material so that each leg portion shall have a single lengthwise seam on the back. The cloth is cut on a bias to secure elasticity.

An improvement in lanterns, patented by Mr. Patrick J. Clark, of West Meriden, Conn., is designed to prevent the disturbance of the flame by currents of air, and to keep the top of the lantern cool.

Mr. Josiah Watts, of Brooklyn, N.Y., has patented a fan driven by a spring and clockwork. The stroke of the fan may be lengthened or shortened, and its velocity may be varied.

An improved car axle box lid, patented by Mr James Seath, of Terre Haute, Ind., is fitted to the end of the oil box, which is made convex and provided at each side with tongues, which fit in grooves in the ends of the cover.

Mr. Charles H. Fuller, of Akron, Ohio, has patented an improved stuffing box for piston rods, in which the old packing may be retained, when new is added. The invention consists in a hollow gland having a conical interior, which receives a portion of the packing.

An improved windmill regulator has been patented by Enos C. Daniels, of Lyons, Ohio. The invention consists mainly in a vane which holds the windmill out of the wind, excepting when force is applied to it. It is a simple device for controlling the action of the mill.

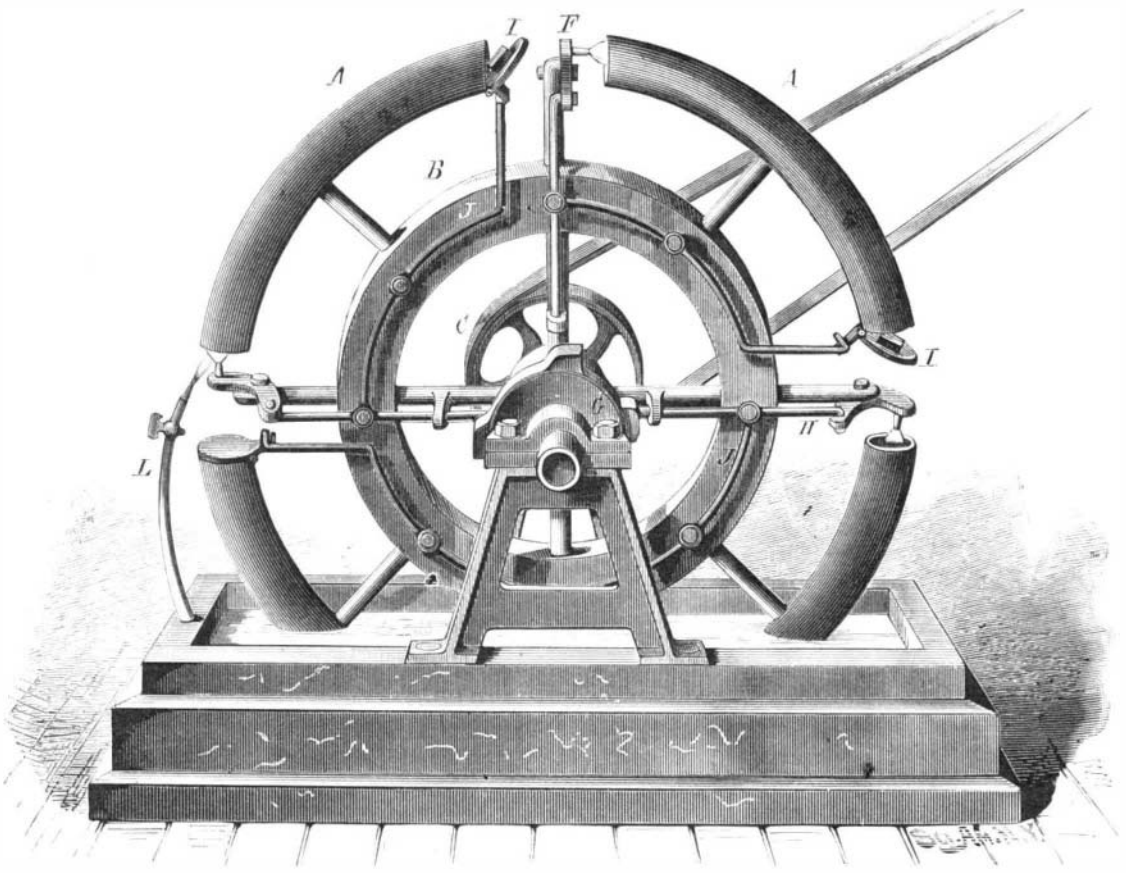
A NOVEL ROTARY ENGINE.

