MECHANICAL INVENTIONS.

An improved horse power mechanism has been patented by Mr. William McE. Dye, of New York city. The object of this invention is to furnish an improved horse power mechanism for various industrial operations usually performed by steam, water, or wind power. This invention is an improvement in that class of power mechanism which combines a continuously acting lever and an endless inclined plane, formed practically of a circular disk pivoted at its center on a ball-and-socket or other universal joint, upon which joint the disk is made to oscillate by the weight of a draught animal moving in a regular manner around its perimeter and up the inclined plane.

Mr. Adam Breth, of New Washington, Pa., has patented a new and improved device for cutting or clipping bolts. The invention consists in pivoting the movable jaw of bolt clippers to a block made adjustable by a clamp screw passing through slots of spring and jaw.

An improved wagon has been patented by Mr. Fredrick Borntrager, of St. Clair, Mich. This invention relates to that class of wagons which have jointed reaches for enabling the wagon to be turned within a small compass.

Messrs. Charles E. Mayo and William L. Perry, of Lowell, Mass., have patented an improved foot power machine for driving saws, lathes, and performing work of similar character requiring small power and high speed. The invention consists in a clutch pulley of novel construction and a treadle arranged to act always in one direction, these parts being combined to secure continuous motion of the driven shaft.

An improved ice cutting machine, patented by Mr. James Shannon, of Cohoes, N. Y., consists of a sled-shaped frame supporting vertical side standards, on which are pivoted forward projecting arms, that are adjustable in a vertical plane by eccentrics and levers, and carry on their free ends vertically-revolving circular saws for cutting the ice, which saws are operated by suitable belts and pulleys on gearing that form part of the device; and it consists, further, of a series of revolving toothed wheels keyed on a horizontal cross shaft in the rear portion of the device, which wheels are designed to rest upon the ice and to urge the machine forward by their revolutions. The saw carrying arms and the rear portion of the machine are also provided with platforms for the operators to stand upon or for the reception of weights to force the saws and toothed wheels into the ice for their more efficient work.

IMPROVED STEAM ENGINE PISTON.

The engravings illustrate the improvements patented by Henry Waterman, of Brooklyn, N. Y., July 12, 1881, and relate to metallic pistons. The object of the invention is to render the piston tight and prevent loss of power by passage of steam into and through the piston; also to compensate for wear and render the packing and its parts easily adjustable. The invention will commend itself to engineers as being very practical in all its details, easily made, durable, and readily adjustable.

In the accompanying drawings, Fig. 1 is a plan view of the piston, with the face plate and packing disk removed. Fig. 2 is a transverse section of the piston; and Fig. 3 a section of the convex spring packing plate.

A is the hub, formed with the face plate, *a*, and with radial arms, *b*, to which the faceplate, *c*, is secured by screws, *d*. B B are split rings placed upon a wide inner split ring, C, between the plates, *a c*. The ring, C, is backed at three equidistant points by spring plates, *e*, and keys, *f*, and at the side opposite its open ends by a curved block or plate, *g*, and key or keys, *h*. The arms, *b*, of the hub are recessed at their outer ends to form lugs, *i*, between which the keys, *f h*, enter. The plates, *e*, at each point are two or more in number, so as to form leaf springs, and are secured by a rivet or otherwise to the keys. The block, *g*, is formed with a central hemispherical socket, *k*, in its inner face, and the key, *h*, is formed with a hemispherical stud, *l*, which enters the socket, *k*, the stud thus preventing lateral movement of block, *g*, while permitting it to rock. The outer convex surface of block, *g*, is formed with a transverse groove, *m*, that is engaged by a stud, *n*, projecting from ring, C. By this construction the ring, block, and key are retained in their proper relative positions, and the block may adjust itself accurately to the inner surface of the ring.

In the recesses of the arms, *b*, behind the keys, *f h*, are filling plates or strips, *o*, of any desired number, as required to expand the ring, C. These being placed to fill out the space when the piston is set or from time to time, as required, furnish solid resistance, and unequal wear can be accurately compensated for.

It will be seen that the expansible ring, C, is held rigidly at its middle portion between the ends, while the remaining portion is allowed a limited amount of movement by the leaf springs, *e*.

