COMBINED MILK PAIL AND STRAINER.

This useful device is the invention of J. L. Drake, of Boston, Mass., and was patented in August, 1867. It is designed to secure greater cleanliness in milking, and to strain the milk while the milking is in progress. The receptacle for the milk is provided with a spout and funnel, a gauze strainer being placed across the lower end of the funnel tube. When the milking is finished, the funnel is removed, and the milk is poured out and strained. The funnel being brought up close to the udder of the cow, the milk is not rendered filthy by droppings of dirty water from the sides of the cow in wet

weather, and the receptacle, being placed out of the reach of the cow's foot, is not liable to be kicked over by a vicious animal. The pail can be also used as a stool for the milker.

Value of the Self-acting Mule.

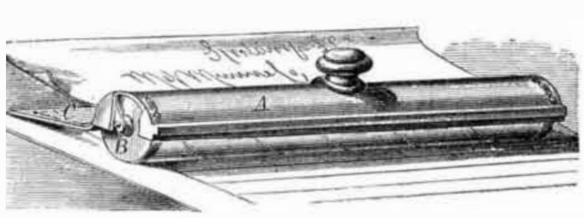
Through the skill of Mr. Roberts, of Manchester, England, the mule was made self-acting, the spinner not having now to work or guide the mule, but simply to see to its being kept in order. The value of these accumulated inventions will be seen, when it is remembered that before the invention of Hargreaves one person could only attend one spindle; at the present time one man, aided by a grown up youth and boy, will tend a pair of mules having 1,200 or 1,300 spindles in each, or 2,600 spindles together. If these facts be carefully examined, it will be seen that one individual, aided by the machinery of the present day, will produce as much yarn as 750 persons could have done a little over one hundred years ago; the result of these improvements being a large diminution in the cost of yarn, and a considerable increase of wages. A spinner in 1760 could only earn from 2s. to 3s. weekly, whereas now he can earn from 30s. to 35s. weekly. In the time of Crompton, which was after considerable improvements had been made in machinery, the cost of spinning weft 40 hanks to the pound was 14s. per pound; 60 hanks, 25s.; and 80 hanks to the pound, 42s. per pound. Now, the cost of producing will be 4d., 7½d., and 1s. per pound, respectively. Such are the advantages resulting from the invention of machinery.

COMBINED BLOTTER, RULER, AND PAPER CUTTER.

The annexed engraving illustrates a very neat and handy device for the counting room and the desks of professional men, including in one implement a blotter, ruler, and paper cutter.

The engraving is a perspective view, with a portion of the semi-cylindrical case, A, broken away, to show the spring which holds one end of the blotter roller, B. The other end of the roller is held by a fixed support, the spring bearing enabling the roller to be inserted or removed for the renewal of the blotting paper

The blotting paper is secured to the cylinder by small metallic bands.



The semi-cylindrical case has a wide thin plate, C, projecting backward, which forms the edge for cutting paper or tearing it across, as shown. The front side of the case has formed upon it a straight edge, which is the ruler. The roller being turned true, it—when rolled upon the paper—advances the ruler in lines constantly parallel to each other, as in the rulers hitherto constructed with rollers.

Patented, through the Scientific American Patent Agency, March 7, 1871, by Hugh S. Ball, whom address for further information, Spartanburgh, S. C.

MUSSEL CLIMBING.

By Rev. S. Lockwood, Ph.D., in the American Naturalist.

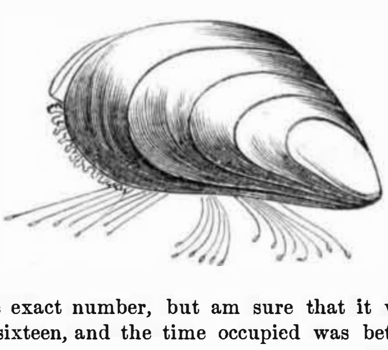
Why should not these pedate bivalves, the mussels, walk? "For want of brains!" says one. You are mistaken, sir. They have brains, the right kind, too, and in the right place—a real pedal nerve-mass, or ganglion; a little bilobed brain at the very base of the "understanding" itself, that is, exactly under the foot, as was fabled of a very agile dancer, that his brains were in his heels.

If seeing be believing, mussels can walk. We once saw a young brown mussel, of the species *Modiola plicatula*, about five eighths of an inch in length, turn his foot to a most excellent account. We had pulled the youngster's beard off, and then had deposited him at the bottom of a deep aquarium. The water was probably but poorly aërated, hence he was evidently ill at ease, and, to our astonishment, he at once began travelling over the pebbly bottom, then up the glass side, with the utmost facility and grace. The foot moved precisely as that of any univalve gasteropod would do, and with the same easy gliding motion. The movement was continued without interruption until he had reached the surface of the water, a distance of not less than 10 inches, which, added to the distance travelled over the bottom, was probably equal to 14 inches. At the surface he lost no time in spinning his byssus, which he fixed to the side for a permanent abode.

For his lively colors, perhaps ruthlessly, we had picked this little fellow out of a large family cluster, snugly packed in a little hole in one of the piles of the dock. It was a large group of all sizes, literally bound together by the silken cords of—attachment, shall we say?

A fellow captive was a full grown, black, edible mussel, torn from his anchorage, a stone near by, at low tide. We afterwards found, ensconced in this black shell, an amount of intelligence which filled us with astonishment. If his youthful fellow prisoner could beat him at walking, he was about to accomplish the feat of climbing to the same position by means of a species of engineering of a very high order.

Placed at the bottom of the aquarium, where he had been for a couple of days, he had succeeded in wriggling himself up to one of the glass sides of the tank. This accomplished, he protruded his large foot, stretching it up as high on the glass as he could reach, this organ seemingly adhering very tightly. A little hole opened near the extreme forward end of the foot. This tiny hole was really the extremity of a folded or closed groove. Out of this a drop of white gluten, or mucus, not larger than the head of a pin, was exuded and pressed against the glass. There was then a slight withdrawing of the foot, simultaneously with an unfolding or opening of the groove, which contained, as if molded there, the already completed delicate thread. This done, the partly contracted foot (not drawn into its shell at all, be it understood) was again extended, this time a little higher than before. The groove or spinneret was again closed, except the little opening on the surface of the foot, whence another little drop of mucus appeared, which also was pressed against the glass. Again the foot was withdrawn a little, the lips of the groove unfolded, and the molded thread set free. This gave thread number two. Each was evidently set at considerable tension. And in this wise, thread after thread was formed and set. (See engraving.) I regret that I did not



record the exact number, but am sure that it was about twelve or sixteen, and the time occupied was between two and three hours, when lo! up went the mussel, about three eighths of an inch high. Yes, he was drawn up by his own cords. He was literally lifted from *terra firma*. Not at all suspecting what was to follow, I mentally exclaimed "This little fellow knows the ropes."

