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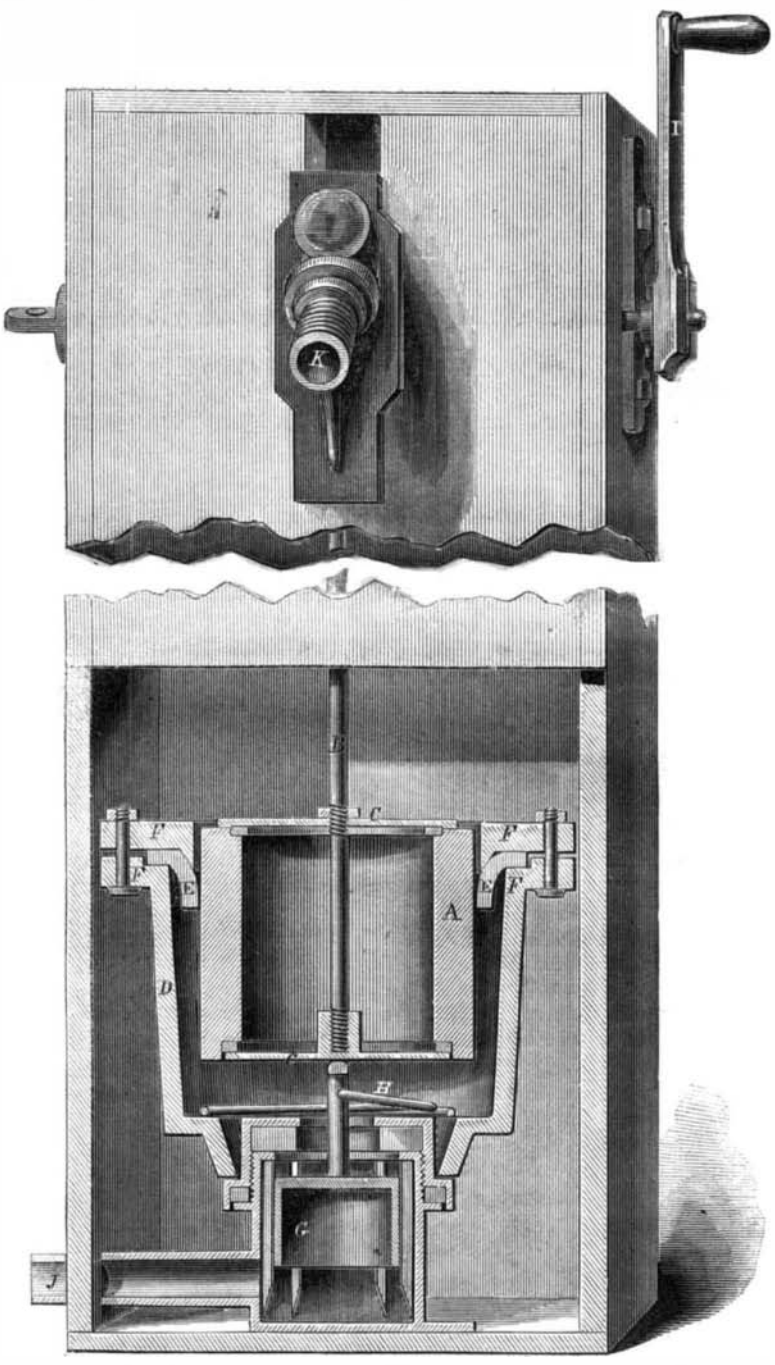
Non-Freezing and Non-Wasting Hydrant.

Street hydrants not unfrequently freeze up in consequence of the waste water collecting around the working parts, and these parts are continually wearing from the action of the gritty particles in the water, and thus causing the evil of leakage. Again, the constituent elements of some water act on metals, which derives an unwholesome property from them. The intention of the inventor of the hydrant herewith illustrated, is to obviate these difficulties, and he appears to have admirably succeeded. It is approved by the Water Board of Baltimore, where seven thousand of them are in use. One gentleman states that one of these hydrants has been in use on his premises for seven years, and has never frozen, nor required any expense for repairs.



