

made a few months since, the objects of which were to increase the economic efficiency of steam boilers, and also to test the effect of circulation of the water in boilers on the generation of steam. My boiler was of about three horse-power and of plain cylinder form, the fire being applied under it in a brick-work furnace in the ordinary manner. The fuel was wood, about three pounds per horse-power per hour being the maximum consumption, and the pressure averaging 60 lbs. per square inch by the steam gage. In order to make the water circulate throughout the boiler, I conceived the idea of introducing an iron plate into the boiler, placed about two inches from the bottom sheet, and slightly depressed toward the rear end, where the products of combustion passed up the chimney; the plate being about three inches shorter than the boiler, that is, there were three inches of space between each end of the plate and the ends of the boiler, so that the water could pass between. The fundamental principle being that the water between the plate and the bottom of the boiler would be heated first, and the water being lighter than the colder water above, would flow along in the direction of the highest temperature—that part just over the grate bars, and where the plate has the highest altitude; thus a revolving current would be formed of which the plate would be the focus.

When this was done the fires were started, and, by means of a man-hole at the top, I was able to note the effect on the water, which had a temperature of 50 degs. As soon as the temperature began to rise, a movement in the water became perceptible, and as the temperature increased, became more and more forcible, forming a current flowing from end to end of the boiler with tremendous rapidity, and boiling furiously. In one minute the entire mass of water had acquired an equal temperature of 200 degs. throughout the boiler. In half a minute more steam began to evolve from the end of the plate over the grate bars (the water, of course, flowing away at right angles to the direction of the steam), and in a solid mass entirely free from bubbles of steam. I now shut down the man-hole and made fast steam; pressure quickly formed; all ebullition ceased, and in five minutes the gage gave 19 lbs. pressure per square inch! By the old method fifteen minutes were required to reach the boiling point. In ten minutes more the pressure was 60 lbs. per square inch, when the safety valve was thrown wide open and the steam, transparent and perfectly dry, rushed forth to a distance of three feet.

By the old way the steam was very wet, and drenched everything around for some distance. So rapidly was steam formed, the swiftly-flowing current constantly sweeping the bubbles of steam from the highly-heated surface of the boiler, that twice the usual quantity of water was evaporated in a given time, while the consumption of fuel—dry pine—came down to one pound per indicated horse-power per hour, by night, and the same rate of economy was obtained in the use of coal, when that fuel was subsequently used.

After having made this highly-satisfactory experiment I concluded to try tubular boilers on the same plan, the plate being placed just above the tubes and slightly inclined upward toward the fire-box end of the boiler, so as to send a constant stream of water through the tubes and maintain equal temperature throughout the boiler. The results obtained were still more satisfactory, steam being formed with astonishing rapidity. Under such circumstances I consider it as conclusive that circulating water in steam boilers is in every manner advantageous, yielding the maximum of economy with the minimum of fuel.

ALBERT J. HASTY.

Waterville, Me.

Small Electric Machine Wanted.

MESSRS. EDITORS:—The Lenoir Gas Engine Company is in want of a cheaper, but equally effective, electric apparatus, than the clumsy Ruhmkorff coil and acid battery now used. If a "thimble battery" will send a spark over the cable, why will it not give our little engines, with 20 feet of wire, a good spark?

I am prepared to contract to-day for one thousand suitable electric machines for the Lenoir Gas En-

gines. Cannot some of your host of inventors supply them?

We are indebted to the SCIENTIFIC AMERICAN for inquiries for our Engines from every nook and corner in the United States—the result of a very modest little advertisement, carried upon the wings of your industry and enterprise.

JOHN B. MURRAY, President, New York City.



O. K. L., of N. H.—Your question is hardly appropriate for our columns, but as you failed to give your name we cannot address you by mail. Naval apprentices are appointed by the Secretary of the Navy. The candidate must be sixteen years old, pass an examination in the ordinary English branches, spend two years in the school at Annapolis, and two as a cadet in the workshop, when, if competent, he can graduate as third assistant engineer.

W. W. and N. G. H., of Texas.—The question propounded is this: "Is there any more power in an engine, the piston of which is twelve inches diameter, having four feet stroke, than in one of the same diameter having but one foot stroke, the steam pressure being the same?" The question is not one of the relative value of long or short levers, but simply one of motion from pressure exerted on the piston. If the pressure on the piston is sixty pounds to the square inch, the six-inch crank would make four revolutions while the twenty-four inch crank made one. The amount of power exerted would be the same. But even if the question was confined to a part of one revolution, thus using the cranks as simple levers, the result would be the same. In one case the short lever would exert its force through a less distance than the long lever would have to travel in performing the same work. The reason for using different lengths of stroke for cylinders of a common diameter is adaptability to the kind of work to be performed.