We give herewith an illustration of a rotary engine of novel character, which the inventor, Mr. Lorenzo B. Lawrence, of Monticello, Cal., calls a rotary vacuum engine. It consists in an arrangement of curved tubes, A, which are open at both ends, and supported by a wheel, B, secured to a hollow shaft, and having tubular spokes, which project beyond the periphery of the wheel into the spaces between the curved tubes, A.

The hollow shaft is supported by plumber blocks, which rest upon the sides of a water tank, into which the curved tubes dip. One end of each curved tube is always left open; the opposite end is provided with a valve, I, which closes automatically as the open end touches the water. Opposite the open end of each curved tube there is a gas burner, F, which is pivoted to one of the tubular arms of the wheel, B, and is moved by a cam, G, attached to the plumber block. This burner receives gas through the hollow shaft and arms of the wheel, B. The valves, I, are operated by the same cam through the levers, J.

The pivoted burners are arranged with reference to a continuously burning stationary gas jet, L, so that the gas is let on as they come opposite the stationary jet, the latter serving to ignite the gas as it issues from the pivoted gas burners.

As the mouth of the curved tube nears the water the valve, I, is closed, and the burner, F, is turned aside, shutting off the gas supply. By the heat of the gas flame the air is rarefied in the tube, B, and as the tube strikes the water, the air is cooled, forming a partial vacuum, which draws the water into the tube causing that side of the wheel to preponderate, and inducing a rotary motion, which is continued so long as the gas is supplied and ignited in the manner described.



LAWRENCE'S ROTARY ENGINE.

A New Explosive.

The staff of the Austrian artillery have been for some time engaged in making experiments at the arsenal of Zamky, says *Galignani's Messenger*, on a material which is said to possess far greater explosive power than any other substance hitherto discovered. During a series of investigations relative to dynamite and compressed gun cotton, M. Nobel found that the latter could be prepared in such a way that it could be completely dissolved in nitro-glycerine. The product is a gelatinous and gummy substance which, at the highest pressure, does not part with any of the nitro-glycerine. That explosive gelatine resists water, cannot be fired by any shock, but only goes off with difficulty and imperfectly when ignited. Further experiments showed, however, that with it a new compound could be formed, admirably adapted to all military purposes. This is prepared by simply adding a little camphor to the gelatine. The proportions are 4 per cent of the former to 96 per cent. of the latter, which consist of 90 per cent of nitro-glycerine and 10 per cent of fulmi-cotton. The gelatinous mass is elastic, transparent, of a pale yellow color, and can be cut with a knife. When set on fire in the open air it burns like dynamite or dry compressed gun-cotton. It only takes fire at a very high temperature, and the action of the camphor is very evident in that respect, for the ordinary gelatine by itself explodes at 200° Centigrade (392° Fahrenheit), while the heat required to produce that effect after the addition of the camphor cannot be tested by any of the apparatus usually applied to that purpose. The new composition cannot be fired by a blow, even from a projectile; it shows no sign of alteration even after having been left in running water for 48 hours. When solidified by cold it forms a mass resembling sugar-candy, and is then more sensitive to mechanical action, but as soon as it is thawed it resumes all its original properties. When exploded, however, it produces less smoke than dynamite or gun-cotton, with a clearer and more sonorous report, and has far greater force than either. The principal objection to its adoption was the difficulty of igniting it, but that has been overcome. When cotton fiber is subjected to the action of sulphuric acid, a white pulverulent substance is obtained, which has received the name of hydro-cellulose, is easily soluble in nitric acid, when it becomes nitro-hydrocellulose. This compound, mixed in the proportion of 40 per cent with 60 per cent of nitro-glycerine, forms the most powerful means of ignition ever hitherto discovered. By properly constructed firing-cartridges of that substance the explosive gelatine becomes as manageable as ordinary powder, with less danger and far greater expansive force.

A Thriving State.