There was next a period of rest. Whether it was due to exhaustion of material, and was meant to allow the secreting gland time to evolve a fresh supply or not, I cannot affirm; but I may say that such was my belief, for after an hour or so it set to work precisely as before, attaching a new cluster of threads. This cluster was set about ⅝ inch higher than the previous one. When this new group of filaments was finished, the same result followed, another lift of a fraction of an inch, but not quite so high as the first. I now suspected its motive—the animal was actually in this singular manner attempting to reach the surface. It wanted to take an airing, and was really in a fair way to bring it about.

While setting its third cluster of threads, I foresaw a serious difficulty in the way, and one against which the spider never has to contend. It was this: after the third lift had been achieved, the threads which had accomplished the first lift had changed direction; that is, the ends of the threads, which had pointed downward when pulling up the mussel, were now pointing upward, and were actually pulling it down. Of course the lowermost thread or threads would exert the most retrograde traction. Thought I, "Sir Mussel-man, you will have to exercise your wits now." I rejoice to say that the ingenious little engineer was complete master of the situation. The difficulty was overcome in this way—as each lowest thread became taut in an adverse direction, it was snapped off at the end attached to the animal. This, as I think, was done by two processes; the one by softening the end of the thread by the animal's own juices, purposely applied, as the pupa in the cocoon moistens its silk envelope, when wishing to soften the fibers, so that it can break a hole through which the imago may emerge; the other by a moderate upward pulling, thus breaking the filament at its weakest point.

The next day our little engineer had accomplished the wonderful feat of climbing to the surface by ropes fabricated during the ascent. Without delay it moored itself securely, by a cluster of silken lines, at the boundary where sky and water met, and was there allowed to enjoy the airing it had so deservingly won. Bravo! my little Mussel-man! No acrobat can beat thee on the ropes.

And what are we to say to all this? Blind instinct, forsooth! Who believes it? The wise men of the ages have written as the tradition of the elders—"byssus-bound," of our Mytilus But it can make, of its bonds, mooring lines of safety against the storm, and with consummate skill can build a silken stairway into its own wished-for elysium of delight. It is some three years since the writer witnessed the facts here recorded, and to this day the sight of a mussel inspires him with profound reflection on the ways of Him who made these creeping things of the sea.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Wrought Iron Railway Sleepers.

The new railway sleeper recently patented by Mr. Richard Gammon, of Westbury, England, is likely, it is said, to supersede the whole of those at present in use, especially in tropical countries. The constructors of the railways in India experience the greatest difficulty in making and maintaining the permanent way. The dry rot, and those pests of India the white ants, destroy everything. Sleepers sent from England creosoted and "pickled," are not protected from the influence of the sun and vermin, and seldom or never last more than three years. It was necessary, therefore, to find a substitute impervious to attacks of insects, which might be made perfect and ready to be laid down wherever they should be required.

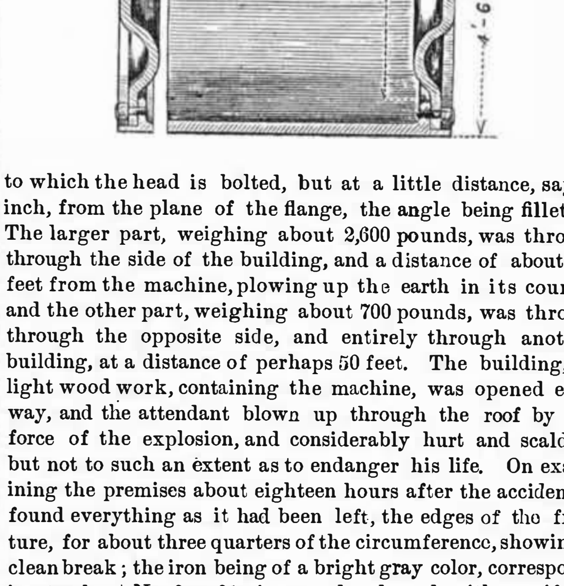
Mr. Gammon's sleeper is made up of a number of webs and plates of rolled iron, riveted together, and pierced with bolt holes for the chairs. This saves about two thirds of the labor of laying, and leaves but little work to be done by native or other labor. The direct cost is not more than 1s. each above that of the best wooden sleepers, and they are calculated to last ten times as long in tropical countries, and three times as long in Europe. Many eminent engineers and railway contractors, who have examined them, believe they will be the railway sleepers of the future. At all events, the invention is highly ingenious, and likely to supply a great want.

Explosion of a Cylinder for Drying Cotton.

MESSRS. EDITORS:—I had occasion recently to examine the ruins caused by the explosion of a cylinder, for drying cotton batting or carpet lining, at the factory of Geo. W. Chipman & Co., Charlestown, Mass.. which occurred at about 2 P.M., April 8th. This explosion being so exceptional in its character, I thought it would be well to call the attention of your readers to the fact that cast iron is in many cases a very unreliable material for constructing cylinders exposed to high temperatures, and to withstand high pressures of steam.

The drying apparatus consisted mainly of two cylindric dryers, similar to those used in paper machines, rotated by gears, having a pipe passed through the right hand journal for admitting steam to the boiler, and a similar pipe in the other for removing the water; this drain pipe turned downwards and extended as low as possible in the cylinder, to keep it as free from water as possible, as is usual in arrangements of this kind. In addition to these dryers was a number of rollers carrying aprons for feeding the wet batting to the dryers, and for carrying it away.

The accompanying figure shows a section of the cylinder and the line of fracture. It will be observed that the fracture did not occur exactly in the angle formed by the flange



to which the head is bolted, but at a little distance, say ¼ inch, from the plane of the flange, the angle being filleted. The larger part, weighing about 2,600 pounds, was thrown through the side of the building, and a distance of about 90 feet from the machine, plowing up the earth in its course; and the other part, weighing about 700 pounds, was thrown through the opposite side, and entirely through another building, at a distance of perhaps 50 feet. The building, of light wood work, containing the machine, was opened each way, and the attendant blown up through the roof by the force of the explosion, and considerably hurt and scalded, but not to such an extent as to endanger his life. On examining the premises about eighteen hours after the accident, I found everything as it had been left, the edges of the fracture, for about three quarters of the circumference, showing a clean break; the iron being of a bright gray color, corresponding to about No. 2 or 2½ pig, sound and good, with a uniform thickness of fifteen sixteenths of an inch; the other fourth of each part had been plunged into the ground; but, so far as I could judge, would, if clean, have shown the same charac teristics as the rest. The heads were held on by being turned to fit the bored ends of the cylinder, and then each was secured by twenty-eight three-quarter bolts tapped into the flange. The boiler was an ordinary vertical cylinder, with internal fire box; diameter, 42 inches, thickness of sheets, one quarter inch; and was single riveted.

