

**VAN RENNES' CALORIC ENGINE AND PUMP.**

As a motor of small size for use in the trades, a new construction of hot air engine and pump has recently been brought out by Mr. D. W. Van Rennes, of Utrecht, Holland, which has quickly found favor, owing to its simplicity and low running expenses.

This motor is represented in our illustrations, in which Fig. 1 shows a motor of the smallest size, heated by a gas flame; Fig. 2, one for four horse power, and Fig. 3, a vertical section of a motor connected with a so-called caloric pump.

On a solid bed frame of suitable size is supported a closed cylinder, T. At the inside of the cylinder is a large piston, X, whose rod, e', passes through a stuffing box, e, to the outside. Between the piston, X, and the walls of the cylinder, T, is left a small communicating space. The upper part of the cylinder, T, is surrounded by a funnel shaped jacket, l, which is partly filled with water for the purpose of cooling, while the lower end of the cylinder is heated up by a gas flame, and in larger engines by a coal or coke fire. The temperature of the air at the inside of the cylinder becomes by the heat of the fire higher at the lower than at the upper part of the same. The heated air ascends in the space around the piston to the upper part, and passes through a pipe projecting from the cover and through a rubber tube to a small copper cylinder, p, which oscillates on a pillar, D, and is open at the bottom. The pressure of the air forces the piston, a', of the small cylinder, p, forward, and moves simultaneously the piston of the stationary cylinder downward. As the piston rod, e', of the large piston is connected by a walking beam and crank rod with the crank shaft of a flywheel, and also the piston of the oscillating cylinder by a piston rod with a second crank of the flywheel shaft, it is obvious that the two rectilinear motions of the pistons produce the rotary motion of the crankshaft. As soon as the pistons, X and a', have arrived at their terminal points, the cooling water jacket begins to exert its influence. The cooling off of the air above the pistons, X and a', produces a partial vacuum, which, in connection with the direct pressure of the atmosphere on the bottom of the piston, a', lifts the piston, a', and returns simultaneously the piston, X, into its former position. The alternate raising and lowering of the pistons produced by the continuous heating up of the large cylinder, produce a continuous rotary motion, which may be utilized.

The caloric pump has in its working some similarity with the "Pulsometer," only that heated air effects here what steam accomplishes in the other. As in the caloric engine the cylinder, p, is connected with the main cylinder, so in the pump a cylindrical vessel is connected by a pipe, r, with the cylinder, T. A suction pipe leads therefrom into a water reservoir below, while a force pipe, C, runs from the top to the place to which the water is to be conducted. The mouths of both pipes are closed by valves, n and o, which open upwards. The heated air passes through the

thereon sufficient to force it up and out through valve, n. As soon as the pump is in motion, a continuous current of water, but no air, is forced through valve, n, so that by the action of the fire below the cylinder, T, the alternate heating and cooling of the inclosed air, and thereby the continuous raising of the water, are produced. One of these pumps is at work in a factory near Amsterdam, where it lifts per minute 28½ gallons of water to a height of 18 feet, and works to the great satisfaction of the owners.

**Building in Steel.**

In their final report the Committee of the British Association on the use of steel for structural purposes, states "that

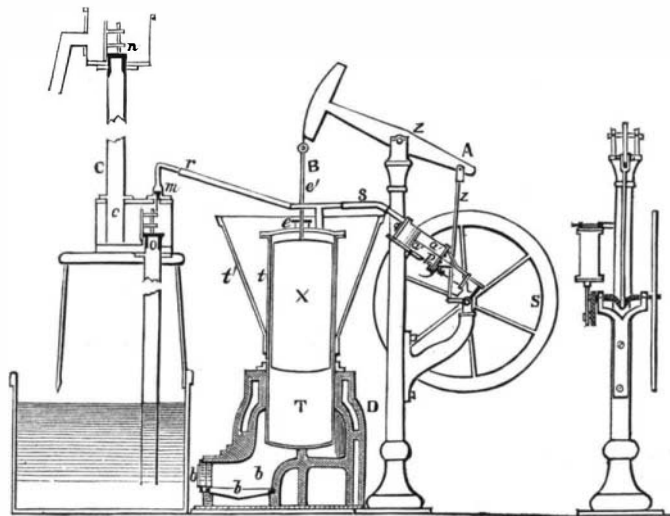


Fig. 3.—VERTICAL SECTION OF ENGINE AND PUMP.

the employment of steel in engineering structures should be authorized by the Board of Trade under the following conditions, namely: 1. That the steel employed should be cast steel, or steel made by some process of fusion, subsequently rolled or hammered, and that it should be of a quality possessing considerable toughness and ductility, and that a certificate to the effect that the steel is of this description and quality should be forwarded to the Board of Trade by the engineer responsible for the structure.

