither barnacles nor seaweed adhere to bright copper, but that the real cause of the failure of Davy's process was the erroneous theory adopted by its author. Davy supposed that the mere contact of the two metals was sufficient, while the fact is, the protection is due to the chemical action going on between the more easily corroded metal and the liquid. A coating of oxide or other salt soon forms on the surface of this metal, and stops the action, when the protection ceases. To continue the protection, therefore, it is necessary that this coating should be constantly, or frequently, removed.

There is a limit to the area of iron surface which a piece of zinc will protect, though it is very large. A few small pieces of zinc would probably protect the largest boiler; they should be soldered to the iron, and should be so situated that their surfaces could be frequently scoured or scraped.

A BRILLIANT SERIES OF EXPERIMENTS.

Arrangements have been made for a course of three lectures at the Academy of Music, in Brooklyn, by R. Ogden Doremus, M. D., Professor of Chemistry and Toxicology in the Bellevue Hospital Medical College, and Professor of Chemistry and Physics in the Free Academy, on "Views of Life through the Medium of Natural Science." It is stated that "efforts will be made to demonstrate the recent discoveries in science, especially in the departments of heat, light, electricity, magnetism, electro-magnetism, thermo-electricity, etc., on a scale commensurate with the size of the edifice in which they will be exhibited."

As Professor Doremus is distinguished for the magnificent scale on which he conducts his experiments, and as these are to surpass all his former efforts, the opportunity to witness them must be a rare treat. Among them will be exhibited the cascade of light, of which we spoke in a recent issue.

THE ENGLISH IRON CLADS.

One of the latest English iron-clads, the *Bellerophon*, is only half clad. That is, for a portion of 160 feet on each side, she is entirely without protection. The central armor is only 100 feet in length, but an iron-plated bulk head 5 1/2 inches thick incloses and protects the battery. All the forward part of the ship is vulnerable to shells, and may therefore be blown to splinters. Possibly the battery and the iron bulk head 5 1/2 inches thick, the engines and boiler possess sufficient buoyancy to keep the frigate afloat after one-half of her has been destroyed. It is said that broadside vessels cannot be completely protected and retain their speed; in other words, that fine models cannot carry the weight of armor necessary to render them invulnerable, but one of our ship builders has shown in the *Re D, Italia*, that a vessel of 285 feet in length, and 50 feet beam, 4 3/4 inches of armor all round, can cross the Atlantic fully equipped at the average speed of 11 knots, without in the least straining herself or even opening the seams in her armor.

NEW PUBLICATIONS.

AMERICAN JOURNAL OF MINING.—This is a neat well-printed journal, lately started, and devoted, as its title indicates to mining and kindred matters. It is illustrated and contains full reports of the condition and prospects of the mines in Colorado, California, and other territories. It is published by Western & Co., 37 Park Row, at \$4 a year.

THE MOTHER'S ASSISTANT AND THE HOME MONTHLY.—These are two different publications issued from the same house, and are calculated to elevate the taste and morals of families. Select tales of an unexceptional character, together with music of a devotional nature, are given in each number. Besides there are poetry and pictures, so that all tastes are likely to be suited. C. H. Pearson & Co., Boston Mass., and American News Co., New York.

STEEL MARKING STAMPS.—Our readers frequently inquire for the above tools, especially patentees who wish to stamp the date of patent upon their inventions, upon brass or iron. Makers of dies would do well to keep a short standing advertisement in the SCIENTIFIC AMERICAN.



ISSUED FROM THE U. S. PATENT OFFICE FOR THE WEEK ENDING APRIL 3, 1866. Reported Officially for the Scientific American

Pamphlets containing the Patent Laws and full particulars of the mode of applying for Letters Patent specifying size of model required and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

53,552.—Quartz Crusher.—S. F. Ambler, Tuolumne Co., Cal.: I claim the strip or flange, c, attached to the mortar box, A, of a float quartz battery, substantially as shown, for the purposes set forth.

53,553.—Weighing and Measuring Grain.—D. D. Armes, Decorah, Iowa: First, I claim the combination of the measuring boxes, C, D, slides, R, R', and scales, d, and arms, e, e, substantially as and for the purpose set forth.