The safety valve worked freely, and was weighted, as nearly as I could judge without seeing the valve itself, at 90 pounds. I could get no reliable evidence as to the pressure carried at the time of the explosion, except that "they were doing all they could." I then made the following calculations, to determine, for comparison, the bursting pressures: And first of the boiler: Taking the maximum tensile strength of boiler plate at 60,000 pounds per square inch of section, and the single riveted joint at half this, or 30,000 pounds, we have $\frac{\frac{1}{2}\times 30,000}{42}=357$ lbs. per square inch as the steam pressure required to burst a longitudinal seam of this boiler, provided, of course, that there is no vibration under this load. The safe working pressure, I may here remark, was one sixth of this amount: $\frac{1}{6}\times 357=60$ pounds per square inch.

Of the pressure required to part the 28 tap bolts sustaining the pressure upon the heads of the dryer cylinders, we take 60,000 pounds to express the tension, required to part a bolt having a sectional area of one square inch cross section; in this case the thread cut on the three-quarter inch bolts reduces their diameters for strength to five eighths of an inch; the sectional area of each, then, is 0·3 square inches. The diameter of the head, acted upon by the steam pressure, was 46 inches; its area, then, is 1,662 square inches. Then $\frac{\cdot 3\times 28\times 60,000}{1,662}=303$ lbs. pressure per square inch. Again, supposing the cast iron cylinder to have been pulled apart by a longitudinal strain, what steam pressure would have been required? Diameter minus approximate thickness $54-1=53$ inches, the circumference of which is about 166 inches, $166\times\frac{15}{16}=156$ square inches of section of metal broken. Then taking only 16,000 pounds as the tension required to part a square inch of this metal, we have $\frac{16,000\times 156}{2,124}$ 1,100 pounds per square inch, the 2,124 being nearly the area of a circle 52 inches in diameter, which is the size of the inside of the cylinder. We find, therefore, that this part of the system is nearly three times stronger than any other part, and if a rupture had occurred from simple pressure, it would have been either in a vertical seam of the boiler, or by parting the bolts of the cylinder head. We must then look for another cause. The steam pressure was most likely at some point above 80 pounds. The temperature of steam at 80 pounds is about 312° Fah.; at this temperature, the heads and about four inches of each end of the cylinders was kept. The remaining part must have been cooled by its girdle of damp batting to at least 232° and perhaps 212°. The rate of expansion for cast iron is given at ·000006 times its length for each degree above 32°; then if the diameter of the cylinder at 32° temperature was 54 inches, at 232°, or 200° higher, it would be $(54\times 200\times \cdot 000006)+54=54\cdot 0648$, and at 312°, or 280° higher, it would be $(54\times 200\times \cdot 000006)+54=54\cdot 0907$—a difference of ·026, and quite enough to cause a fracture, if this difference of 80° temperature occurred in a well defined line round the cylinder. The explosion took place when the rotation of the cylinders had been stopped for a moment, they being encircled by the wet or damp batting, and the fracture followed the line marked by its edge, in its course round the cylinder.

The fracture, then, was caused by the difference in the temperature of the two parts of the cylinder contiguous to each other, and the explosion by the expansion of the steam hitherto held in confinement by the strength of that cylinder.

If any of your readers should take the trouble to read this lengthy communication, and can suggest any more reasonable explanation, I would like to see it.

I would remark that my calculations are not intended to be exact, but approximate sufficiently for practical purposes, and serve to illustrate my theory.

WM. N. HARRISON.

Boston, Mass.

Simplicity in Design.

MESSRS. EDITORS:—Next to good fitting, there is nothing which tends so much to the good repute of a mechanic and his products, as persistency in some simple form or style in the finish and ornamentation of his work.

If the work be a machine, all of the visible shaft, bolt, stud, and nut endings should be turned or milled carefully to the same general shape or form. There is nothing so neat and appropriate as the simple reverse curve style, free from corner or bead.

Inward corners should always be avoided. There is nothing so discouraging in machine cleaning as complicated beadings, or in house cleaning as complex moldings; they are only dirt catchers, void of beauty.

It is no light task to keep a complex machine like the railway engine clean and tidy; the finish and ornamentation of such machines should, by all means, be made as simple as possible. Neatness and utility should be the only objects in their construction, and all elaboration in the way of show should be avoided.

I have often questioned the propriety of using so much brass in the external finish of locomotives; it tarnishes so easily, that an almost continual rubbing is necessary to keep it bright, imposing a tremendous tax on patience and muscle. Paint and varnish judiciously applied occasionally, especially to all of the large surfaces, such as cylinder and steam chest casings, would be far more neat, economical, and satisfactory.

F. G. WOODWARD.

Poisonous Fertilizers.

MESSRS. EDITORS:—The editor of the Boston *Journal of Chemistry* quotes my article on poisonous fertilizers, from page 372 of the last volume of the SCIENTIFIC AMERICAN, and makes the following remarks

The above absurd item has been "going the rounds" of the press during the past six months, and it is quite time that it was stopped. This attempt to frighten farmers who are enterprising enough to dissolve bones and prepare their own fertilizers is hurtful to the interests of agriculture and derogatory to science. In the ordinary sulphuric acid of commerce, which is made from Sicilian sulphur and condensed in platinum retorts, the amount of sulphate of lead present is but a mere trace, seldom exceeding one fourth of one per cent. The same may be said of arsenic; some specimens of acids from the best makers do not afford even a trace of this metal or any of its salts. The dunce who started this item, probably read in some old book or journal that specimens of acid, prepared in England some years ago from iron pyrites, were found by Dr. Rees, Mr. Watson, and others, to contain arsenic, and hence seized hold of the idea of making a sensational article on "poisonous fertilizers." Such loose statements are fraught with evil, and cannot be too severely condemned. It may be said that the quantities of lead and arsenic found in the worst specimens of commercial acid would not have the slightest influence upon crops, when presented through the medium of superphosphates. Farmers and horticulturists need have no fear of deleterious effects from the use of any of the acids found in the market.

I never supposed the quantity of lead or arsenic present would produce any immediate perceptible results; and unless friend Nichols denies that small quantities of poisonous minerals accumulate in the body, he surely has no good reason for the assertions that he makes.

Professor Davy, alluded to in my former letter, says: "As arsenic is well known to be an accumulative poison, by the continued use of vegetables containing even a minute proportion of arsenic, that substance may collect in the system till its amount may exercise an injurious effect on the health of men and animals."

In an editorial article, on page 215, Vol. XXI., the SCIENTIFIC AMERICAN says: "Lead is one of the most insidious of poisons, accumulating little by little in the system through long periods of time."

And I see no reason why arsenic, lead, and all other poisonous minerals capable of forming insoluble compounds with sulphur, or with phosphoric or carbonic acids, may not meet these in the blood, and thus become fixed. I might produce more evidence to show that poisons accumulate and thus produce injury, but will not occupy space to do it at present.

It is evident that, if my conclusions are right, the old-school practice of medicine is at fault; and it appears important that its practitioners should substantiate their views. If Dr. Nichols, or any other drug doctor, will prove that minute quantities of poisonous minerals do not accumulate and produce harm, I shall be most happy to be convinced.