"2. That the greatest load which can be brought upon the bridge or structure, added to the weight of the superstructure, should not produce a greater strain in any part than 6½ tons per square inch. In conclusion, we have to remark that in recommending a coefficient of 6½ tons per square inch for the employment of steel in railway structures generally, we are aware that cases may and probably will arise when it will be proposed to use steel of special make and still greater tenacity, and when a higher coefficient might be permissible, but we think those cases must be left for consideration when they arise, and that a higher coefficient may then be allowed in those instances where the reasons given appear to the Board of Trade to justify it."

interest of steel manufacturers as opposed to iron manufacturers, to secure to them advantages which would not naturally accrue to them, else we think a higher coefficient, a greater difference in strength and resisting force, as compared with iron, would have been demanded of the steel.

**New Inventions.**

Mr. Martin Bock, of Hughesville (Drum's P. O.), Pa., has patented an improved Clock Case, in which a time movement, a striking movement, and an alarm movement are carried in and by a single frame, and inclosed in a case of neat appearance and of compact form and size; provision is made for operating and regulating the various parts from the exterior of the case; a cheap, substantial, and serviceable clock is produced, and several advantages are obtained.

An improved Annealing Furnace has been patented by Mr. Edwin H. Hill, of Worcester, Mass. This invention relates to an apparatus for annealing and spooling wire at one operation, while it is more particularly intended for wire used on reaping machines; it is also applicable to other descriptions of wire.

Mr. Ferdinand Diescher, of New York city, has patented an improved device for attachment to a bedstead to prevent children from falling out of bed. The invention consists in a number of strips of wood jointed together at their upper ends and having the lower ends spread out fan-like, and attached to the bedstead by means of a socket that receives the middle strip.

Mr. Philip Listeman, of Collinsville, Ill., has patented an improved Gate, which is so constructed that it may be conveniently opened and closed by a person on horseback or in a vehicle. It is simple in construction and easily operated.

An improved Post Hole Digger has been patented by Mr. Charlton Patterson, of Rock Island, Ill. This invention consists in the combination, with the digging bucket, of an annular piston and central piston rod, operated by a connecting rod and lever, the latter being pivoted to the hollow handle of the post hole digger.

Morris Jacobs, of Fort Clark, Texas, has patented an improved Padlock which cannot be unlocked by a key, in the ordinary manner, without a preliminary and peculiar manipulation in order to place the tumblers or locking bolt in the required position for contact with the bit of the key. The body of the padlock is made in two separate parts, the one being pivoted to the other, and capable of rotation (when released by spring catches) to change the position of the tumbler and bolt with reference to the key hole.

Mr. Seth Kethledge, of Center Point, Iowa, has patented an improved Lumber Measure, in which the motion of the spur wheel or toothed disks is transmitted to an indicator which has a reciprocating rectilinear motion longitudinally of the carrying frame or case. No adjustment is required for the purpose of measuring boards of different widths. Instead of a circular dial there is a scale marked with figures arranged in columns extending longitudinally on the surface

