THE VICTOR CALORIC ENGINE.

The mechanical construction of the Victor engine is shown in the sectional view. Though novel in form and adjustment, the arrangement of the parts is extremely simple and effective. Its general plan is entirely novel, as it is the first upright double crank hot air engine ever introduced in the United States, though the Victor engine has been in successful use in England for some years. The piston chamber is entirely closed at its lower end by the heater which is in the form of a drum. Above the heater there are substantially only two working parts—a main piston and a piston of peculiar construction which acts as a combined displacer and regenerator. The main piston runs up and down in the upper part of the piston chamber which is surrounded by a water jacket and kept cool, forming the cooling portion of the cylinder. This main piston does not materially differ from an ordinary steam engine piston. It is packed with steel rings so that there is no leather packings to burn out, and the piston is as durable as any piston can be made. The steel rings adjust themselves to wear on the cylinder so that there can be no leakage until the rings are worn out, and they can then be replaced easily at trifling cost. The lower piston or regenerator is composed of a flat cap which fits the cylinder, and a few inches below this a cast iron conical cap, which, when the piston is down, comes over the dome shaped heater, while a thin iron cylinder connects the sides of the upper cap and the lower end of the conical cap, while the space thus formed between the upper cap, the lower conical cap and the sides of the thin iron cylinder is filled with wire gauze. The whole regenerating piston is kept together by the rod which is screwed into the upper end of the lower conical cap, then passes through the wire gauze, then through the upper flat cap which is solidly fastened to it, tnen passes upward through a stuffing box in the centre of the main piston, and then through the guide which is bolted at the top of the piston chamber in the form of a bridge. To this rod is attached its connecting rod which is itself connected with the crank shaft and so imparts motion to the regenerating piston. There are small holes in the top of the regenerating piston and also small holes in the sides of the same piston near the bottom so that the air may be forced in small jets back and forth through the wire gauze which fills the piston. Motion is imparted to the main piston by a connecting rod attached at one end to the crank shaft and at the other to the piston. The two cranks of the shaft are set an angle of ninety degrees apart. These two pistons—the main or upper piston, and the lower or regenerating piston—are all the working parts within the piston chamber. Both pistons are substantially made very durable, no more liable to wear out than a steam engine piston, and if broken by any accident can be quickly replaced at small cost. The lower port of the piston chamber, below the water jacket, has our interior lining of asbestos, which is made by rolling asbestos cloth on a mandrel, and is hard and more durable than any metal. This is one of the novel and most valuable features of the engine. Many compositions of metal have been tried and patented for use as a lining to these hot air chambers in caloric engines, but none have been fully satisfactory. The Victor Engine Company hold an exclusive right to use the interior lining of asbestos, as well as the exclusive right to use double crank in combination with the two pistons described.

The engine is used with either gas or kerosene as fuel, and can be adapted for coal. The dome form of the heater allows the heat to be concentrated in the most effective way. In using gas a Bunsen burner is used, as shown in the diagram. One gas tip or burner is used, but this is placed in a large cast iron tube which opens to the outside of the base and at the inner end extends upwards inside the dome of the heater. At the upper end this tube is curved with wire gauze similar to the gauze used in miners' lamps. The gas tip is inside the tube and several inches below. The air draws through the tube and mingling with the gas from the gas tip, the combined gas and air pass through the gauze and is lit on top, thus giving perfect combustion and great heat from a small amount of gas. The flame strikes directly upon the top of the under side of the heater, and whatever results of combustion there are passed down the sides of the under part of the heater and up through the chimney. No particle of the results of combustion can reach the interior of the heating chamber, so that the pistons are never clogged or made gummy. The heater is made intensely hot and as the regenerating piston curves down over its top, the air is quickly compressed upon a red hot surface and as quickly expanded by the intense heat and drives the regenerating piston upward with great force. As soon as this piston starts upwards the hot air rushes through the perforations in its side near the bottom, is driven through the wire gauze which takes off much of the heat and then rushes in small lots through the holes in the upper part of the same piston against the sides of the cooling chamber and is quickly cooled and condensed. A vacuum is created and at the same time the main piston and the regenerating piston come together and the air is forced down again through the wire gauze, taking up the heat again when the same process is repeated. The expansion of the air imparts force to each piston in succession and the air is used over and over again with no change, except as a very small portion of air is let in at each stroke from a small automatic valve in the side of the engine. In this manner a larger amount of force is developed than has before been obtainable from hot air. The No. 1 engine has but a six inch cylinder and is only three feet — inches high, yet will force 300 gallons of water per hour 50 feet high with small consumption of either gas or oil. The heating chamber is made still more perfect by an outside coating of asbestos cement. The engine runs at high speed, the crank shaft making regularly 250 revolutions a miuute, and consequently a governor is required and used. We believe no hot air engine has hitherto attained any such speed and governors have therefore not been used on other hot air engines. The engine has also a novelty in the shape of a small lever, which upon being moved allows the pressure to escape and the engine stops, and which is simply closed when it is desired to start the engine. The engine has been used in England chiefly as a motor, and is intended to be used also as a motor here, but the company have fitted some of their engines to be used for pumping water by taking the pulley off from the crank shaft and attaching a pump to the side. The engine can, however, be used effectively in either way. It runs noiselessly, swiftly and with great regularity. It is small, compact and solid, and seems in every respect to fill the requirements as a practical working engine.—*Chicago Journal of Commerce.*

WOOD CRYSTALS.

Chemical analysis has long since detected the presence of various mineral substances—potash, soda, silica, etc.—in many forms of vegetable growth; and the main source of potash at present, as of soda in former times, is the ashes of certain trees and plants. It also appears, as the result of microscopic investigation, that many of these mineral salts retain or assume a crystalline form even when imbedded in the solid portion or bark of certain plants, as the microscope most unmistakably reveals. Should it be proved that the form these crystals assume is regulated or modified by the conditions and character of the growth which incloses them, it is evident that the fact would be one of great interest to science, and of peculiar value and service to the druggist, since it would enable him to determine the nature and purity of any medicinal bark or wood, by examining a crushed sample under the glass, and comparing the forms ot the crystals with those presented in a series of standard plates. Thus the absence of the desired crystal, or the presence of others differing in form from the standard, would enable him to determine the nature and extent of the impurity or adulteration. A new study is here opened up.

GIMLET-POINTED SCREWS OF 1755.

Mechanics of adult age can easily remember when gimlet-pointed screws came into use within the last 30 years, superseding the blunt pointed ones before used, and the former have been considered a modern invention. But we have lately seen half a dozen screws with excellent gimlet points, which were taken from an old piano, and bear unmistakable evidences of age, and of having been made before screws were made by machinery. The piano is inscribed "Jacobus Kirckman, Fecit, Londini, 1755," and the screws are doubtless of that date. The most curious point in the case is that after such screws as these had been once made mechanics should have gone on using square-pointed screws for nearly a century.—Worcester, Mass., *Gazette.*

—The *Philadelphia Record* says: Messrs Cockburn & Co., of Newcastle, England, have introduced the Maxim-Weston electrict light into the Backworth and Ashington and the Page Bank collieries with complete success. This promises to lessen the severe the casualties to which the collieries are subject.