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 quantity 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 pratically 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 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.

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THE ROCKLAND SLATE QUARRY,

MELBOURNE, P.Q.*

By Ernest McC. Macy, *McGill University.*

This quarry is situated in the township of Mel bourne (Eastern Townships), about seven miles and a half from the village of Melbourne, and a few rods away from a large creek running from Brompton Lake to the St. Francis river. This creek, which affords excellent water-power for the machinery at the quarry, and also for mills lower down, runs through a deep gulley with pretty steep banks, and the quarry is opened on the top of the right bank. The vein of slate lies next to the Serpentine rock, on the east of it, and in a nearly perpendicular position, running in the direction north-east and south-west. All these strata on the east of the Green Mountains lean to the south east, and those on the other side (west) lean to the opposite direction. The vein extends a long distance, quarries being opened on it in this province, at Melbourne (on Mr Walton's estate), on Mr. Steele's place and at Danville, and in Vermont, at Montpelier, Norfield and Brattleborough.

The Danville quarry produces school-slates for which the Rockland stuff is too hard, and it has lately been much improved, and opened upon a larger scale than formerly. The supply of slate there is very large and of the best quality, colour, and texture, for writing-slates and the finer uses to which slate is put. The colour of the Rockland slate is a blue black, and its strength is unsurpassed. Lying to the east of it, there is a vein of green slate on which a quarry was partially opened some years ago, but there is no other colour known to be in this locality. At Acton, about twenty miles to the west, red and purple slates have been found; but this kinds are not well adapted for roofing, as they do not split thin enough, but they are used for tiles and mantels. Another deposit has been found to the east near Sherbrooke, but it is not good enough to warrant its working well. The Rockland vein is the largest and thickest deposit of good workable slate that has been found on this continent. It consists of three strata of slate, separated by beds of flint from ten to fifteen feet in thickness, and the three veins combined are about three hundred feet thick. The stratum furthest to the west, lying next to the Serpentine rock, has been worked right through and the second, which is a rather better quality, has been opened up. The slate probably extends to a depth of three or four thousand feet below the surface, and as the Company own a mile of the vein, the supply may be said to be practically inexhaustible. It is worked in benches made by natural joints in the rock, and the depth is about one hundred and twenty-five feet to the first, and about fifty feet more to the second bench, making a total depth of about a hundred and seventy-five feet.

The pit is about four hundred feet long, and of a rectangular oblong shape. There are two tunnels, one at each bench, running through the bank, the one at the first bench having been intended for taking out the rubbish, but it was found to be more economical to raise it to the surface with derricks and dump it down the outside, as the bank is almost perpendicular. For this purpose short tramways are laid, slightly inclined, from the pit to the dump so that the trucks, which are pushed by men, run down easily to the dump when loaded and are pushed up again without much difficulty when empty. The tunnel at the second bench was made for the purpose of drainage. The slate-mill and derricks are worked by a water wheel about forty rods from the mill, the power being conveyed by means of a wire rope, and it therefore costs nothing except keeping the machinery in running order. In the mill they make tiles, billiard-beds, mantels, wash-tubs, sinks, cisterns, paste-boards, and everything that slate is used for, and a few years ago they made a number of large slabs for lining the interior of burial-vaults. The mantel stuff is sold to manufacturers who finish, and marbleize it, imitating all kinds of marble to such perfection, that it can scarcely be distinguished from the original marble, and the various kinds of wood are imitated in the same manner. The slate for mantels, tubs, etc., is sawed to the proper size by circular saws, then planed to the required thickness, and finally polished with wet sand. The slabs, that have to be joined, are grooved, bolted with iron bolts, and cemented. There are, I think, about fifty or sixty men employed in the pit and slate mill, and at the derricks, and also at making the roofing slates. Those who work at making slates, etc., are paid by the piece, and get more or less according to the amount of good slate which is brought up in the day, while those who work in the pit, and on the derricks, are paid of course by the day. The roofing slates are made of eighteen different sizes, from twelve to twenty four inches in

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