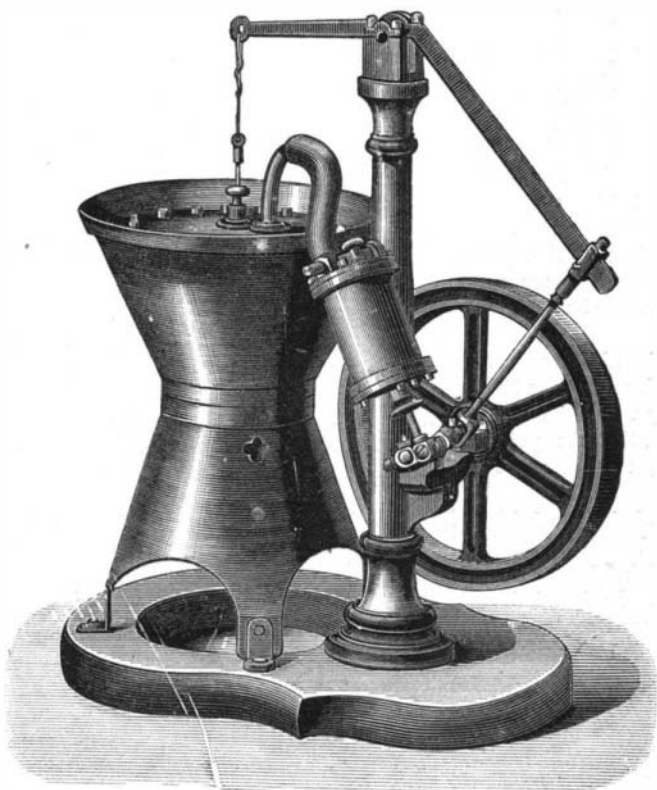


Fig. 1.—SMALL CALORIC MOTOR.

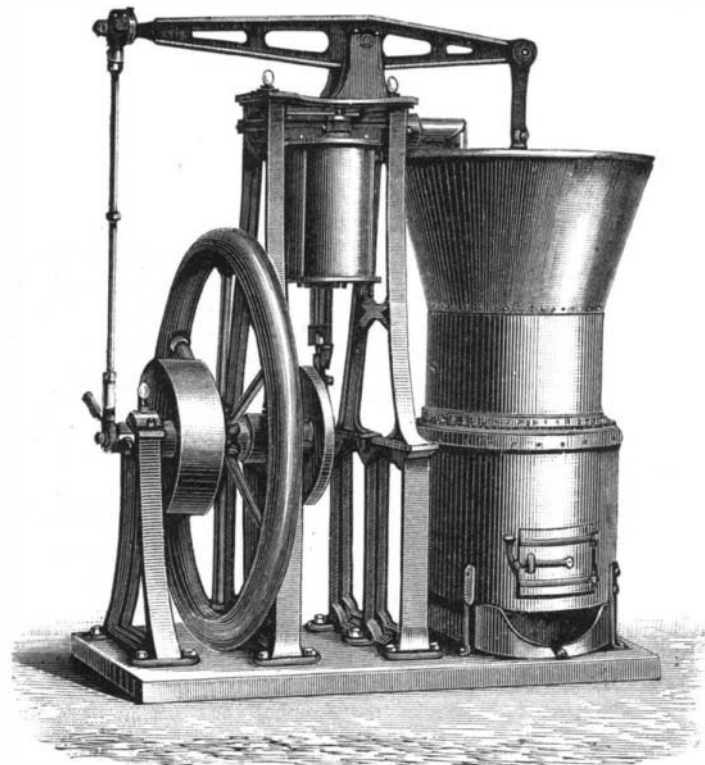


Fig. 2.—FOUR HORSE POWER CALORIC ENGINE.

opening, m, into the cylindrical vessel, and into pipe, c, closing the valve, o, and opening the valve, n. As soon as the air is cooled off by the cold water jacket, the atmospheric pressure closes the valve, n, while a partial vacuum is formed above valve, o. This in connection with the air in the suction pipe causes the opening of the valve, o, and, by the partial vacuum created in the suction pipe, the lifting of the water from the reservoir. The next supply of heated air cannot escape through the pipe, c, as the lower end of the same is closed by the water; it therefore exerts a pressure

This report has since been acted upon by the Board of Trade in the printed paper issued by them in reference to railway structures. "It will be observed," they say, "that a coefficient of 6½ tons per square inch is assigned to steel, that of iron being 6 tons per square inch. This increase of the coefficient will effect important economy in structures, especially in bridges of large spans, and will also tend generally to increase the employment of steel for railway and shipbuilding purposes."

This measure seems to have been designed in the special

of the carrying frame or case, and a separate column is provided for each of the different standard lengths of lumber.