CLARK'S NON-FREEZING AND NON-WASTING HYDRANT.

The plunger, A, is a cylinder of terra cotta, or earthenware, with a glazed vitreous surface, secured to the rod, B, by means of the heads, C, packed with disks of rubber. It works in the case, D, and is made air and water-tight by means of the annular packing, E, secured between the rims, F. The valve, G, is cup-shaped, and has a stem projecting upward into the case, D, and is furnished at its top with a rubber disk, which closes the central aperture in the bottom of the case. A coiled spiral spring, H, retains it firmly in place. The packing, E, is covered with powdered soapstone, applied by means of warm gum. When water is to be drawn, the handle, I, is turned, which screws down the cylindrical plunger, A, on the stem, and depresses the valve, G. The water then enters the pipe, J, and the case, D, discharging through a pipe, its mouth shown at K.

The action of the spring, H, when the pressure exerted by the handle and screw is relaxed, is assisted by the upward force of the water, so that a close joint is at all times assured. The same pressure of water against the lips of the packing, E, increases the pressure of the packing against the plunger. Whatever gritty substances may be in the water are held by the packing, and do not injure the vitreous surface of the plunger. The taste of the water cannot be affected by the earthenware. All the working parts are readily accessible. They can, if necessary, be taken out and replaced, at any time, without breaking the ground, by means of a tool made for the purpose.

Patented Sept. 3, 1861, by Lewis P. Clark. For manufacturing, State, or city rights, apply to G. W. Brooks, 248 Lee street, Baltimore, Md.

RULES ON THE METRIC SYSTEM.—A correspondent suggests that some of the manufacturers of carpenters' rules make a half-meter rule, folding in two. Closed, it would be two and a-half decimeters, and open, five decimeters, or 19.685 inches. It should be graduated to centimeters. These rules would familiarize the people with the new system and aid in its adoption.

The Effect of Sunshine on Fire.

At the meeting of the Scientific Association at Buffalo, Prof. Horsford, of Cambridge, read a very interesting paper on the above subject.

He commenced by alluding to the popular notion that sunshine deadens fires; mentioning that the fires in grates in rooms having southern exposures burn briskly in the early part of the day, slacken before noon, and revive again before sunset. Stoves and ranges that bake well in the autumn, winter, and spring, fulfill their office but indifferently in the middle of the day in the hight of summer. Some furnaces, in which iron is generally smelted without difficulty, cannot in very hot terms be brought to a working heat. While the popular mind ascribes these effects to some agency of the sun, scientific men are disposed to regard the effects as rather apparent than real.

The first recorded research bearing upon the subject, was made as long ago as 1825, by Dr. Thomas McKeever, who found, as he conceived, the popular impression sustained. In his experiments a given weight of wax taper was consumed quicker in the dark than when exposed to the sun. A given length of candle required less time for combustion in the dark than in sunshine. A given weight burned quicker in a paintedlantern than in an uncoated lantern, both alike exposed to the sun.

These experiments did not find acceptance with Gmelin, and did not appear in the original Hand Book of Chemistry, doubtless from a conviction that some error must have occurred either in the method or record of observation. Nevertheless, Dr. McKeever's experiments apppear as additions in the Cavendish Society's translation of the Handbook. The summary of his results may be stated thus: It required eleven minutes to burn in the sunshine the same weight of candle that burned in the dark in ten minutes.

Similar experiments were made at a later period by Dr. Morrill Wyman, of Cambridge, and reported to the American Academy of Arts and Sciences. The result at which he arrived was exactly the reverse of that reached by Dr. McKeever. He burned two sperm candles, each alternately for half an hour in the sunshine and darkness, and found the candle during its exposure to sunshine burned more rapidly than when in the dark.

