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IMPROVED CALORIC ENGINE.

The Caloric Engine and Siren Fog Signals Company, of London, have been occupied in producing caloric engines suitable for general purposes, and our illustration, which we find in *Engineering*, shows the most recent design. This engine is of two horse power nominal, or 3½ actual horse power.

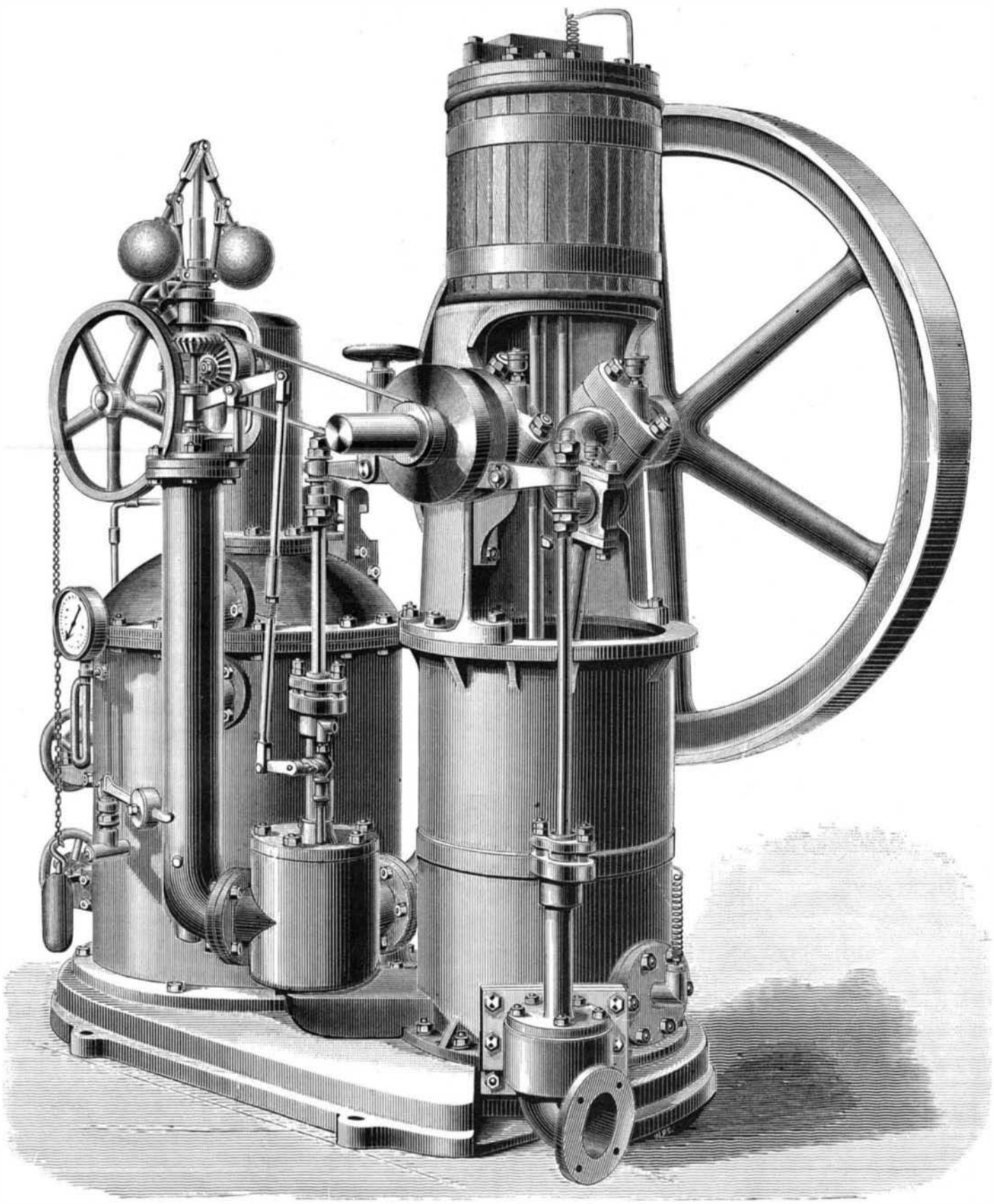
It consists essentially of three parts, viz., a pump for supplying compressed atmospheric air; a generator or retort into which the air is forced and there heated; and a cylinder into which the heated air is expanded for the purpose of operating the piston. The generator comprises a cylindrical firebrick lining of smaller diameter than the casing, so that an annular space is left between the two, and a set of grate bars upon which the fuel is burned.

After a fire has been lighted in the generator, the air is, in the first instance, supplied by a hand pump or (in the case of small engines) by turning the fly wheel until the necessary pressure is created, when the engine commences to work, and the air pump at the top delivers at each upstroke of the piston a charge of air into a valve casing, where, by means of a hollow cylindrical valve, it is divided into two streams one entering into the annular space above referred to, whence it descends and passes through the grate bars and the fuel, the other stream being delivered directly into the spaces above the fire. The air passing through the incandescent fuel forms, in the first instance, carbonic acid and ultimately carbonic oxide, so that the space above the fire may be considered as a combustion chamber, containing carbonic oxide and nitrogen. The oxygen of the air delivered into this space enters into immediate combination with the carbonic oxide, and produces an intense heat with a consequent increase of pressure.