An improvement in Rotary Engines and Pumps has been patented by Messrs. Walter E. Bartrum and Henry C. Powell, of London, England. This invention relates to rotary apparatus that may be employed as an engine worked by steam or other fluid under pressure, or as a pump for raising or forcing fluids, or as a liquid or fluid meter.

Mr. Frederick K. Collins, of Butler, Ind., has devised an

improved attachment by which the person sleeping or resting on a bed or sofa will be fanned, thereby insuring a more comfortable rest in hot weather. The invention consists of a bed cover or cloth that is hung to hooks at the foot end of the bedstead, and attached to fulcrumed crank arms at the head end of the bedstead. The crank arms are operated by crank rod connection from a suitable clock train, so as to impart a fanning motion to the spread or cover.

Mr. Floyd Heavener, of Laramie City Wyoming Ter., has patented an improvement in Wind Wheels, designed to render the same self-governing by causing the area of resistance which the wheel presents to the wind to be automatically varied in inverse proportion to the force of the wind, to render the action of the wheel uniform.

Correspondence.

The Deleterious Use of Alum in Bread and Baking Powders—Alum being Substituted for Cream of Tartar

BY HENRY A. MOTT, JR. PH.D., E.M.

Having been appointed Chemist by the United States Government for the Indian Department, it became my duty to submit to chemical analysis, among other articles, the various baking powders offered the Department, and as a result of my investigation I found that at least fifty per cent of the baking powders offered were grossly adulterated. After making this discovery I determined to submit to analysis every baking powder I could find on the market, and to expose such powders as were adulterated, so that the public may be warned from purchasing them in the future. The number of baking powders I have examined amount to forty-two—twenty-nine of them from various sections of the country having been offered to the Department, and thirteen obtained from various grocery stores throughout the city of New York.

Instead of the baking powders of commerce being composed alone of those constituents which have been demonstrated to be perfectly harmless and wholesome, the public have imposed upon them powders largely adulterated with most injurious and hurtful compounds, put up in cans neatly labeled "chemically pure," as if that fact (?) had anything to do with rendering the powders wholesome. Scheele's green (arsenite of copper) is often "chemically pure," but it is always a deadly poison.

It, therefore, becomes necessary for the benefit of the public to examine into the powders on the market, and to denounce such of them as are composed of constituents detrimental to health.

The best powders are composed of bitartrate of potash (cream of tartar), tartaric acid, carbonate of ammonia, and bicarbonate of soda, held together to prevent decomposition by a little starch.

The injurious powders are composed of alum and bicarbonate of soda, and often contain terra alba (white earth), insoluble phosphate of lime, etc., etc. The effect of alum when taken internally has been shown by Wilmer and others to produce dyspepsia, constipation, vomiting, griping, and even inflammation of the gastro-enteric mucous membrane, as it is a powerful astringent acting chemically on the tissues. These serious effects will not of course be brought about immediately from the small quantity of alum used in one loaf of bread, but it is certain that persons continuing to eat bread containing alum will, in time, suffer from its evil effects, and the weaker the constitution the sooner will the effects be noticed.

Duma speaks to the same effect when he says: "It is to be feared that this salt exerts a deadly action by its daily introduction into the stomach, especially in persons of a weak constitution." And other great authorities, such as Carpenter, Dundas, Thompson, Gibbon and Normandy, all agree that the continued use of bread containing alum will bring about dyspepsia and other troubles, and such was the opinion of the late Baron Liebig. The celebrated Pereira considered "that whatever may have been the effect in the case of healthy persons, sick persons did really suffer in that way." In the *Lancet* is mentioned a case in whom dangerous gastro-enteritis was apparently induced by a single dose containing between ten to twenty grains of burnt alum. Dr. Parkes, in his work on Hygiene, states that from eight to forty grains of alum, and probably more, have been found in a four-pound loaf of bread.

The effect of alum on bread is to tend to whiten it, and to prevent an excess of fermentation (when yeast is used) when the altering gluten or cerealine acts too much on the starch; but while it accomplishes this object, it lessens at the same time the nutritive value of the bread by rendering the phosphoric acid insoluble.