In 1856 the subject was taken up by Prof. Joseph Le Conte, of Columbia, S. C. He concentrated, with the aid of a reflector and burning glass, the sun's rays upon the flame only of a wax (sperm) candle in a large dark room. At the same time another candle was burning in the same room, under identical circumstances, except that the flame was not exposed to the sun's rays. The result showed that the effect of the sun's rays, though greatly exaggerated by concentration, when confined to the flame, did not appreciably increase the consumption of tallow.

Here, then, we have apparently all possible results of experiment, to wit. Sunshine diminishing the rate of combustion, as observed by Dr. McKeever; augmenting the rate, as observed by Dr. Wyman, and producing upon it no effect whatever, as shown by Prof. Le Conte.

Dr. McKeever ascribed the retardation to some peculiar effect, as of interference of the solar rays upon flame.

Dr. Wyman inferred that the sunshine, by warming the tallow of the candle exposed to it, facilitated its melting, and by so much spared for destructive distillation and combustion the heat of the flame, which would have otherwise, in larger measure, gone to liquefy the tallow.

Le Conte exclusively showed that when the column of wax or tallow is sheltered and the sunshine directed solely on the flame, the effect on the consumption of the tallow is too small to be recognized.

The observations of the later experimenters agree

in throwing doubt upon the interpretation which Dr. McKeever gives of his own experiments.

Prof. Horsford then proceeded to detail a series of experiments he had made, showing the probable source of error in Dr. McKeever's investigation. He ascribes it to the incidental greater flaring of the candle in the dark. The experiments with the lanterns he explained by the well known effect of dark paint in absorbing radiant heat and converting it into heat of conduction, by which the air in the painted glass lantern was more heated than in the lantern that was not painted.

Prof. Horsford then gave an account of the diminished draft in the range flue of his dwelling house during the recent hot term, which rendered it impossible to bake meats or bread in the oven of his range. This continued from eleven o'clock to about three, within which hours bread could not be baked. With the decline of the sun in the afternoon, as in the early morning, the oven performed its office better.

The chimney was 54 feet high. The roof of the house was of dark slate. It was all exposed to heat before eleven. Some of it began to pass into shade about three.

In the effect of this greater exposure to the sun, during the hours when the sun was highest, Prof. Horsford found the explanation of the observed phenomenon. The heated top and sides of the house warmed the air in contact, giving rise to an upmoving column from the top of the house, and to an endless shroud of air sweeping up the sides of the house. This ascending shroud by friction draws the air from the cracks, doors, and windows of the house, lessening the pressure of the air in the interior, and, of course, diminishing the draft.

After showing the applicability of this explanation to the various cases that occur with dwellings, iron furnaces, etc., the paper concluded with the following summary :—

First. That sunshine falling on the flame only of a burning body does not affect its rate of combustion.

Second. That, other things being equal, neither light nor darkness exerts appreciable influence on the rate of combustion.

Third. That, other things being equal, of two samples of the same combustible, one burning in sunshine will consume more rapidly than one burning in darkness.

Fourth. That combustion during the winter is more vigorous than in the summer, because a given volume of air contains more oxygen—is denser and drier.

Fifth. That slight currents, by causing a flame to flare and come in contact with more air in a given time, cause more rapid combustion, and by presenting greater surface from which radiant heat issues to warm the combustible about to be burned, increase the rate of combustion.

Sixth. That the diminished draft of chimneys in very hot weather, when the general atmosphere is at rest, and the sunshine intense, is due to upward currents on the outside of the house, arising from the heated surfaces of the roof and walls, which currents, by friction, draw outward, through cracks and open doors and windows, the air from the interior of the house, and so lessen the pressure within and overcome the draft of the chimney.

Seventh. That the popular impression that intense sunshine lessens the draft of chimneys is founded in fact.

A Life-Saving Machine.