53,554.—Safeguard for Watches.—Eugene F. Badgley, Brooklyn, N. Y.: First, I claim the attachment to a watch or pocket case of a clamp or ring, when constructed in the manner and for the purpose as described.

53,555.—Gage Cock.—Phineas Ball, Worcester Mass.: First, I claim the combination and arrangement within the chamber, V, of the filter, s, with the water way, l, and port, n, as and for the purpose stated.

53,556.—Carriage Spring, etc.—M. L. Ballard, Canton, Ohio: I claim the uniting and holding the ends or plates of a spring by means of an independent cap, and bolt or rivet, made and applied, substantially in the manner and for the purpose described.

53,557.—Street Sprinkler.—L. F. Bancroft, Worcester, Mass.: I claim making the upper part of the water reservoir, A, circular, and the bottom flat, in combination with the use of the clamping bands, L, and tightening nuts, f.

53,558.—Tool for Trimming Boot and Shoe Heels.—S. C. Bedell, Red Bank, N. J. Antedated March 30, 1866: I claim a tool for trimming boot or shoe heels, having the general construction and arrangement herein described, and cut or with or without an adjustable cutter screw, operated as specified.

53,559.—Plows.—Alonzo T. Boon, Galesburg, Ill.: First, I claim the spiral cam, C, in connection with the shaft, c, for operating either a mole or subsoil plow, substantially in the manner and for the purpose herein set forth.

53,560.—Car Coupling.—John W. Boughton, Appleton, Wis.: I claim the combination of the shouldered tumbler, obliquely set coupling pin and corresponding opening, operating substantially as described and represented.

53,561.—Social Game.—Milton Bradley, Springfield, Mass. Antedated March 30, 1866: I claim as an article of manufacture, the social game, substantially as herein set forth.

53,562.—Letter Boxes.—W. H. Bramble, Decatur, Ill. Antedated March 30, 1866: I claim the use of hinged or adjustable doors or lights for post office boxes, when said doors or lights are operated from the inside of the office or box for the purpose of facilitating the delivery of letters, as herein specified.

53,563.—Manufacture of Bronze Powder.—Leopold Brandeis, Brooklyn, N. Y.: I claim the production of grains, scrapings, filings, shavings or borings from copper, tin, etc., their alloys by proper tools, like a turning lathe or other tool, to flatten these particles of metal by means of rollers or stamens with polished steel or chilled surface, for the purpose of getting them bright and brilliant to manufacture therefrom bronze powder in any way used for the purpose of reducing these small flat fragments to still finer ones, always offering a bright surface, just the same as if the metal had passed previous through all the processes of repeated hammerings, annealings, rolling, beatings, etc., etc.

53,564.—Drill Cable Meters.—L. C. Bristol, Victor, N. Y.: I claim in combination with the drill cable or its equivalent, of well boring apparatus, a meter having a traction wheel or pulley, substantially as shown, for the purposes herein set forth.

53,565.—Plowshare.—P. H. Bronson, East Avon, N. Y.: I claim securing the detachable false point, P, to the shares of plows, by means of the screw bolt, S, and the dove-tail locking lips, a, b and c, substantially in the manner and for the purposes herein set forth.

53,566.—Step Ladder.—Charles W. Brown, Newark, N. J.: I claim the arched brace of wood in one piece, spanning the ladder frame, substantially as specified.

53,567.—Corn Sheller.—William R. Burns, Lancaster, Pa.: I claim the combination of the adjustable shelling bar, with its slots, l, l', and the concave, double-inclined bottom, P, P', with its opening, V, under the spiked cylinder, M, together with the

vibrating sieve, S, shaking attachment, L, in K and D, fan, B, and line, C, when these several parts are arranged and operated substantially in the manner described for the purpose specified.

53,568.—Carriage.—Clarke T. Bush, Rensselaerville, N. Y.: I claim the arrangement and combination of the side springs, e, e, yielding to the diagonal struts, h, h', slot or loop, i, hinges, p, p, substantially as and for the purposes set forth.

53,569.—Method of Extracting Gold and Silver from Ores.—Charles F. Carpenter, Louisville, Ky.: I claim the manner of using atmospheric air for the purpose of facilitating the extraction of gold and silver from ores, causing a separation between gold or silver and the ores of base metals, and consists in introducing the said atmospheric air between the flame of a reverberating furnace and the ores containing gold or silver which are spread upon the hearth of the furnace.