Dr. N. says that I attempted to frighten farmers from preparing their own fertilizers. On the contrary, I would advise them to prepare their own, rather than purchase those found in market. Perhaps the cheapest way of getting an acid free from lead and arsenic, would be to buy the cheapest acid and precipitate the lead and arsenic by hydrosulphuric acid.

H. A. S.

Charlotte, Maine.

The Use of the Jar in Boring for Oil.

MESSRS. EDITORS:—In your issue of April 15th, there is an article, copied from Blake's "Notices of Mining Machinery," in which there is a mistake with regard to the operation of the "jars" used in oil well boring. "By it (the jar) a blow or sudden jerk may be given upwards, so as to loosen the bit in case it becomes wedged in the hole, while the same device serves to give a blow downwards upon the auger, after the bit strikes the bottom, thus doubling the efficiency of each stroke."

It is not the office of the jars to strike both ways, except on special occasions. When the tools stick, in running down, as is often the case with a "reamer," the jars are struck downwards for the purpose of driving them through the "tight place." The jars are sometimes worked both ways for the purpose of wearing a tool loose that has become fastened on the bottom; but otherwise, in the language of an old driller who read the article, "If they should 'ketch' a man working his jars both ways, in the oil country, they would hang him."

The jar was originally introduced for the purpose of knocking the tools loose, when sticking, and are worked, when all is going right, about three or four inches. More than this is useless, and less does not give the driller to understand whether or not the drill is striking the bottom, especially if working a deep hole.

J. W. SADLER.

Tidioute, Pa.

How to Build a Chimney.

MESSRS. EDITORS:—In looking over your excellent paper of March 18th (page 180 of current volume), I noticed an article, written by Austin B. Culver, of Westfield, N. Y., upon the construction of chimneys, to which I fully subscribe, so far as he goes; but I think that he has overlooked one important matter, which, no doubt, has been the cause of more fires than any other which has come to the notice of the public. That is the improper construction of the water table, made by projecting one course of bricks on each side of the chimney, about an inch over the body of the chimney, at a point where the chimney was brought through the roof. The error is in making it too low. Chimneys are generally built before the building is shingled, and proper allowance is not always made for the thickness of the shingles; hence they are crowded up tight under the water table. If the chimney settles more than the building, or if it be a flue, built upon any part of the wood work, or upon a flue stone resting upon joists too weak to sustain the weight, the result is the separating of the chimney by the water table resting upon the shingles, thereby making an opening at a very dangerous point, where burning soot or sparks can most easily communicate to the shingles.

ISAAC BRADFIELD.

Pomeroy, Ohio.

Early Railroading.

MESSRS. EDITORS:—On page 242 of the present volume of the SCIENTIFIC AMERICAN, there appeared an article giving some statements in regard to early railroading, in connection with the name of William Hambright as an old conductor. The facts recited recal the nearly analogous case of the Baltimore and Ohio Railroad, and Captain John Mitchell, of Baltimore. The Lancaster Railway was one among the first railways in this country, but not the first one.

According to my authorities, the first railway was a rather inferior one, which ran a short distance out of Boston. Then followed the Baltimore and Ohio Railroad, whose charter is dated in 1824, and the corner stone of which was laid at Baltimore in 1828. This road ran originally to Ellicott's Mills, a manufacturing site about ten miles from this city, and an attempt was made to use wind sails as the means of propulsion on the road, but they were speedily abandoned for horse power; and, some time after, two locomotives with upright cylinders—commonly called "grasshoppers"—were imported from England. The road extended in 1830–1 to Frederick City, Md., a distance of sixty miles; thence it was laid to Cumberland, and finally to the Ohio river.

John Mitchell, a well known citizen, was appointed mail agent by Hon. Amos Kendall, postmaster general, in 1837, being the first railroad mail agent under the United States government. His route lay from Washington to Philadelphia. He was paid a salary of $800 per annum, and he alternated on the route with John E. Kendall, a nephew of the postmaster general. Capt. Mitchell occupied his post a short time, when he resigned to accept the office of high constable of Baltimore, a position which he held for several successive terms. He is now the captain of one of the police districts of this city, and still a hale, hearty, and active gentleman and officer.

G. W.

Baltimore, Md.

Wooden Railways.

MESSRS. EDITORS:—Noticing considerable discussion in your columns on the subject of wooden railroads, I wish to offer some results of my experience, touching the difference in the material used.

At the Marine Railway at this place, the carriage used in hauling out vessels is 300 feet long; as few vessels on the lakes are over half this length, and the upper part of the carriage is but little used, the track for some years was made of hardwood plank, 2 inches thick by 7½ inches wide, laid upon heavy oak stringers. These planks were rock elm, white oak, and hard maple. So long as they had but to carry the weight of the carriage, they all worked well, but as soon as we began to handle vessels on the upper part of the carriage, the elm and oak plank commenced peeling and winding around the rollers, causing considerable trouble. The maple continued to work well until the whole was replaced by iron.

Here the movement is of course very slow, but the pressure on the rollers is heavier than the tread of any locomotive.

In the account of J. M. Speer, Sr., & Sons' wooden railroad (April 1st), the rails are white oak, and acted just as they did here.

On the Clifton Railroad, I understand they are principally maple. This wood is not so durable as oak in resisting decay, but wears far better under a wheel. The reputation which the Clifton road bears here among those best acquainted with it, and uninterested in it, seems to be quite similar to that of Messrs. Speer with theirs, so far as its permanent value is considered.

G. W. PEARSONS.

Ogdensburg, N. Y.

What Women Want.

MESSRS. EDITORS:—I saw some remarks in a late number of your paper about the probability of finding a cheap power, available for the ordinary purposes of every neighborhood. With your permission, I will say a few works regarding some wants of women which, it seems to me, might be served by it. I believe one reason why the lot of the majority of women has not been more alleviated by invention, is that their requirements are not fully understood. That dumb, pathetic patience, with which the household workers toil and wear out, leaves men in the dark as to how to help them. I have had occasion to think a good deal about their necessities, and will explain what seems to me to be the fittest means of satisfying an important one.

I believe few things could be desired which would so much relieve this class of women, as a cheap laundry in every neighborhood. I have long pondered about this, but the want of cheap power seemed to render the accomplishment of such an object impossible. Washing machines for every home do not meet their difficulty, for it is constant work and consequent want of time, and not alone heavy work and want of strength, which needs to be relieved. I do not mean to say washing by hand is not hard labor; but this cannot be relieved by mere mechanical devices without losing in time. Nor could the employment of some other than human force settle the difficulty, since there would be still a mental and physical strain of constant attention.

The care of a household, with its cooking, house cleaning, washing, ironing, sewing, and mending, brings conflicting claims of duty. They harass a woman, because all must be, to some extent, neglected, and no one of the number seems to admit it. Thus the exertion is long continued, the care very great, and this wear and tear breaks down the nervous system, a woman's most sensitive part.