Sufficient proof, I think, has been shown that alum is a most dangerous element to introduce in baking powders, and it now becomes necessary for the benefit of the public to expose such unwholesome and injurious powders as contain it. Having analyzed the Royal Baking Powder, I find it composed of only those elements which have been demonstrated to be perfectly wholesome and healthful, having for its active principle pure grape cream of tartar instead of the injurious alum used in the following powders. I do not mean by signaling the Royal Baking Powder, that it is the only properly made powder on the market, as there may be others equally as good. I simply introduce it as I had to select one, and thought the one I had used in my

kitchen for years, and which had always proved satisfactory, would be the best illustration.

Out of the many baking powders I have examined, I have selected the more prominent ones that are adulterated, giving in each case a quantitative analysis of the same. The following analyses are of "Dooley's Standard Baking Powder," "Patapsco Baking Powder," "Charm Baking Powder," and the baking powder manufactured by C. E. Andrews & Co., of Milwaukee. The analysis of the last three baking powders given in the first column was made by Professor Robert W. Schedler.

No. 1.

DOOLEY'S STANDARD BAKING POWDER.	
Burnt alum	26.45 per cent.
Bicarbonate of soda	24.17 " "
Sesquicarbonate of ammonia	2.31 " "
Cream of tartar	None
Starch	47.07 " "
	100.00

No. 2.

PATAPSCO BAKING POWDER.	
Smith, Hanway & Co., Baltimore, Md.	
Analysis by Dr. Mott.	
Burnt alum	19.16 per cent.
Bicarbonate of soda	23.36 " "
Cream of tartar	None
Starch	57.48 " "
	100.00

No. 3.

CHARM BAKING POWDER.	
Rohrer, Christian & Co., St. Louis, Mo.	
Analyzed by Dr. Mott.	
Burnt alum	29.60 per cent.
Bicarbonate of soda	31.13 " "
Cream of tartar	None
Starch	38.12 " "
	100.00

No. 4.

BAKING POWDER MANUFACTURED BY C. E. ANDREWS & CO., MILWAUKEE, WIS.	
Burnt alum	22.53 per cent.
Bicarbonate of soda	21.79 " "
Cream of tartar	None
Starch	55.68 " "
	100.00

On reviewing the above analyses it will be seen that, in the "Patapsco Powder," about 20 per cent of burnt alum is used, over 22 per cent in Andrews', over 26 per cent in Dooley's, and about 30 per cent in the Charm. And the manufacturer of "Dooley's Powder" not only has the audacity to put on the market this injurious and unwholesome powder, but to put upon the labels the deceptive statement, "chemically pure."

Not one pound of these powders could be sold in England, as it is against the law to use alum for making bread. Why have we not such a law?

A case is reported in the English Law Reports of 1871-2, 7th Queen's Bench, 135. November 15, 1871, where a baker was convicted for using alum in making bread.

I could furnish, if it were necessary, analyses of many other alum powders, as at least 50 per cent of the baking powders contain alum; but the above serves to illustrate their nature, and to show the importance of discriminating with a great deal of care when purchasing baking powders. It is far better to select only "standard powders," as the "Royal Baking Powder," for example, than to risk purchasing the many adventurous compounds which are sure to be put on the market by persons who have no higher motive than dollars and cents.

What would become of the above-mentioned baking powders containing alum if they were introduced on the English market? The answer is simple—they would be swept out of existence. It is to be hoped, then, that the public, by refusing to purchase them, will bring to them all the same fate.

By exposing these injurious and unwholesome baking powders, the public must not be frightened from using baking powders when properly made—of which I have already stated there are a number on the market. In fact, baking powders are a great convenience, as the constituents are so combined that their use is always attended with success; and there is no danger of biscuits made with them having an alkaline taste, or being impregnated with yellow specks or streaks, as is often the case when ordinary cream of tartar and soda are used. This results from the fact that the ordinary cream of tartar found in market is adulterated from 10 to 90 per cent with foreign substances; consequently it becomes necessary to change the proportion to be used with every new lot, which can only be correctly arrived at by a chemical analysis of the cream of tartar.

The advantages of using "baking powder" in preference to yeast are, that with the former none of the nutritive parts of the flour are destroyed, a larger yield is obtained, and the result accomplished with a great saving of time, which would otherwise be required to promote the fermentation when yeast is used.

The advantages of using "baking powder" in preference to the ordinary cream of tartar and soda found on the mar-

ket are not only that it is more economical, but the results are always attended with success, there being no fear, as stated, of producing an alkaline taste or yellow streaks in the product.