The governor alters the position of the cylindrical valve according to the load on the engine, so that the proportion of air sent through the fire and into the space above is varied, and also the consumption of fuel, according to the amount of work being done by the engine.

In engines of larger size than the one we illustrate the governor is made to perform four functions, viz.: 1, it determines what quanty of air is to be delivered to the bottom of the fire; 2. what quantity above fire; 3, what quantity of air is to be rejected altogether; and 4, at what point of the piston's stroke the supply of motive fluid is to be "cut off." One great impediment to the successful operation of a caloric engine, working at such a high temperature, has been the undue heating of the connections and seating of the valve, which commands the communication between the generator and the working cylinder. This difficulty is now overcome by surrounding the parts with an air chamber, which forms practically a part of the main pipe for conveying the compressed air from the pump to the generator; so that for every stroke of the pump there is a current of cold air around the valve. The piston, which, as is usual in caloric engines, is provided with a shield or guard, has rings of the Ramsbottom kind, which are found to answer well.

The illustration shows a single cylinder engine, which is very satisfactory for ordinary purposes, but where great regularity and steadiness of working is essential, these engines are constructed with two cylinders, the cranks being



IMPROVED CALORIC ENGINE.

placed at right angles. From a test made with a twelve horse power double cylinder caloric engine the following results are stated to have been obtained: Indicated horse power of cylinders, 41·24; power of air pumps, 21·04; net indicated horse power, 20·2. Tested by the dynamometer the effective horse power was 14·39. The consumption of ordinary gas coke was 36·56 pounds per hour, which equals 1·8 pounds per indicated horse power, and 2·54 pounds per effective horse power. The difference between the indicated and effective power shows a considerable margin for friction, but it must be remembered that the cylinders are necessarily larger than those of a steam engine of same power.

THE REBACKING OF PAINTINGS.

A Washington letter describes the *modus operandi* of taking off the old canvas of some of the great paintings hanging in the Capitol rotunda and substituting new. The picture is laid upon its back on the floor and a sufficient thickness of cartridge paper gummed on the face to prevent injury. It is then turned over and the old canvas scoured off with pumice stone. This is a tedious operation requiring much care. The new canvas is stretched and covered with a thick adhesive substance which penetrates every part. The back of the painting is then covered with a more fluid mixture, when the canvas is laid upon it. The whole is turned over, the face of the picture coming uppermost. Small flat-irons, heated to a temperature that will hasten the drying of the glues without injuring the paint, are passed carefully over the surface, the cartridge paper preventing harm. Toward the close heavier irons are used. The paper is then moistened and removed, when, after imperfections have been touched up, the picture is returned to the wall.

"MIND YOUR BUSINESS."

An anecdote is told of a clockmaker who, being employed to construct a new clock for the Temple, London, was desirous of a suitable motto to be placed under the clock. One day he applied to the benchers of the Temple for the motto, while they were at dinner, and one of them, annoyed at the unseasonable interruption, testily replied, "Go about your business." Understanding this to be the selected motto, the clockmaker inscribed it under the clock, where it still remains to admonish all to attend to business.

The Continental cent, usually known as the Franklin cent because its legend was proposed by him, gives the same advice in the words: "Mind your business." This is frequently misquoted and corrupted to "Mind your own business," which instead of a counsel to diligence is a rebuke to meddling. Franklin's advice was an admonition to perform duty and to care for the concerns which make life successful. It contains the very kernel of all business wisdom. A homely adage is that "It is better to drive your business than to let your business drive you," better to be a master and manager of your business than to be its slave and victim. This is the essence of the Franklin cent motto, and, whether acknowledged in so many words or not, it is the actuating principle and the underlying cause of all business management and business success.

A Historical Case of Acquired Automatism.

The venerable pianist, Franz Liszt, says the *Times*, has ceased to play in public on account of the stiffness of his finger-joints. The fact recalls the method by which he used to keep his fingers supple, a method which is also an interesting illustration of acquired automatism. It was his custom for more than forty years to read a mass immediately upon rising in the morning, and when that duty was finished to seat himself at the piano. So seated, he placed on the rack in front of him, not a musical composition, but some new work of French or German literature, first being careful to mark the number of pages which he intended to read. Then for a long time, sometimes for two or three hours, he would continue to read his book and practice scales. On one occasion, being asked if the reading did not interfere with the playing, or the playing with the reading, he replied: "Oh, no, the playing of the scales is entirely mechanical with me, and simply exercises the fingers; I give all my mind to the reading, very much as do our good ladies who knit stockings and read at the same time."

An Elastic Lacquer.