Thus, women need to have their work divided, and done in part by others. It may perhaps be thought that my description of the trouble shows the want of servants. But there can, in the very nature of things, be but a very small minority of the sex who can be thus aided. Wherever the very great majority of women do not marry, there is an artificial state of matters. For my part, I think that the want of good servants, which becomes greater and greater every year, as civilization is diffused, is owing to natural causes, and shows that we must make some other provision to lessen household labors.

If women who have families, could get garments made (leaving them no sewing but the mending); if they could have all the washing done, and that part of the ironing (a good deal) which could be done by machinery; the work which would be left, would neither wear them out nor render mental improvement or enjoyment impossible. It could rarely be very heavy, except in cases where there would be more than one woman in a family to do it.

I am satisfied the sewing could be go trid of, though it is foreign to the present subject to say how.

I suppose two things are needed to make real this fine project of mine for disposing of washing. The first is to obtain cheap power in every neigborhood; and, I presume, if wind could cheaply be made to store up compressed air, thus changing a variable to a constant force, it would be accomplished. The other requirement is machinery so cheap that somebody, in every country neighborhood, would be able to purchase and make a living by it. Perhaps it may sound Utopian to say this, but if clothes could be washed, dried, and ironed (so far as machinery could be made to do this) for twelve and a half or even twenty-five cents a dozen, it would confer a boon on women a million times greater than the ballot.

I suppose most inventors think mainly of the money they may make, and it may be considered a waste of words to speak of blessings to humanity. But in the old-fashioned time and place in which I was raised, money made without a benefit of equal value to the community from which it was obtained, was regarded as a not very honorable possession. As I have never given up this opinion, I refuse to think that honor is dead among others, and I hope there are some inventors who will be influenced, not merely by the prospect of gain, but by the hope of benefitting the sex to which their mothers belonged. BETSY.

Need for Long Lamp Wicks.

MESSRS. EDITORS:—In the number for April 8th, E. W. B. disputes the need for wicks longer than those at present sold by American manufacturers.

For some years I have imported, for my own use, English wicks, which are put up in rolls of one dozen yards. Beside the economy, the mess and trouble of changing a wick is reduced to a minimum.

Should any American manufacturer, who makes a good article, try the plan of selling in rolls, I have no doubt it would either largely increase his business, or compel other makers to adopt the same system.

I know of only two American manufacturers who make really good wicks, but in reference to the English, I can say that the last, of a yard length, burns as well as the first.

CANADENSIS.

Standard Sizes for Rails.

Mr. Bessemer, in his inaugural address as President of the Iron and Steel Institute, makes the following remarks on standard sizes for railway iron:

"In the early days of our railway system, the great Stephenson and his compeers had to feel their way gently in the new career they were pursuing; their engines were mere toys compared with those we now employ, and the loads they drew were small in proportion. It was, therefore, only necessary that they should employ a rail suitable to the traffic of the lines as then worked; but as the railway system began to develop itself, and new lines were opened, the necessity for heavier engines and greater traffic became apparent to the engineers by whom they were designed. Nor was the mere addition of size the only point studied; different modes of laying down the rail were proposed, and were canvassed with great interest. Stone blocks gave way to cross wood sleepers, and these again had their rivals in longitudinal sleepers, and with them came the bridge rail, and the Vignoles rail, and the double-headed rail now commonly in use. Nothing could be more natural than the way in which the profession thus glided imperceptibly into the adoption of rails, of almost every imaginable variety of form and size, nor can any one be blamed for a result almost inevitable under the circumstances.

"But it is now evident that there is no need in practice for this infinite variety of size and form; we know pretty accurately what is the general average traffic on a line, and the weight of our engines. The work which a rail has to perform is so perfectly simple, and so clearly defined, that there cannot at the present day be any difficulty in establishing a standard rail suitable for all purposes.

"Thus, suppose we take the double-headed and the Vignoles rail, as representing the two classes of rails suitable for longitudinal or cross sleepers; and if we make a heavy, medium, and light one, of each of these types of rail, we should have a choice of six sizes, that would supply all the reasonable demands of our present railway system. Taking these three standard sizes of iron rails, of each class, I would then make three other standa ds of steel rails, in which the table or wearing surface was identical in each case with the iron standard, but so reduced in weight per yard as to reduce its power to resist a blow, or to sustain a weight precisely equal to the iron standard; so that in all cases the iron *a b c* rails and the steel *a b c* rails should possess the same powers of resistance to a heavy load, or a sudden concussion. We should thus diminish the great apparent difference in price between the iron and steel rail, for it must be remembered that the price per mile, and not the price per tun, is the real test of the cost of rails. The adoption of a standard rail would afford great facilities to the manufacture, by diminishing his stock of rolls, and allowing him to manufacture in slack times, and to supply any sudden demands from stock. It would lessen the cost of production, and afford the general advantages, to the consumer and producer, which have hitherto resulted, in all cases, from the adoption of universal or standard measures. It is difficult to imagine the state of utter confusion that would have reigned throughout our whole railway system, had the gage differed on every rail to the same extent as the rails. The one instance afforded by the broad gage is sufficient to convince us of the immense disadvantages that would have resulted from such an error, and, I doubt not that, should we happily arrive at an universal *a b c* standard for rails, we shall in the future look back with dismay at our present chaotic state."

Earths and Alkalies used in Pottery, etc.

White American bolus is bright, white, compact, very smooth and soft, not coloring, burns very hard, and at last forms a whitish glass.

Pearl white: light, smooth, not unctuous nor coloring; burns to a very pale yellowish white.

Tobacco-pipe clay: smooth, unctuous, slightly coloring, but is rather hard and very white; used principally to make tobacco pipes and white stone wares.

White lumber stone is used to take stains of grease out of woolen cloth.

Soap rock or Spanish chalk is white, firm, compact, weighty, hard, smooth, unctuous, not coloring; writes upon glass, and, if rubbed off, the marks become again visible by breathing upon the place, and, therefore, very useful in painting on glass, the engraving being afterwards hardened by fire; and, therefore, preferable for staining by fluoric acid.

Kaolin or porcelain clay is dry, friable, unfusible; that of Cornwall is used to make English china and fine pottery; that of Limoges, to make Sèvres china, and is exported to most all countries of the globe. In earlier and the present times, similarly famous for their beautiful gilding and paintings, these articles are made in the manufactures of Meissen, and at Berlin and Passau, to make china for Saxony, Prussia, and Austria.

White chalk is white, soft, will mark linen when newly burned; it grows hot with water, and falls into powder, and is then made into crayons for painters.

Terra cimolia is white, compact, smooth, coloring, burning rather harder, found in the island Argentière; it is used to wash clothes.

Hard chalk is coarse.

Spanish white, *blanc d'espagne, blanc de troyes*, are made from soft chalks by washing and making into large balls for cheap white painting, and covering papers, cards, etc.

Prepared chalk is made by precipitation from a solution of muriate of lime by a solution of sub-carbonate of soda in water, and washing the sediment.