Between the plate, *c*, and the edges of rings, B C, is the packing, *p*. This may consist of a circular plate of spring metal, of convex concave form, as shown in Fig. 3, which being clamped by plate, *c*, packs the joints between the plate and rings, so as to exclude steam from the interior of the piston.

For large size pistons I prefer to use packing rings or ring segments. These will be made of spring metal and curved transversely, so that when placed upon the expansible rings and clamped down by the face plate they insure a tight joint.

This piston, when fitted with plate, *g*, is especially adapted for use in horizontal cylinders, where, on account of the sag, the wear on the packing rings, B, is unequal. Such wear can be readily compensated for by adjustment of the backing without affecting the solidity of parts.

Fig. 1.

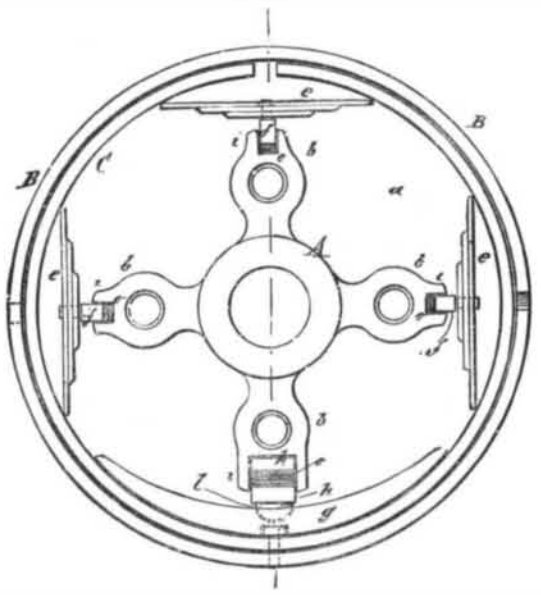


Fig. 2.

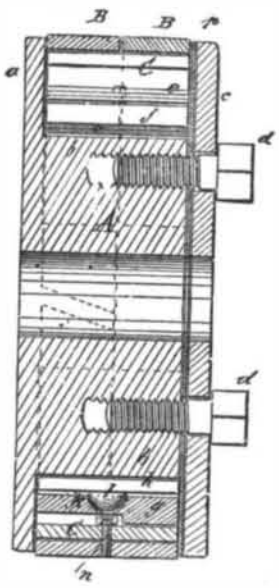


Fig. 3.

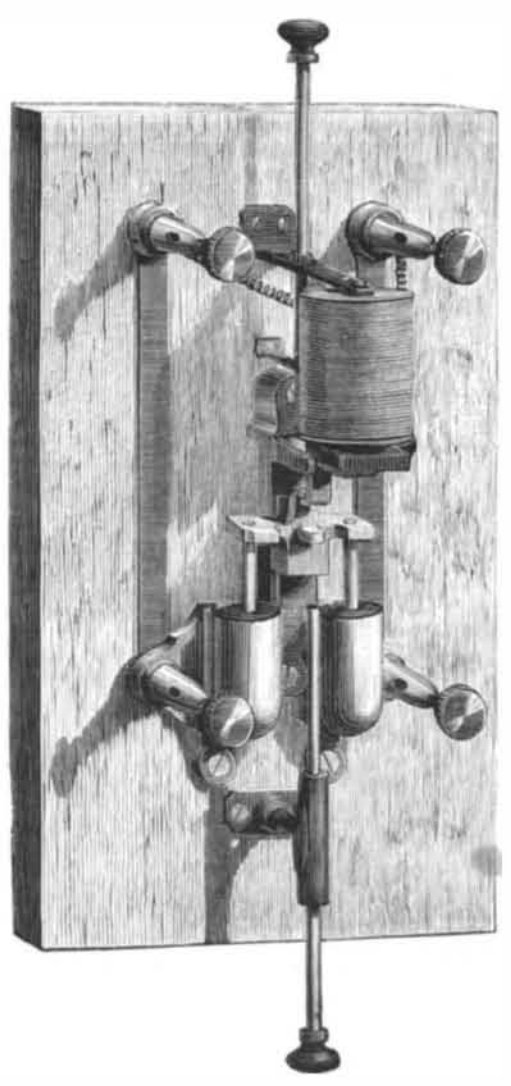
WATERMAN'S IMPROVED PISTON.