F. D., of Pa.—You say the grate bars of your boiler, twenty feet long, by thirty-six inches diameter with one fourteen-inch flue, are only ten inches from the boiler. The space is too little. Better be fifteen or eighteen inches if you wish to utilize the combustion of your fuel. For such a boiler we think a stack thirty inches diameter is full large. Two gage cocks, if properly placed, are as good as three; but for convenience and economy you should have a water indicator. It will save the time of the engineer, and the continual wear of the gage cocks. The direction the grate bars run, relatively to the boiler, will not effect its efficiency.

M. J. S., of Ill.—Polished iron will retain heat longer than if it be rough. If the iron of your apparatus is not to be subjected to a higher temperature than 250 deg. we suggest that you paint it or varnish it of a light color.

N. C. T., of Ill.—We are not aware of any composition used to coat polished steel, giving it a blue color which will not be removed by use. The bluing of steel is effected by exposing it to a charcoal fire, or to heated plates of iron, until the requisite color is obtained. The heat required is not sufficient to soften hardened steel. A transparent varnish can be applied hot, but will not last for your purpose. One part gum copal, one oil of rosemary, and two or three of alcohol is its composition.

J. O. M., of N. Y.—Refer to our reply to W. L. F. of Ill., in our issue of Oct. 27th. Or, if you prefer a cheap process of bronzing, paint your castings of the shade required and varnish. Before the varnish is quite dry, while "sticky," dust it with a copper or bronze dust and rub it on with a linen pad or a paint brush. Then varnish. Muriate of copper dissolved in water will give a copper coating to articles of cast iron, but they must be preserved with a coat of varnish.

D. M., of Pa.—You will see in this issue that we have published an article, illustrated with a diagram, which meets your ideas on the relative positions of the crank and piston.

EXTENSION NOTICES.

John James Greenough, of New York City, having petitioned for the extension of a patent granted to him the 17th day of January, 1854, for an improvement in machines for pegging boots and shoes, and reissued the 4th day of July, 1854, and again reissued on the 16th day of April, 1859, in six divisions, numbered 698, 699, 700, 701, 702, and 703, on which divisions extension is now prayed for for seven years from the expiration of said patent, which takes place on the 17th day of January, 1863, it is ordered that the said petition be heard on Monday, the 11th day of February, 1867.

George W. Brown, of Ga esburg, Ill., having petitioned for the extension of a patent granted to him the 2d day of February, 1853, for an improvement in seed planters, and reissued Feb. 16th, 1858, and again reissued Sept. 11, 1860, in five divisions, on four of which extension is now prayed for, viz., numbers 1036, 1087, 1038, and 1039, for seven years from the expiration of said patent, which takes place on the 2d day of February, 1867, it is ordered that the said petition be heard on Monday, the 21st day of January next.

Harvey Murch, of Lebanon, N. H., having petitioned for the extension of a patent granted to him the 14th day of June, 1853, for an improvement in mop heads, for seven years from the expiration of said patent, which takes place on the 14th day of June, 1867, it is ordered that the said petition be heard on Monday, the 26th day of May next.

NEW INVENTIONS.

The following are some of the most prominent of the patents issued this week, with the names of the patentees:—

BOX FOR FORMING METALLIC NUTS.—JOHN TURNER, Richmond, Va.—This invention has for its object to furnish an improved die or box for punching metallic nuts, which can be reduced or enlarged, to adapt it to nuts of different sizes; and by means of which the position of the center may be changed as desired within certain limits.

CORN PLANTER.—R. M. YORKS, Schoolcraft, Mich.—This invention relates to a portable device for planting or dropping corn, and it consists of a novel arrangement of parts, whereby two rows of corn may be dropped simultaneously, and with a greater or less number of grains or kernels in a hill, as may be desired.

COAL-OIL LANTERN.—J. O. HARRIS, Reading, Pa.—The object of this invention is to simplify the construction of the lantern render it more compact, especially as regards weight, and at the same time retain all the advantages of the original lantern.

BOOT JACK.—H. N. DEGRAW, Newburgh, N. Y.—This invention relates to a boot jack of that class which are provided with movable or pivoted jaws, and it consists in a novel and improved manner of applying the jaws to the foot piece and arranging certain parts therewith, whereby the jaws may, by the pressure of one foot on the foot piece, be made to grasp the heel of the boot on the other foot, so that it may be readily withdrawn.