Magnesia is white, and is obtained by precipitating the bittern or liquor left in the boiling of sea water, after the common salt has been separated, by a lye of wood ashes or sub-carbonate of potash.

Sub-carbonate of magnesia is made up while drying into large cubes, the edges beveled; is powdered by being rubbed through a sieve.

Gelatinous alumine, hydrate of alumine, or pure alumine, not dried, but in a moist state, is used to mix cobalt in an oxidised condition, and other oxides, as a basis for the color.

Baum's white of alum: Roman alum, one pound, honey, one half pound, calcined in a shallow dish to whiteness.

Blanc de Bougival or gera earth is silvery, silky, white, very fine and glossy if rolled with a glass roller; used to make enamel surfaces on paper or cardboard; is effervescent with acids, and used as well as fine whiting.—*Professor Dembinsky, in the Mechanics' Magazine.*

Preservation of Meat.

Dr. Baudet, of France, has given details of a variety of experiments by him, made with solutions of carbolic acid, or, as some term it, phenic acid, in the preservation of meats. As the results of the experiments of one process, the acid used in aqueous solutions, he says:

I conclude that phenicated water, in the proportion of from $\frac{1}{1000}$ to even $\frac{5}{10000}$, might be applied to keep raw meat fresh and sweet, without imparting to it either any perceptible smell or taste, provided the meat be kept in well closed vessels, be they casks, tinned iron canisters or other vessels.

Second process; By means of vegetable charcoal, coarsely broken up, and saturated with phenicated water, at from $\frac{5}{10000}$ to $\frac{1}{1000}$. This process is applied as follows: I cover the meat with a thin woven fabric, in order to avoid its direct contact with the charcoal, which might penetrate into the fiber of the meat, which is placed next into barrels, care being taken to place therein first a layer of the phenicated charcoal, then a layer of meat, and so on alternately, until the barrel is quite filled, and all interstices properly taken up by the charcoal.

As regards the importation of raw meat, preserved by this means, from South America, I would suggest that the meat, first covered with any thinly woven fabric, be placed in bags made of raw caoutchouc, very abundantly obtainable in the country alluded to; so that the importation of raw meat and the importation of caoutchouc might go, as it were, hand in hand.

The mode of filling in alternate layers of phenicated charcoal and meat would, of course, remain the same; and there would be no difficulty in hermetically sealing up bags made of caoutchouc, either by soldering the seams together, or by placing a cap of caoutchouc over the mouth of the bag, and soldering the cap on hermetically.

Dangerous Burning-Fluid.

It would appear to be the duty of every scientific journal to utter a note of warning against the dangerous burning oils with which our country may be said to be literally flooded. The number of accidents arising from the use of adulterated oils is so great that many life insurance companies are disposed to charge higher rates where petroleum is employed in the family of the assured. The community is always deeply shocked at a murder or railroad accident, and a thorough examination is at once held by the coroner; but the burning to death of whole families, the immense destruction of property from fires occasioned by adulterated and dangerous oils, make no more than a passing impression. There appears to be no doubt that the number of deaths from this cause is far greater than from railroad accidents; and the sooner the most stringent measures are adopted to guard the community against the repetition of such calamities, the better for all concerned. We desire to call attention to the mountebanks who travel around the country to exhibit their non-explosive oils. They show that it is impossible to explode their particular brand, and they give as a reason that it has been treated with certain chemicals in a way to remove all danger. The oil, they say, has been "carburetted" or "carbonized," "ozonized," "oxygenized," and is no longer liable to explosion. They put some of the fluid in a can and set fire to it, and sit down on the can. They perform as many tricks as the most experienced master of legerdemain, and perfectly silence unscientific listeners. These men are one and all, impostors, and if you live in the country, call in the hired man and turn them out of doors; if you reside in the city, call in the police and enter a complaint against them then and there, and have free lodgings provided for them in the station house. Nobody pretends that naphtha, alcohol, ether and the like are explosive. They can be lighted and burned quietly and in the most inoffensive manner. It is only when mixed with the oxygen of the air that an explosive compound is produced, and this part of the experiment is naturally omitted by the exhibitor. It requires considerable skill to prepare just the right mixture of light oils and air to insure success, and it is under cover of this difficulty that the dealers in adulterated oils escape detection. Unfortunately, just the proper mixture is sometimes formed in lamps as the oil is exhausted, and the fatal explosion takes place. The number of accidents from the bursting of lamps is very small, and it is not the question of explosion that should attract the most attention. By far the greater number of deaths and losses by fire have arisen from the ignition of the lamps or cans, either from the breaking of a lamp or some careless handling of the petroleum—the ignited fluid spreading over the clothing of the person or on the floor is what does the damage. It ought to be understood that there is no chemical that will make an oil safe; the patents and claims on this subject are sheer impositions. The only way to make an oil safe is by distillation, that is, removing from it all oil or naptha that will take fire below 110° F. Any oil that can be lighted on its surface by a match and will continue to burn without a wick, is unsafe. Sperm oil, rape seed oil, and the refined petroleum can be poured upon the floor and a match applied, but they will not burn; it is necessary to heat them to a high point before any vapor will come off that will take fire from a taper and continue to burn. Any oil that, when poured into a saucer, will take fire from a match and continue to burn, as alcohol does, is unsafe, and ought to be discarded at once. Such an oil contains volatile compounds which can give rise to explosive vapors, and if the lamp breaks, may occasion the most dangerous burns. We must therefore warn all persons from using such oils about the premises.

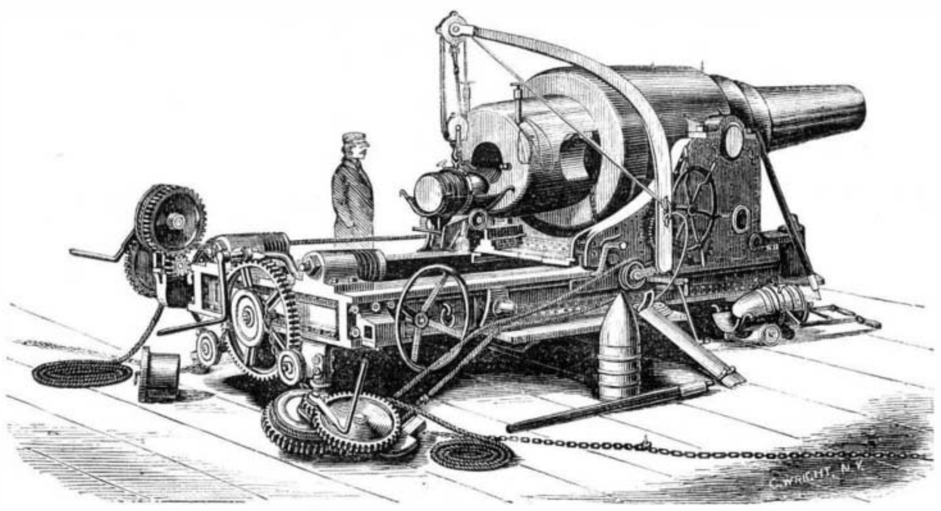
There is another danger to which we wish to call attention and that is the use of cheap fluids in the so called vapor stoves. Next to the use of gunpowder for heating purposes, we know of few things so dangerous as these inventions. Their very utility is founded on the conversion of the oils into a vapor so that it can be readily ignited, and afterwards the heat of combustion keeps up the supply of gas. The persons who use these contrivances first manufacture a vapor that, when mixed with air, is fearfully explosive, and then in defiance of fate, they put a light to it, and ought to be thankful that the whole apparatus is not blown to atoms. The inventors of these infernal machines are fully aware of the danger and hence the long list of precautions that accompanies each package; all of the directions are intended to guard against the formation of the explosive mixture of air and vapor mentioned at the outset of our article. The skill required to manipulate such contrivances is of the highest character. We have used them in laboratories to produce a powerful gas jet for many years, but never allowed any but experienced assistants to attend them. In inexperienced hands or where the greatest care is not constantly exercised, they should never be used. We repeat, trust none of the so called non-explosive oils or patent contrivances to burn them.—*Journal of Applied Chemistry.*