A new life-saving apparatus was lately tested near Boston, under the direction of Captain Fengar and Commodore R. B. Forbes. Commodore Forbes placed his mortar at Deer Island in position, and at the signal it was discharged, the hollow shell flying high across amidships and leaving the line in the rigging. It was quickly secured, and in a few minutes the larger line was drawn in, made fast, and the communication with shore thus secured. The life car, in shape like the Winans steamer, and made of painted canvas, stretched on a light frame, was hauled along side, into which two sailors were snugly stowed, through the "manhole," and in three minutes safely landed ashore. The experiment was entirely successful.

Enlargement Test for Ordnance.

At the Manchester, England, meeting of the Institution of Mechanical Engineers, Mr. Whitworth read a paper on the expansion of guns in firing and his device for the measurement of the bore. We find the following report in the *Engineering*. We refer to the statements therein contained in another column :—

"Mr. Whitworth's (the president's) paper expressed the opinion that the "best" proportion of a solid projectile was three diameters in length, and that a gun would properly consume a powder charge one-seventh of the weight of the shot. Why these arbitrary proportions were best was not explained, yet Mr. Whitworth applied them to the 13.3-inch gun, which, he said, should throw a 990-lbs. shot, and consume 141 lbs. of powder, while the American 15-inch guns should throw a 1,522-lbs. shot, and consume 217 lbs. of powder. Because neither of these guns could bear anything like such charges, their bores were pronounced "too large," and the guns themselves were "inefficient." These conclusions, or rather broad assertions, were not, perhaps, strictly covered by the title of the paper, and they were undoubtedly open to dispute. It will, we think, be generally agreed that the efficiency of guns should be measured by the total destructive power which they can exert without injury to themselves ; and we very much doubt whether, of two guns of the same weight, and firing the same powder charge and weight of shot, that with a small bore and long projectile would withstand as many rounds as the larger bore worked at a lower initial pressure, and giving more room for the due expansion of the powder gases. But to proceed to the measuring instrument. It was designed by Mr. Whitworth, in 1864, to ascertain the enlargement of the bore of the 70-pounder gun during the competitive trials of the special committee at Shoeburyness, the primary object being to test the amount of charge which any particular gun would bear without injurious disturbance of its parts. The instrument is simple enough, and consists of two tubes, one within the other, and both rather longer than the bore of the gun. To the inner end of the outer tube is attached a brass head with three arms, having each a groove upon its face, within which grooves radial steel "feelers" are set out to the exact diameter of the gun, by means of a screw of fine pitch on the inner tube, and which draws in a cone which sets out the "feelers." An index pointer on the inner tube moves in a slot cut in the outer end of the outer tube, and by the position of this pointer the exact gage of the gun is read off. The tubular measuring rod is supported within the muzzle of the gun by a grooved brass pulley, so that it can be moved freely backward and forward in the bore. The instrument would indicate to within the one ten-thousandth of an inch at any part of the bore. The exact measure of the bore at the middle of the length of the powder charge and at the middle of the length of the projectile were ascertained before commencing to prove a gun, and also after each successive charge, commencing with a somewhat small charge. As was to be expected, a small enlargement was found to take place with ordinary service charges, and irrespective of the decided enlargement due to overcharges. In the case of the 70-pounder gun, the measurements, taken during the firing of nearly 3,000 rounds, showed that the bore enlarged regularly with successive charges of 10 lbs. of powder and a 70-lb. shot, and this enlargement was attributed to the wear of the chamber of the gun by the action of the powder. In the first 2,886 rounds the enlargement of the diameter was 0.0198 inch. In the next 50 rounds—20 of them having been fired with 140-lb. shot and 20 with 280-lb. shot—the further enlargement was 0.017 inch, showing that nearly as much enlargement was caused by these 50 rounds as by the previous 2,886 rounds. The last 15 rounds—fired with shot of from 350 lbs. to 490 lbs. and five of them with an increased powder charge of 15 lbs.—produced a further enlargement nearly equal to that of the 2,886 rounds. The instrument thus afforded the same means of carrying out the test of guns as are now adopted in the testing of girders, in which the effect due to the test loads is observed, and the permanent set noted. One curious result noted was, that Mr. Whitworth had fired charges with 12-inch air space between the powder and shot, and without bursting the gun. It was enlarged, however, exactly at the base of the shot, where the force of the explosive gases was suddenly arrested in an accumulating wave of pressure. The same gun was next fired with 1 inch more of air space, or with 13 inches between the powder and the shot ; and here again the gun was bulged exactly at the base of the shot, or rather at that point, 2 inches from the base, where the full diameter of the well-known Whitworth 70-lb. projectile is reached. And between the distinct bulge due to the 12-inch air space and that due to 13-inch, the intervening inch along the bore of the gun was found to be parallel. Mr. Whitworth has begun to vent his guns with platinum, and this has stood 4,000 rounds, whereas the copper vents required to be replaced after only 200 rounds.