For use in vertical cylinders the plate, *g*, is not essential

Further information can be obtained by addressing the patentee, Henry Waterman, 18 Dunham Place, Brooklyn, N. Y.

CUT-OFF FOR ELECTRIC LAMPS.

The present tendency in voltaic arc systems is to place several lamps in the same circuit, their number varying from three or four up to *forty*. The great advantage of such an arrangement exists, as well known, in the great saving in wire that results from it. But, as an offset, it is necessary to employ currents of very high tension, and if this be too great the apparatus may become dangerous; and then, too, the insulation of the wire is very difficult.



RAPIEFF'S CUT-OFF FOR ELECTRIC LAMPS.

In practice it is well not to attain so exaggerated tensions, but to be content with placing only ten, twelve, or sixteen lamps, at the most, in the same circuit. But under these conditions all the lamps are mutually independent, and if one of them, through some accidental cause, is extinguished all the rest go out at the same time. This is a very grave trouble, for which various remedies have been sought. It was for the purpose of obviating it that Mr. Rapieff devised his "safety apparatus," and that all the Brush lamps are furnished with an arrangement called a "cut-off." Mr. Anatole Gérard's "automatic sentinel," which we are about to describe, accomplishes the same object with at least as great a simplicity and with one additional advantage—it is completely independent of the lamp; it forms an apparatus apart, easy to watch, and always within reach of the hand whenever it is desired to make several lamps in the same circuit independent of one another; and it is applicable to all lamps in service, whether they are continuous current or alternating current, voltaic arc or incandescent.

The accompanying cut will allow the working of the apparatus to be readily understood. It consists of a straight, fine wire and single-bobbin magnet, the extremities of whose wires are connected with the two upper terminals, to which, also, are joined the two wires coming from the lamp to which the apparatus is adapted. The conductor coming from the machine is connected with the lower terminal to the left, and the wire proceeding from the lower terminal to the right goes to the second lamp and second apparatus.

The two lower terminals are in metallic communication with two small iron cups which are half full of mercury. Above these cups there are two iron rods fixed to a metal cross-piece carrying a hook which engages with a second hook fixed to the armature of the electro-magnet. When the current passes it divides itself between the lamp and the fine wire of the electro-magnet without the armature being attracted thereby. In case of an accident or the extinction of a lamp, the entire current passes through the fine wire, and, the electro-magnet becoming active, attracts its armature, which, on tilting, disengages the hook and allows the two rods to drop into the cups of mercury.

The current then passes directly from one lower terminal to the second, that is to say, from one lamp to the other, through the intermedium of the iron rods; and thus the circuit is not interrupted by the accident which happened to one particular lamp, and all the others continue to operate just as if nothing unusual had occurred.

As may be conceived, it would be easy, instead of establishing a *direct* communication, to intercalate a resistance equivalent to that of the lamp put out of service, so as not to disturb the conditions of the electric circulation; and it would be easy likewise to utilize the fall of the rods for actuating an alarm bell, or even an indicating tablet, and thus to convert the apparatus into an automatic tell-tale, which would not be without utility in certain kinds of night work.

This apparatus also replaces the ordinary commutator; since, in order to relight a lamp when extinguished it is only necessary to press on the button located beneath. On raising the rod it strikes against a spur projecting from the cross-piece which supports the two rods, and, lifting it, causes the two hooks to engage, and the current then passes through the lamp. To extinguish a lamp it is only necessary to press upon the upper button, when the rod to which it is attached tilts the armature, disengages the hooks, and closes the circuit anew by the dropping of the iron rods into the mercury cups.

In a more recent model than the one here represented Mr. Gérard has arranged the mercury cups one above the other, instead of placing them side by side. The present arrangement gives greater width to the apparatus, which often has to be located on a narrow support, but the principle is in no wise changed thereby.—*L'Electricien.*

A Wrong to be Righted.