Krupp's Cast-steel Breech-loading Rifled Guns.

The superiority of cast steel over every other material used for guns is now an acknowledged fact, and its general adoption may be regarded as merely a matter of time. The Krupp system of breech-loading steel guns is now used by many of the European governments with much success, and to the wonderful accuracy of range and great penetrating power of these guns may be attributed, in a large measure, the recent victories of the German armies whenever their artillery was used. They are manufactured at Fried. Krupp's great establishment, at Essen, Prussia. An interesting description of these works was published some time ago in the SCIENTIFIC AMERICAN. About two thousand steel guns have, so far, been turned out.

The largest Krupp guns used at the siege of Paris were 24-pounders, or, as they are now called, fifteen centimetres (about six inches). The weight of this gun is about six thousand pounds; charge of powder, four and a half to five and a half pounds; weight of projectile, fifty-five to sixty pounds. The French forts were armed with the largest marine guns of the French fleet, but the accuracy of the 24-pounders soon dismounted them, piercing the casemates and reducing Fort d'Issy to a heap of ruins. During the entire siege operations, as well as in the artillery fights, the loss of the Germans was insignificant.

Our engraving is a view of one of Krupp's eleven-inch, breech-loading steel guns, with self-acting casemate carriages, showing also the mode of charging the gun. An illustration of a fourteen-inch gun, of somewhat similar form, carrying a projectile weighing 1,000 lbs., was published in our paper of Oct. 1, 1870.



KRUPP'S CAST-STEEL BREECH-LOADING RIFLED GUNS.

COMPARATIVE VALUE OF VARIOUS GUNS.

	Weight of gun.	Weight of projectile.	Weight of charge of powder.	Foot-tuns per square inch of section of projectile.
	lbs.	lbs.	lbs.	
24-pounder siege artillery	6,000	55 to 60	4½ to 5½	
" " marine hooped gun	8,000	77	15	47·70
11-inch Krupp gun	55,000	495	83	74·70
15 " Rodman gun	39,000	460	60 to 100	26· to 43·

The above table shows that the penetrating power of a 15-inch Rodman gun, weighing 39,000 lbs., with 60 lbs. of powder, is equal to 26·80 foot-tuns, and with 100 lbs. of powder, equal to 43 foot-tuns, while the 24-pounder Krupp gun, weighing only 8,[illegible]00 lbs., and with only 15 lbs. of powder, is equal to 47·70 foot-tuns. A ship armed with this light weapon would be more than a match for any vessel with as many 15-inch guns on board as she could carry.

In view of these facts the quicker our government removes the smooth bore Rodman guns from its forts and vessels, the better. It is evident they are good for little except old iron.

The latest competitive trial of steel guns took place on the Steinfeld, at Vienna, in October, 1870, between a Krupp 9 in. breech loading gun and a 9 in. Armstrong muzzle loader.

After 111 rounds (with prismatic powder), the Armstrong gun showed a split 26 inches in length, and was declared to be completely unfit for service.

The Krupp gun fired in the same time 210 rounds—the gun and the breech loading apparatus being pronounced perfect at the close of the trial.

The greatest number of rounds, fired from one of the 11 in. Krupp guns, on record at the works, is about 600, but some of them have, no doubt, fired a much larger number.

The 14 in. guns (50 tuns) were tested two years ago by 18 rounds each, with projectiles of 1100 lbs. and 150 lbs. of powder.

Thos. Prosser & Son, 15 Gold street, New York, are the American agents.

Workmen's Houses.

It is so repugnant to the feelings of an Englishman, says the *Scientific Review*, to be compelled to dwell with several families in one house, that every endeavor to provide cottage accommodation for workmen, who have naturally but a limited amount to dispose of for rent, should receive the utmost possible encouragement; more especially as, from the smaller amount of profit attending the construction of cheap houses, there is less inducement for architects and builders to give their attention to that class of dwelling. To meet, therefore, the wants of workmen, whether artisans or clerks, Mr. John P. Harper, M. E., of Derby, has prepared an admirable series of plans for workmen's houses and semi-detached cottages, which can be so cheaply erected as to permit of their being let at a merely nominal rental, although affording all the comfort and convenience that need be desired.

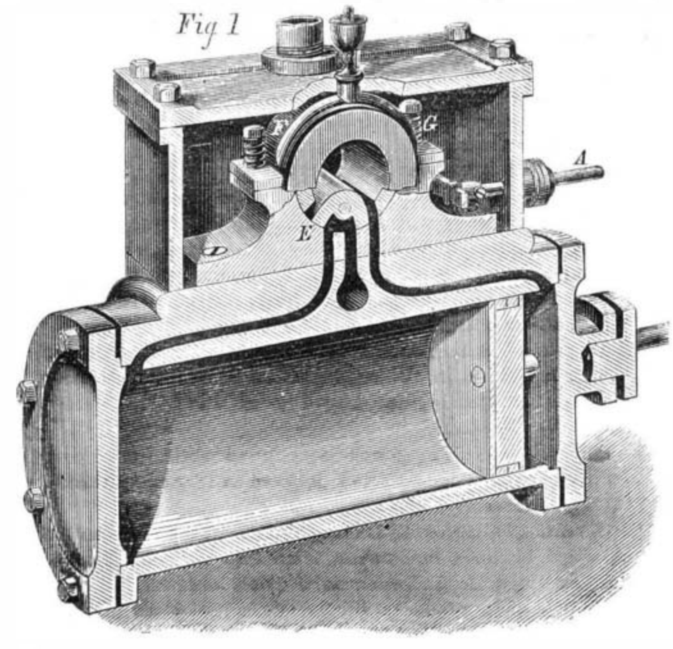
The hollow brick wall is that which Mr. Harper advocates, and as by this means one third of the bricks otherwise necessary are saved, its advantages will be obvious. The hollow walls, moreover, are quite as substantial and durable as solid walls of equal thickness. As in this system of building there is always an air jacket between the inner and outer portions of the walls, the damp cannot enter the rooms, so that the houses are rendered drier, warmer in winter, and cooler in summer. The advantage of the hollow wall system may be judged of from the fact that some of the houses built in dry weather upon that system, by Mr. Harper, have been inhabited before quite completed, without injury to the occupants. As the design of the houses, and the amount of the accommodation given, must, of course, be dependent upon the amount of money that can be expended upon them he has prepared several sets of plans to meet the various requirements, care being taken in all cases to give a moderate-sized living room, and ample bed room accommodation.