In reporting on the iron and steel industries of Belgium, as represented at the Paris Exhibition, Assistant Commissioner J. D. Morrell says that there is something amazing in the comparative prosperity of the Belgian iron and steel industries, when their spare natural resources are taken into consideration, and when the same industries of more favored countries are experiencing a greater or less depression. The causes for this condition of things, Mr. Morrell says, are to be found in cheap labor, long hours, the technical education of workingmen, strict economy in administration, attention to minutest details, and use of the most improved labor-saving machinery. The population of Belgium is very dense, 5,000,000 people inhabiting 12,000 square miles of territory. The country is a hive of industry. There is no room for drones. Every man has his work to do, and he must be content with small wages, for high wages would soon put an end to all employment by destroying the ability of Belgium to compete in foreign markets. Strikes are exceedingly rare, and when they do occur they are soon terminated, because the Government will not tolerate them. Personal economy is essential to existence. The labor of women and children is utilized. Railroads through its own territory, favorably situated seaports, and a trading spirit handed down from the middle ages, aid in securing foreign purchasers for Belgian manufactures. Belgium utilizes all her resources. She is industrious and frugal. She neglects none of her opportunities. Mr. Morrell concludes this portion of his report by the remark that much of the distress existing in other countries might be obviated by the practice of the same virtues, and that it would not involve the reduction of wages to the Belgian standard.

Profits on Beer and Milk.

According to the English newspapers, the depression of trade in Great Britain does not extend to every industry. The celebrated brewers, Bass & Co., it is stated, divided as profits for the year 1878 the almost incredible sum of £400,000. The Anglo-Swiss Condensed Milk Company, it is also stated, divided a profit of £60,000. The alarm in London respecting the milk served from infected cows, it is said, has largely increased the trade in condensed milk within a short time.

It would seem, therefore, that while the metal trades and some of the other important industries of the country are greatly depressed, the articles of food and drink are paying a good profit to the dealers.

Iron in New Zealand.

The Government of New Zealand has, within a few years, constructed more than one thousand miles of railroads within its colony, all the material for which, except the sleepers, having been transported, at heavy cost, from England. The present Minister of Public Works, Mr. James MacAndrew, has undertaken the experiment, with a view of promoting the iron industry of the colony, of advertising for proposals for one hundred thousand tons of steel rails, to be made from the native ores of New Zealand. In addition to the advertisement in another column, a pamphlet has been printed by the Government containing maps and diagrams, which may be had from Sir Julius Vogel, Agent of the Colony, on application at 7 Westminster Chambers, London.

Around the World in Thirty Days.

In a letter to the *Herald* detailing some of his plans for the coming summer, Mr. Samuel A. King, the aeronaut, says that during his thirty years' study of aerial navigation, in the course of which he has made somewhat over two hundred ascensions, without injury to life or limb, he has steadily endeavored to avail himself of whatever experience or suggestion might afford to make traveling in the air practical, definite, and useful. Numerous and often costly experiments have shown him that, with no mechanical appliance or power yet discovered, is it possible to journey definitely and with certitude through the air to any previously designated point, in opposition to the direction of a prevailing wind. The balloon, therefore, remains to-day what it was in the days of the Montgolfiers, a machine that all the skill and ingenuity of man cannot prevent from floating with the wind, which controls and directs it absolutely from the moment it is launched. The application of any known mechanical power, to be of any use as against a wind directed upon the vast surface of a balloon, is entirely impracticable in consequence of the weight involved. Mr. King is confident, however, that a great deal can be accomplished with the balloon, slave to the wind though it be, and that it is possible to operate them so as to greatly prolong their carrying ability. As the result of a long series of experiments Mr. King speaks confidently of his ability to make a balloon voyage of a month's duration, a time sufficient, with a thirty-five mile breeze, to circumnavigate the globe; and he claims to have demonstrated to his own satisfaction that it is not only feasible to construct a balloon that will maintain the bulk of its lifting power, but that it is also easily practicable to keep it afloat and in transit for this length of time.

Mr. King proposes to operate during the coming summer a spheroidal (captive) balloon, having a diameter of 65 feet and a capacity of 150,000 cubic feet, inflated with hydrogen, maintaining a second balloon of like dimensions as a reserve in case of accident. If his experiments with these are satisfactory he proposes to construct an air ship double the size of his captive balloon, for a transatlantic voyage, to be undertaken "in earnest," some time in 1880, following the well-established storm path on which the *Herald* bases its European weather forecast.

The Sizes of Ferments.

The *Brewer's Guardian* has compiled from trustworthy authorities the following table, showing the sizes of the various ferments found in beer and other fermented liquors:

	Diameter of the Cells in Fraction of an Inch.
Saccharomyces cerevisiæ	·00031 to ·00035
" minor.....	·000315
" ellipsoideus.....	·00024 by ·000176
" pastorianus.....	·0007 by ·00035
" exiguus.....	·00098 by ·000118
" apiculatus	·000236 by ·000118
" mycoderma	·000118 to ·000787
Viscous ferment.....	·000047 to ·000055
Lactic "	·0000984
Butyric "	·0000687 by ·000687
Mycoderma aceti.....	·000059 by ·000118