Breech-loaders and Patched Rifle Balls.

From "F. R.," we have received a communication in regard to an article in our issue of Aug. 11th, from "An Unbeliever in Breech-loading Fire-arms," which objected to these arms for sporting purposes, because the ball could not be patched. Our present correspondent claims to have constructed a cartridge which carries a patched ball, designed for breech-loaders, which makes this kind of arm the most efficient in use. The patch envelopes the bullet the same as in the muzzle-loader, and the ball is secured to the cartridge by looped cords. In the discharge of the piece, when the ball leaves the gun, the patch drops off, leaving the projectile unincumbered. It has received the approbation of all who have tried it. The advantages claimed are :—

First. The greased patch causes an even, smooth fit between the barrel and the ball ; prevents the irregular, vibratory motion of the bullet, and causes it to leave the barrel without that erratic jerk, with which the rough, naked ball leaves the rifle.

Second. The greased patch acts as a swab, effectually cleaning the gun, after every fire, from the foulness of the previous discharge, allowing, positively, no dirt to collect in the barrel. This alone renders the improvement invaluable. The bare, naked ball never did this ; it only ground or rubbed the dirt into the polished inner surface of the barrel ; at times clogging in the barrel, and bursting the piece, and at times, jumping and tearing across the twist, destroying the rifle. If any one will examine an ordinary breech-loader, which has been frequently used, he will find the interior of the barrel sprinkled with a nebulæ of rust. This oxidation is the result of the grinding into the barrel the acid foulness of the burnt gunpowder, and can be removed only by mechanical means. Compare with this the muzzle-loading, patched-ball rifle—smoother, brighter, better years after, than the day on which it was made, all because it uses the patched bullet.

Third. A rifle using the patched ball will not only shoot better, but will last a lifetime ; it will scarcely wear out, and is never leaded.

Fourth. With the greased patch, there is not so much force lost in overcoming the friction, and the force before so spent now assists in giving the ball a higher initial velocity.

Sawing Lumber.

A correspondent, D. L., of Vermont, who claims to have had many years experience in setting up and running circular saw mills, says that the "end play" delusion is still cherished by many in the Middle States, but in New England it is rejected. He says he is running a saw 50 inches in diameter, at 800 revolutions per minute, sawing spruce and hemlock, some of it very knotty, on one-and-a-half-inch feed ; and most of the lumber is sawed so smoothly that it is difficult to tell, by the appearance of the boards, how much the saw cut at each revolution. He thinks it would be impossible to run a 50-inch saw 800 revolutions where "end play" is permitted. If the power is limited, the speed should be reduced. It is better, he says, to run 400 revolutions per minute on one-and-a-half-inch feed than 800 at ¾-inch feed. It dulls a saw as much to saw 500 feet of lumber on ¾-inch feed, as to saw 1,000 feet on one and a-half-inch feed, and requires almost as much power, if the saw is in proper order.