The schooner M. C. Mosley, of Boston, on the way to Charleston, picked up at sea the captain and crew of the brig Alphonse, which had been disabled in a recent storm and abandoned. At Charleston the health authorities learned that the shipwrecked mariners were from the infected port of Cienfuegos, and properly ordered the Mosley to quarantine. The chance of yellow fever infection from shipwrecked sailors, who had endured twenty-four hours of severe exposure to storm in open boats, was certainly slight; but the law was specific, and the health officers were constrained to obey it.

It does not seem right, however, that the performance of a meritorious act on the part of the captain of the Mosley should meet with no other recompense than the inconvenience and losses incident to quarantine. That would be very like imposing a penalty for doing an act of humanity. The case would seem to be a suitable one for special action on the part of the national government, to recognize and reward appropriately the conduct of the captain and crew of the Mosley, and to repay the owner of the vessel for the loss occasioned by the delay in quarantine. The case is not likely to be often repeated; still, it would be a misfortune to have an evil precedent established by means of it.

Fire Engineers' Convention.

The ninth annual convention of the National Association of Fire Engineers assembled in Richmond, Va., September 13, President Green, of Boston, in the chair. The officers elected for the ensuing year were: President—G. Watt Taylor, of Richmond. Vice-Presidents—One from each State. Secretary—Harry Hill, of Cincinnati. Treasurer—A. C. S. Hendrick, of New Haven, Conn.

LIME-EXTRACTING HEATER AND FILTER.

Where the feed water is pumped directly into the boiler without being purified, the heat soon frees the impurities, which are precipitated upon the inner surfaces of the boiler shell and upon the flues, to which they cling in the form of scale, which is a non-conductor of heat, and being interposed between the water and the boiler shell, allowing the fire to act injuriously on the iron, rapidly deteriorating it, soon weakening the boiler, and incurring the dangers of explosion and the expense of frequent repairs. Stoppages and delays in cleaning boilers, as well as priming or foaming, which carries grit over into the engine to its great injury, must be reckoned among evils resulting from impure feed water.

The actual cost and damages sustained from these more prominent evils, together with many minor ones unmentioned, all of which directly and inevitably result from the presence of scale in boilers, if summed up and expressed in dollars would greatly astonish steam users.

Much thought, time, and money have been expended in experimenting with reference to the nature and effects of boiler incrustations. In an able paper on "Incrustation of Steam Boilers," read before the American Association for the Advancement of Science by Dr. Joseph G. Rogers, he says: "The evil effects of scale are due to the fact that it is relatively a non-conductor of heat. Its conducting power as compared to that of iron is as 1 to $\frac{1}{50}$. This known, it is readily appreciated that more fuel is required to heat water through scale and iron than through iron alone. It has been demonstrated that a scale of one-sixteenth of an inch thick requires the extra expenditure of fifteen per cent more fuel. As the scale thickens the ratio increases; thus, when it is one-fourth of an inch thick, sixty per cent more is required; at one-half of an inch, one hundred and fifty per cent, and so on. To raise steam to a working pressure of ninety pounds the water must be heated to 320° Fah. This may be done through a one-fourth inch iron shell by heating the external surface to about 325°. If a one-half inch scale intervenes the boiler must be heated to 700°, almost a low red heat. The higher the temperature at which iron is kept the more rapidly it oxidizes, and at any temperature above 600° it soon becomes granular and brittle from carbonization or conversion into the state of cast iron. Weakness of boilers thus produced predisposes to sudden explosions, and makes expensive repairs necessary."

Ordinarily there will have accumulated in a new boiler after four months' use one-sixteenth of an inch of scale; after eight months' use, one eighth of an inch of scale, and so on. Now, if Dr. Rogers' theory is correct, it necessarily follows that after one month's service a boiler will consume three and one-fourth per cent more fuel than at first; after two months' service, seven and one-half per cent more, and so on, making an average for the year of over twenty per cent more fuel than it would have consumed if using pure water.

The difficulty of this scale formation can be overcome in three different ways:

First.—Picking the scale off by mechanical means.

Second.—Purging the boiler by means of the chemical compounds known as boiler powders. This is dangerous, chiefly from the fact that an acid or other chemical strong enough to eat off the scale will not stop there, but will go ahead and eat the boiler shell as well.

Third.—The use of pure water. The simplest and surest way is always the safest and best. If the water is purified from scale forming material before entering the boiler, certainly no scale can form.