In the plan, which seems to have secured the greatest amount of approbation—for Mr. Harper has built a considerable number of houses upon it, and the tenants have always expressed themselves highly satisfied with the arrangements and accommodations afforded—he has given an excellent living room, or kitchen, 15 ft. by 14 ft. 2 in., with a small space (about 8 ft. by 3 ft.) taken out at one corner for stairs and cupboard; a parlor 11 ft. by 9 ft.; and a good cellar pantry 9 ft. by 3 ft. 7 in.; while on the upper floor are three moderate-sized bed rooms—one with a good fireplace in it. The privies, ash pits, and coal stores, are at a distance from the houses, so that their healthfulness is insured. When built in blocks of not less than twelve, these houses can be erected at the rate of £78 each (exclusive of drains), and a small scullery, or wash house, can be added at very little cost. The design appears very good, and is calculated to give good and efficient ventilation in every room.

SEIFERT'S BALANCED STEAM VALVE.

The soul of a steam engine, if we may be allowed such an expression, is in its valve gear. It is this, principally, that gives an engine its individuality, and upon it, more than on anything else, depends the economy with which a steam motor performs its work.

Fig 1



Many have been the devices by which it has been sought to relieve steam valves from the pressure on their faces.

Fig. 2

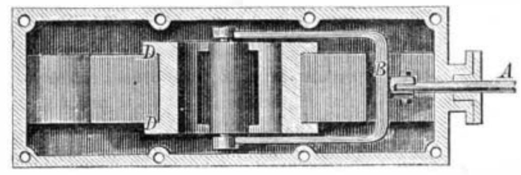
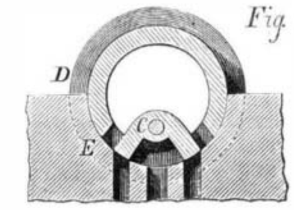


Fig 3



To say that a perfectly balanced valve probably does not exist, is only to reiterate the story of man's constant failure to attain to his ideal, whether in mechanics, art, or morals But although imperfections cannot be wholly eliminated from this class of devices, any more than from anything else man can contrive, a degree of perfection may be, and has been obtained, sufficient to greatly lessen the loss of power expended in overcoming valve friction.

Our engraving shows another competitor in this field, designed primarily for use on locomotives, but adapted to any kind of engine, which, while it is claimed to be as perfectly balanced as others in use, offers advantages not possessed by them.

The valve is cylindrical, and fitted to seat on all sides The steam is admitted through the center of the valve, and pressing equally in all directions, does not press the valve more in one direction than in the opposite direction, so long as the fitting remains steam tight.

Fig. 1 is a vertical and longitudinal section through cylinder, steam chest, and valve. Fig. 2 is a plan view of the valve and its attachments, and Fig. 3 is a sectional elevation of the valve, with a portion of the seat. The valve stem, A, Fig. 2, is pivoted to a yoke, B, which in turn is pivoted to the valve at the lower side, as shown at C, Fig. 3.

On each side of the valve is formed a rim or flange, D, Figs. 2 and 3, which fits steam tight against the sides of the valve seat, E, Figs. 1 and 3, and also tight against the sides of a cap, F. This cap, F, is held down to its place by studs and coiled springs, shown at G, Fig. 1. This allows the valve to rise when the motion of the engine is reversed, or when it is running without steam.

The valve, being simply a slide valve running upon an interior cylindrical surface, retains all the properties of the ordinary slide valve, with this additional characteristic, that, moving on a central axis, which is the geometrical axis of the cylindrical surface of the valve, it has a quicker motion, giving more rapid admission of steam, sharper cut-off, and freer exhaust.

Besides these advantages, it is claimed that it can be made at a cost little exceeding that of the plain slide valve When the engine works water, all sediment tends to run down and escape at the exhaust, instead of spreading over the seat and cutting the surfaces of both valve and seat. The valve can be applied to any engine in use, the new seat being placed over the old one without any injury to the latter. The seat of the valve, except, at most, the areas of the two ports, being always covered, it is not so liable as the old style of valve seat to be injured by rust, when the engine stands unused. In case the yoke should break, it will drop at once down, out of the way of blows from the return stroke of the valve stem, which obviates the breakage of parts in the steam chest under such circumstances. If the valve itself should break, which sometimes occurs, none of the broken parts can get out of place or wedge in the ports, and thus give rise to extensive breakage, as would be the case with the plain slide valve.

It is claimed that on engines with heavy fly wheels, and upon which the demand for power is very unequal, as with those used for driving rolling mills, etc., the quick motion of this valve will act as a controller of speed, enabling the engine to accommodate itself to the work to be performed.

The valve is lubricated by means of a cup with tubes leading down over the cap, as shown in Fig. 1; and it retains oil better than a plane surface.

Patented, through the Scientific American Patent Agency, March 28, 1871, by Seifert and Kane.

Address for rights or license to use, Mr. T. Kane, 222 East Fifty-second street, New York city.

The Star Sirius.

Many things combine to render this brilliant star an object of profound interest. Who can gaze on its pure silvery radiance, and reflect how many ages it has adorned the heavenly dome with its peerless lustre, and how many generations of mankind have rejoiced in it—and among them all the wise and the good and the great of history,—without awe, and admiration!

In ancient Egypt, it was an object of idolatrous interest. It was then of a brilliant red color, but is now a lustrous white; and the cause of this change of color, as well as the nature and period of the revolution it denotes in the star itself, are wholly unknown. Its distance from our earth is not less than 1,300,000 times our distance from the sun; and its light must travel twenty-two years to reach us! Another circumstance of deep interest connected with it is, that it has changed its position, during the life of the human family, by about the apparent diameter of the moon; and that astronomers, detecting some irregularities in its motion, have been convinced that it had a companion star—which they thought to be non-luminous, since their telescopes could not detect it. But Mr. Clark, with his new and powerful achromatic telescope, has found this neighbor of Sirius, hitherto invisible, and verified the conclusions to which astronomers had been led by reasoning on the facts they had ascertained.

HOW TO PRESERVE EGGS.—Apply with a brush a solution of gum-arabic to the shells, or immerse the eggs therein; let them dry, and afterwards pack them in dry charcoal dust. This prevents their being affected by any alterations of temperature.