A lacquer, said to be of great elasticity, perfectly supple and not liable to peel off, is made in the following manner: About 120 pounds of oil varnish is heated in one vessel, and 33 pounds of quicklime is put into 22 pounds of water in another. As soon as the lime causes an effervescence, 55 pounds of melted India-rubber are added. This mixture is stirred and then poured into the vessel of hot varnish. The whole is then stirred so as to be thoroughly mixed, then strained and allowed to cool, when it has the appearance of lead. When required for use, it is thinned with the necessary quantity of varnish and applied with a brush, hot or cold, preferably the former. This lacquer is useful for wood or iron and for walls; it will also render waterproof cloth paper, etc.

THE United States Wood Vulcanizing Company of this city have had sixty of Jenkins' valves in use during the last year, some under steam pressure of 150 to 235 pounds per square inch, others under 150 pounds air pressure. The sizes vary from 4 inch downward, and we are informed that the cost for repairs for the sixty valves has been less than three dollars.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

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OVERTHROW OF THE BARB FENCE PATENTS.

For several years past the manufacture of barbed fencing wire has been under the control, substantially, of a single concern, namely, the Washburn & Moen Manufacturing Company, of Worcester, Mass. They acquired an eminent position in the trade, in its early days, by the exercise of superior skill and enterprise in producing machinery to make the wire, by honest endeavor to furnish a first class article, by promptness in filling orders, and finally by contenting themselves with a very small margin of profit. This was the original basis of their trade; it has been steadily maintained, and upon it has arisen the gigantic business now governed by the corporation. As soon as the barb fence business began to develop into large proportions, other makers became anxious to dip in and grasp a share; this they could only do by supplying an inferior article. To protect themselves as far as possible, to prevent the ingress and competition from makers of poor stuff, Washburn & Moen bought up all of the principal patents relating to barb fences; they then applied to the Patent Office and obtained reissues of some of the oldest of these patents, on which new and broad claims were allowed. Some of these reissued claims covered a wire or fence bar of any sort having barbs or points upon it. Other claims were for merchanism of any description for making any kind of barb fence. With these claims and reissues, some of which had been tried and sustained by the courts, the manufacture was so guarded and surrounded by bristling patent points, the margin of profit being low, that few makers have cared or ventured to fight the Worcester holders, but have preferred to pay them a small royalty as licensees.

Under several decisions of the Supreme Court of the United States in various cases, it has been laid down as a new rule that the reissue of an old patent so as to make it cover, by new claims, any new or broader ground than the original patent, is invalid. In view of these decisions Griesche and Fuchs refused to pay royalty to Washburn & Moen. Issue was joined, and on the 4th inst., in the United States Circuit Court, St. Louis, Mo., Judge Treat decided the case, holding, in effect, that the broad claims of the barb fence patents are invalid, both as respects the article produced and the machinery for making the same.

The magnitude of the barb fence business will be understood when we state that the estimate of the quantity of this fencing made in 1882 was 80,000 tons, or 500,000 miles in length. The firms claiming under their patents the exclusive right to manufacture barbed wire are said to have made within the year in royalties from their licenses and from extra profits in their own business between $4,000,000 and $5,000,000.

The royalty, though large in the aggregate, amounts in the detail only to $2 per 1,000 feet of fencing—not a heavy burden upon individual farmers.

Those who imagine that the overthrow of these patents is likely to result in any material reduction in the price of barb fencing, as paid by consumers, probably are mistaken. The decision may bring about a greater division of the trade and its profits than now exists; but where the margin of profit is already low there is not much room for the lessening of prices to the general public.

THE INDUCED CURRENT.

In our own little section, circumscribed by a very short radius, nature seems to be unceasingly striving to obtain an equilibrium: the war of the elements is constant; the changes are rapid; measured by our standard, the proportions are great—yet the grand harmony of the whole we guess at, but do not understand. A change in the density of the atmosphere is followed by wind: gales, hurricanes, and cyclones. Water seeking a level causes the current; mechanically, the moving water scours the bottom, erodes the banks, and carries a current of air along with it on the surface. We imitate nature in a miniature sort of way in regard to the actions of gases and liquids, and style the results induced currents.

If two copies of this paper be rolled up so as to form tubes, one two inches and the other one inch in diameter, all the apparatus is at hand with which to illustrate some of the more striking effects of these currents. Holding the larger tube pressed against the mouth, we blow through it and note the force with which the air strikes against the hand placed about three inches from the other end. Now if the tube be held a short distance from the face and we blow toward it with the same effort as at first, the pressure against the hand held in front of the other end will be much increased. In the first instance the current was only that of the expelled breath; in the second, this current, as it passed through the tube, drew along with it a certain portion of the surrounding air. A candle held near the face will be affected by these currents moving toward the entrance to the tube. Their presence can also be detected by the difference in temperature of the two currents, the second being the cooler. If we go through the same programme, but with the small tube held in the mouth, like results will follow. With the small tube fastened about half way through the other, leaving a space between sides of the two, we have a crude imitation of an important machine. Air or water sent through the outer tube, entering at the end from which the little tube projects, will make a powerful suction through the inner. On this plan the sand pump, so successfully used in the Hudson River Tunnel, is designed. That part corresponding to the small tube is placed in the mixture of sand and water, and water under heavy pressure forced