INDICATOR FOR RAILWAY.—E. B. VAN WINKLE, New York City. This invention relates to an indicator for railways and is designed to indicate to the conductors of trains on arriving at a depot, or at any point on the line of the road where the invention is placed, the exact time a preceding train passed said depot or point, so that collisions which not unfrequently occur in consequence of the slow motion or delay of one train on a track and the rapid motion of a succeeding one, will be avoided.

HORSE HOLDER.—WM. B. CHAPMAN, La Salle, Ill.—This invention relates to a horse holder to be attached to the hub of a wheel of any vehicle, for the purpose of securing or making the lines or reins fast to it.

SPIKE-DRAWING MACHINE.—NATHAN ADAMS, Altoona, Pa.—This invention has for its object to improve the construction of the spike-drawing machine patented by the same inventor, September, 1865.

HOLLOW ARBORS.—JOHN BURT, Sturgis, Mich.—This invention consists in so constructing hollow arbors for rounding square sticks that only the knife or bolt which cuts the wood, shall touch the stick.

HORSE HAY FORK.—T. H. ARNOLD, Troy, Pa.—This invention relates to that class of horse hay forks which are provided with hooks or prongs connected with certain mechanism which admits of their being adjusted in line with a bar so that they may be readily thrust into the load or mats of hay to be elevated and then turned outward from the bar so as to catch into the hay and take up a quantity when the device is elevated.

DRILL.—NOTTINGHAM AND DUNCAN, Vinton, Iowa.—This invention relates to a tool or drill, for enlarging the bore of a well, at and about the lower end; for this purpose it is so connected to the lower end of a rod that by rotating which in any proper manner, the tool will be brought to bear against the sides of the well and cutting the same, produce the enlargement desired.

PULLEY SUSPENSION HOOK.—D. B. BAKER, and P. S. MILLER, Rollersville, Ohio.—This invention is designed to furnish an improved means by which the pulley of a horse hay fork may be suspended from a rafter or other support of difficult access, and for similar uses, without the inconvenience and danger of clambering to the desired point of suspension and suspending the pulley by a chain or rope.

SASH FASTENER.—DE LANCE COLE, Marshall, Ill.—This sash fastener and supporter is of such a construction that the sash can be fastened and supported at any desired height.

GOVERNOR VALVE AND VARIABLE CUT-OFF.—J. L. DICKINSON, Dubuque, Iowa.—This invention relates to a steam engine and consists in certain improvements in governor valves and in the variable cut-off, whereby many of the obstacles which have been met with heretofore are overcome.

WRENCH.—W. EVANS, Forestville, Conn.—This invention consists in the manner employed for locking the movable jaws to the bar of the wrench which has the said movable jaw fitted to slide upon the bar, which latter has its back serrated or toothed.

TAG OR LABEL.—G. W. STORER, Portland, Conn.—This invention relates to a tag or label especially intended to be used upon trees, shrubs, vines, and other plants, although it can be employed for other purposes; the invention consists in so forming the tag or label, made either of sheet metal or other suitable flexible material, that it can be secured to and around the tree, or other plant or article, without requiring the use of an additional or extra fastening device, and without the least injury to the article to which it is applied.

BEEHIVE.—MOSES GUTHRIE, Clifton, Iowa.—The nature of this invention consists in so constructing a beehive that the bees may be kept in different apartments or may be allowed to work in one apartment, as may be desired.

COMBINED STOVE AND FURNACE.—H. G. DAYTON, Maysville, Ky.—This improvement consists in the arrangement of a reverberating chamber directly above the fire box, in which the heated air is first received and wherein it serves to impart heat to the air contained in an annular surrounding chamber which is supplied with air at top, and serves in part to heat air in the main radiating chamber, which incloses both the reverberating and the secondary air heating subdivisions.

BAKING PAN.—STEPHEN WEST, Trenton, N. J.—This invention relates to an improved pan for baking fancy crackers, and it consists in forming the bottom of the pan with a series of semicircular corrugations, grooves or channels, to receive and hold the cracker material during the baking operation, thus preserving their round or cylindrical shape.

SORGHUM SKIMMER.—W. B. SEWARD, Bloomington, Ind.—This invention has for its object to furnish an improved skimmer, by the use of which the operator will be able to skim both sides of the pan with equal facility, and it consists of a skimmer open at both ends so as to permit either end to be used to lift or remove the scum.

COUPLING FOR CULTIVATORS.—SILAS M. WHITNEY, Galesburg,