This brings us directly to a consideration of the means acknowledged by competent engineers as the best in use for the prevention of this formation by the furnishing of pure water, and this is exactly what the Stilwell heater accomplishes. The water enters the heater at the top, and in its downward passage traverses a large area of heating and depositing surfaces, arranged in the form of removable shelves, having alternate openings. As the thin sheet of water passes over these shelves, all of which are very hot, and descends from shelf to shelf, it is met in its downward course and constantly acted upon by an ascending current of steam which enters the heater at the lower port. The action of this lower current of steam completes the separation and precipitation of the foreign particles which is begun when the water enters the heater. The construction of the heater is such that not a drop of water can pass down through it without being thoroughly boiled. The lime, magnesia, sulphur, iron, silica, etc., which this process of boiling sets free from the water, are deposited in a crystallized state upon the entire series of shelves, the deposit always being heaviest upon the upper shelf and diminishing in quantity as it approaches the lower shelf. From this lower shelf the water passes through the filtering chamber, which completes the purification, and it is then fit to enter the boiler.

In this heater the escape steam from the engine is utilized, and the volume used enables the purifying of large quantities of water, while every particle of the water is boiled thoroughly.

The arrangement of the shelves and the ease with which they can be handled and withdrawn for cleansing.

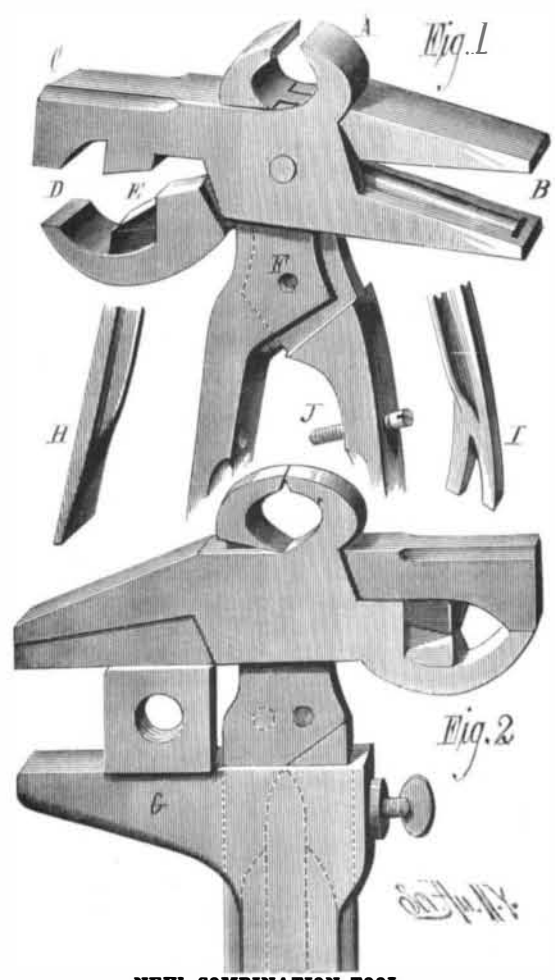
The filtering system, the leading point in which is that the water passes upward through the filtering chamber on its way to the discharge pipe and not downward or sideways, as is usually the case.

STILWELL'S LIME-EXTRACTING HEATER AND FILTER.

These heaters have been tested abundantly during the past ten years, and we are informed that there are to-day over three thousand in active use. They are manufactured by the Stilwell & Bierce Manufacturing Company, of Dayton, Ohio.

IMPROVED COMBINATION TOOL.

The engraving shows a new implement combining many useful tools in a compact and handy form. It forms a pair



NEW COMBINATION TOOL.

of nippers, A, a pair of pliers, B, which are provided with a rib in one jaw and a corresponding groove in the other jaw for the purpose of crimping the ends of stove pipe to facilitate putting the lengths together.

The end opposite the pliers is formed into a hammer head, C, against the under side of which the jaw, D, closes. This jaw and the adjacent surface of the hammer head are recessed, forming a holder for the nail, enabling the user to start and drive a nail with one hand.

The two halves of the tool are perforated at F, at the joint, to form a wire cutter, and an adjustable jaw, G, is fitted to the handles, forming a monkey-wrench.