The Swedish Buckeye Machine.

To the Editor of the Scientific American:

In number 25 of the SCIENTIFIC AMERICAN for the 22d of last June, Mr. E. H. Knight, in a letter from the International Exhibition in Paris, concerning the reaper and mower exhibits, says that "Westeras Mekaniska Werkstad" has illegally pirated the patented "Buckeye machine" of Adriaance, Platt & Co., of New York; and in a bold faced manner entered on a contest at the Exhibition. As these statements have been published even in the Swedish newspapers, we respectfully request that you in your paper would copy the following explanations:

The Buckeye machine is not patented in Sweden. In consequence whereof is anybody in this country justified in making a copy of the same.

Westeras Mekaniska Werkstad has never pretended to be the inventor of the machine, and which as well our advertisements from the commencement of the manufacture, as our catalogues plainly ascertain, when mentioning that "it is made from the Buckeye model," although that has not been inscribed on the machine, as such a thing has been deemed unnecessary.

We have certainly not thought there was anything cabalistic in the figures; we have simply let them remain (in order not to alter the model) and use them in our catalogues so as to give such countrymen of ours, who are in possession of American Buckeye machines, an opportunity of obtaining parts for reserve, which otherwise would have been almost impossible.

The Swedes are not yet able to stand a contest with the Americans in the construction of harvesters, especially as they only for a few years past have been used in this country, and then of American make. The handiwork has formerly here been cheap, and harvesters therefore less necessary; but of late, on account of several reasons, the day's wages have been raised and the farmers compelled to, at a very high price, buy American machines in want of any Swedish ones.

Consequently, when we came to the conclusion of making reapers, we thought ourselves best serve the public at large by using a pattern which we considered the best; and we certainly believe that we have acted with perfect honesty as long as we never have claimed those copies to be our own invention; on the contrary, always told their origin, though not on the machine itself, as we have deemed that unnecessary, every machine being accompanied by a catalogue explaining that it is of the Buckeye construction, and the appearance so plainly shows the copied model, that no doubt regarding our position of manufacturers of the said machine ever ought to arise.

WESTERAS MEKANISKA WERKSTADS AKTIEBOLAG.

Westeras, September, 1878.

The Mound Builders' Unit of Measure.

Mr. J. W. McGill, who has been making a critical study of the artificial mounds of northeastern Iowa and contiguous parts of Wisconsin and Minnesota, finds considerable evidence of the employment of a unit of measurement in their erection, the possession of which would prove the mound builders to be tolerably advanced toward civilization when they entered the country. In the *American Journal of Science and Arts*, for October, Mr. McGill gives a large number of measurements made by him in one of the most extensive systems of mounds in northeastern Iowa, and arrives at the conviction that the linear unit employed by the builders was simply, or had grown out of, the pace or yard.

The northern limit of the mounds of definite dimensions is not certainly known. Mr. McGill has sought vainly for evidence of the use of measurements in the most northerly of the mounds. His own examinations so far extend only to latitude 43° 30' N., and there the mounds are of constant or related dimensions. The most northerly of the measured mounds are undoubtedly within Minnesota.

In conclusion Mr. McGill observes that if we assume a slow southerly migration to have taken place in the mound builders, it will explain the evident increase in geometrical knowledge attested by the various works found in passing across the United States from north to south. In the Northwest we find measurements of simple lines, but not of angles or areas. In Ohio, angles were correctly measured, the squares being accurate squares and the circles perfect circles; and areas were measured, as attested by adjoining squares and circles being equal or very nearly equal in area, though there is no satisfactory evidence that the cardinal points were then known. In the lower Mississippi region the cardinal points were known. The gradual modification in the various arms and implements, and the striking improvements in pottery, together with many other important considerations, lend support to this view.

A FULTON, N. Y., man recently laid his finger on the table in front of a buzz saw to feel the momentum of the air. The saw was going so fast that the teeth were not to be seen. His finger was taken off. While he was looking at it the foreman came up with the question: "How did you do it?" "Why, I put my finger down so," answered he, placing the other forefinger, as he thought, well away from the teeth. To his horror, the saw took off that one, too, at the second joint.