53,570.—Valve Gear for Oscillating Engines.—Henry T. Carter, Portland, Me.: I claim the rock valve stem, S, arm, a, in combination with a slotted link upon the trunnion box cap, in the manner and for the purpose herein set forth.

53,571.—Means for Attaching Legs to Music Stools.—Elijah D. Castelov, Meriden, Conn.: I claim the combination of the pillar, A, B, with the blocks or pions, C, D, and the hubs, M, when the disc, H, is made to fit and the disc to hold, substantially as herein described.

53,572.—Spring Power for Propelling Carriages.—Wm. K. Chase, Charlestown, Mass.: I claim the springs, K, K, one or more, applied to a drum, I, placed loosely on a shaft, E, to which wheels, F, F, are attached, in connection with the pions, D, on the hubs, M, the hind wheels of the wagon, the ratcatcher, H, I and J, or drum, I, the yokes, L, L, lever, M, and sliding rod, N, and the pawls, b, b, on the wheels, G, G, of shaft, E, all arranged and applied to operate in the manner substantially as and for the purpose specified.

53,573.—Stair Carpet Pad.—George W. Chipman, Melrose, Mass.: I claim as a new article of manufacture, the stair carpet pad constructed of one or more layers, consisting of fibrous matter covered on each side with sheets of paper and enveloped in a closed case of textile material, when the whole is quilted at several points throughout all the materials composing the pad.

53,574.—Railway Car Coupling.—Thomas J. Christy, Noblesville, Ind.: I claim the drop latch, L, when the same is constructed substantially as shown, with pivoted slot, p, and inclines, d and i, each performing the offices described, all constituting a self-acting car coupling, as set forth in the foregoing specification.

53,575.—Grain Drier.—George Clark, Buffalo, N. Y.: First, I claim a closed or air-tight grain drying kiln or chamber, combined and operating in connection with air-heating furnaces, and blowing air pumps or fans for the purpose and in the manner substantially as described.

53,576.—Broom Head.—James O. Clay, Hudson, Wis.: First, I claim a broom head or frame consisting of the piece, B, having a series of more blades, a, a, and the piece, A, provided with the arms, a, and d, fitting in the openings in said socket, said piece being hinged at b, as shown and described.

53,577.—Rotary Plows.—Levi H. Colborn, Chicago, Ill.: First, I claim giving the helical or screw plow blades of a rotary plow, in addition to their screw form, an additional curvature from the periphery toward the center, beginning at or near the entering edge, and gradually increasing toward the leaving edge, the same being a development of the mold board of the common plow around an axis of rotation.

53,578.—Gig Tree.—Edward A. Cooper, Lancaster, N. Y.: First, I claim the square raised shank, C, on the cheek hook, E, and corresponding mortise in the tree plate, in combination with a binding screw or bolt, as described.

53,579.—Bed Spring.—Delos V. Crandall, Canton, Iowa: I claim inserting the coiled wire in the aperture, C, of the slot, B, and fastening it by the stopper, D, as herein described and for the purposes set forth.

53,580.—Mangle and Wringer.—David Cumming, Jr., New York City: I claim the use of the abutments, g, g, in combination with two or more rollers, arranged substantially as described and for the purposes set forth.

53,581.—Apparatus for Distilling Spirits.—H. G. Dayton, Mayville, Ky.: First, the evaporating pan, E, with a steam jacket, a, in combination with rose, i, coil, F, steam drum, B, and still, A, constructed and operating substantially as and for the purpose described.

53,582.—Bullets for Small Arms.—John G. De Coursey, Philadelphia, Pa.: I claim the watin-described projectile for small arms, the same being composed of the central tubular lining of tinned iron, rounded to which is a kernel exterior, to engage in front as described, in combination with a hard metal washer, B, bearing against the rear of the said tube, the whole being otherwise constructed as set forth, for the purpose specified.

53,583.—Manufacture of White Lead.—Clarence Delafield, Factoryville, N. Y.: I claim, First, uniting or combining a solution of the nitrate of

lead or its equivalent for this purpose, made substantially as described, with a solution of the carbonate of potash, or its equivalent, for this purpose, made substantially as described for the purpose of producing the white lead of commerce.