A screw, J, in one of the handles, and a corresponding hole in the opposite handle, forms a punch and die for making holes in metal.

The end of one of the handles forms a tack puller, and the end of the other a screwdriver.

Fig. 1 shows the head of the implement and the end of the handles.

Fig. 2 shows the implement with the wrench jaw attached.

This invention was lately patented by Mr. John Straszer, of Manchester, Mo.

Eruption of Mount Lapwai, Idaho.

The recent report of a volcanic eruption in Idaho Territory is confirmed by a correspondent of the *Eagle*, of Butler, Pa., who visited the volcano about the middle of August in company with a representative of a Walla Walla newspaper.

As seen from Camas Prairie the column of smoke rising from Mount Lapwai was like that of a steamer beyond the horizon at sea. The mountain is two days' ride from Camas Prairie. Omitting unimportant personal details, the correspondent's account runs as follows:

"About 500 feet below the cone a large column of smoke sprang into the air hundreds of feet and then folded over to the east. Flames shot up to a great height, and a seething flow of lava was at that time rushing down into a small valley to the west and emitting a strong, sickening sulphuric odor, which made it impossible to remain by it any length of time. The lava had moved a distance of one mile from the mountain and was gradually making its way toward the Salmon. The neighboring hills were covered with ashes."

The visitors were informed by a Lapwai Indian that the lava flow is intermittent. With the wind at their backs they climbed the cone when the crater was quiet, though greatly disturbed and sickened by the sulphurous odors. The crater was about 500 feet below the rim of the cone, and appeared to be about an acre in extent. When the flow ceased the visitors went down to the edge of the crater, after covering their faces with rubber folds and their eyes with glasses. The heat was great. On one side it was possible to descend twenty feet into the crater without being nauseated, thanks to a favorable wind. The lava poured into the crater from the sides, and, when it was full, bubbled over and ran into the valley. The surrounding country is volcanic, and the Indians reported a recent eruption of Mount Idaho, a large peak a few miles from Mount Lapwai.

The visitors spent twenty minutes in the crater. At 5:45 P.M. the flow began again, and they hastily retreated. Scientific parties were fitting out at Portland, Oregon, toward the end of August, to visit the volcano. Mount Lapwai is one of the Blue Mountains, a low range crossed by the Snake River.

New Steamer for Oregon.

The new iron steamship, Walla Walla, the seventh vessel built by John Roach & Sons for the Oregon Navigation and Improvement Company, is now taking in cars and railroad material for the company, preparatory to her voyage to Oregon. The Walla Walla is 336 feet in length, 40½ feet beam, 23½ feet depth of hold, and of 5,000 tons displacement when loaded. She is constructed wholly of iron, with seven watertight compartments, with one complete iron deck, and the second deck is three-fourths iron. As she is constructed for the purpose of carrying coal between Seattle, Puget Sound, and San Francisco, and will probably return without cargo, she is fitted with three water-ballast tanks to retain the center of gravity on line with the keel, when the vessel is discharged of cargo. All the deck houses are built of iron, and a handsomely furnished cabin and staterooms aft afford accommodations for thirty first-class passengers. The vessel is fitted with compound engines of 2,000 estimated horse power, and has six cylindrical boilers, and her estimated speed when fully laden is twelve knots an hour. She is schooner rigged, with a square sail forward, and upon her arrival at San Francisco will take her place on the regular route with the two other colliers recently built—the Willamette and the Umatilla.

Battery Carbon.

A useful method of preparing cheap carbon poles for voltaic batteries has been devised by M. Mauri. It consists in taking finely powdered graphite mixed with an equal weight of sulphur free from carbonate, and heating the mixture in a crucible until all the sulphur is fused. The temperature, however, should not be raised over 200° Cent. When the mass is fluid it is poured into a suitable mould of metal, and a stout copper wire is inserted to serve for an electrode. When the mass is cool and solid it is ready for use. Its conductivity is practically as good as that of the best retort carbon, and as it is more electro-negative than simple carbon, the electromotive force of the cell is higher. By increasing the proportion of sulphur in the mixture a highly resisting composition may be obtained which can take the place of copper or platinum silver coils for telegraphic or electric lighting purposes.