53,584.—Reservoir for Wells.—R. H. Dewey and E. M. Tillotson, Pittsfield, Mass.: We claim in its application as a buried water reservoir in the bottom of a well, the filtering chamber consisting of a perforated cylinder whose interior spaces are filled with filtering material, the central space forming a chamber from which the water supply is drawn by an ordinary elevating device, as described.

53,585.—Door Latch.—Henry L. De Zeng, Geneva, N. Y.: I claim, First, The sliding latch, A, and bolt, B, constructed substantially as specified.

53,586.—Rock Drill.—Julius C. Dickey, New York City: I claim the central drill bit, B, made to answer the purpose of a reamer, in combination with the drill bits, A and C, substantially as set forth.

53,587.—Typographic Printing.—John Donlevy, New York City: I claim, First, The utilizing the spaces between the letters and lines of text, left blank in ordinary printing, by filling such spaces, by means of utilizing lines, with a pictorial background, divided into sections and adapted to arrange alternately or otherwise, with the lines of text, spaces, quatrats, etc., substantially as and for the purposes set forth.

53,588.—Axle Box.—D. H. Dotterer, Philadelphia, Pa.: I claim, First, Fitting the sections of packing of a journal box in such manner that they may be adjusted from the outside of the box, substantially as described.

53,589.—Pen for Weaning Calves.—J. B. Dow, Davenport, Iowa: I claim the calf-weaning and stall-feeding pen, constructed as herein described.

53,590.—Process for Amalgamating Gold, Etc.—F. N. Du Bois, Black Hawk, Colorado: I claim the use of an amalgam of gold and mercury, substantially of such consistency as to render it adaptable for the purpose set forth.

53,591.—Churn.—Daniel Dinton, Brooklyn, N. Y.: I claim the rotary dasher, B, constructed with an open center, substantially as shown, in combination with the plates or gatherers, e, e, all arranged substantially in the manner as and for the purpose specified.

53,592.—Cultivator.—Solomon Dwight, Rockford, Ill.: I claim the combination of the rigid tongue, the curved side pieces, the adjustable rear and middle cross beams, the adjustable handles, the swivelling plows, and the yielding-spring corn guard, when constructed, arranged, and operating as described.

53,593.—Railway Switch.—Stephen A. Emery and Frederick A. Prince, Portland, Maine: We claim, First, The peculiar construction of the lever, d, with wings, in manner above described, or their equivalents.

53,594.—Apparatus for Draining Cellars.—Augustus F. Erieh, Baltimore, Md.: I claim, First, The combination with the stationary vessel, A, provided with a pipe leading from the hydrant or other water supply, and with a discharge pipe, of the air-conducting pipe, E, vessel, G, discharge pipe or pipes, H, H', and float, I, substantially as and for the purposes set forth.

53,595.—Medicine.—W. H. Farnham, Sparta, Wis.: I claim the medical compound of the several ingredients mixed together or in about the proportions stated, and for the purpose specified.

53,596.—Steam Engine.—Isaac Ferris, Cincinnati, Ohio: I claim, First, The open-ended cylinders, A, A', B, B', C, C', and pistons, D, D', E, E', arranged, connected and operating substantially in the manner, and for the purpose set forth.

53,597.—Mash Machine.—Jacob T. Forrer, Peoria, Ill.: First, I claim the combination of the shaft, G, and post, D, with the tub, A, substantially as described and for the purpose set forth.

53,598.—Grinding Cylinders of Paper Engines.—Clinton T. Frost, Medfield, Mass.: I claim the application of the grinding plates, a, to the cylinder of paper engines in such manner that they may be moved outwardly from its circumference, and secured in position, as occasion may require, as hereinbefore explained.

53,599.—Rock Drill.—George P. Ganster, New York City: First, I claim the combination and arrangement of the flyer, C, rat head wheel D, pawl, o, rock shaft, Q, rod, T, and a crank, S, on the axle, S', of the roller, S'', or its equivalent, substantially as and for the purpose herein specified.

53,600.—Brick Machine.—John George and Henry Hague, Jackson, Mich.: We claim the attaching of the grinding or tempering arms, J, of