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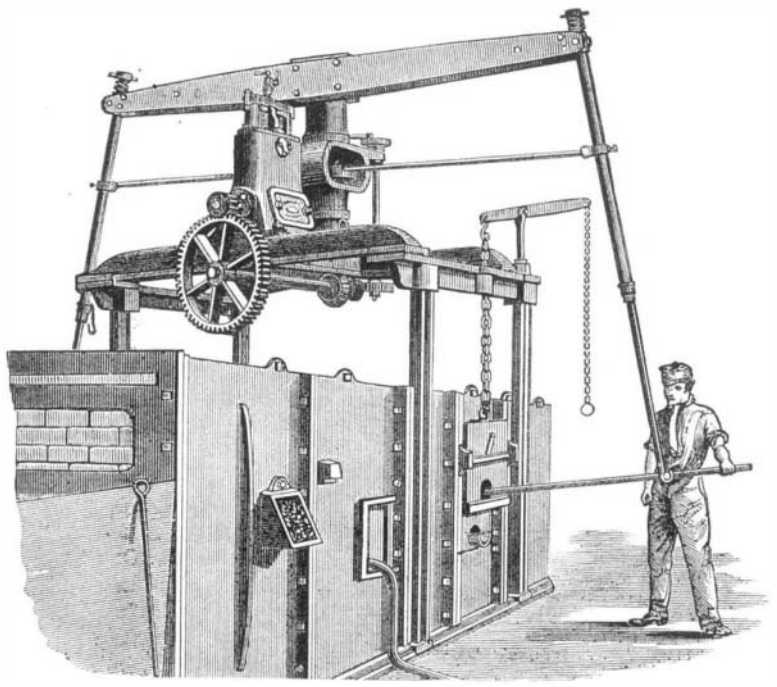
PUDDLING MACHINERY.

We illustrate herewith a rabbling machine for puddling iron, which can be used in conjunction with any of the known furnaces in puddling, and is now almost exclusively used in the Cleveland district, in England, being fixed over the ordinary furnaces. The machine and engine [Clough's patent three-cylinder] are attached to a substantial bedplate, supported on four double-headed rails, or by other means, over the furnace, the latter having a door at each side for charging and withdrawing the bloom when puddled. From each end of a wrought iron beam are suspended two tubes, to which are imparted a vibrating motion from a crank plate working in the column of the machine. These tubes have at the lower end a double hook, on which the rabbles hang, and the latter, in addition to receiving the vibrating motion of the tubes, also have imparted to them a radial motion from the ends of the wrought iron beam. The rabbles thus operate in two directions, and puddle the iron over the whole surface of the furnace bed. The usual charge for a furnace is about 14 cwt., but considerably larger charges have been successfully dealt with.

The consumption of coal is about 14 cwt. to the ton of bars made, and much less fettling is required. The men have easier work and get out a much greater weight in less time than by ordinary hand labor. Considerably over one hundred of these machines have been sold during the past year, and they are acknowledged by those whose opinion should carry weight, to solve in a most satisfactory manner the problem of mechanical puddling. Special care has been taken to have all the working parts as far as practicable protected from dust, as it is well known what grinding effects the dust and ashes from puddling furnaces have upon machinery.



CLOUGH & CO.'S PUDDLING MACHINE.

BRAYTON'S HYDROCARBON MOTOR.

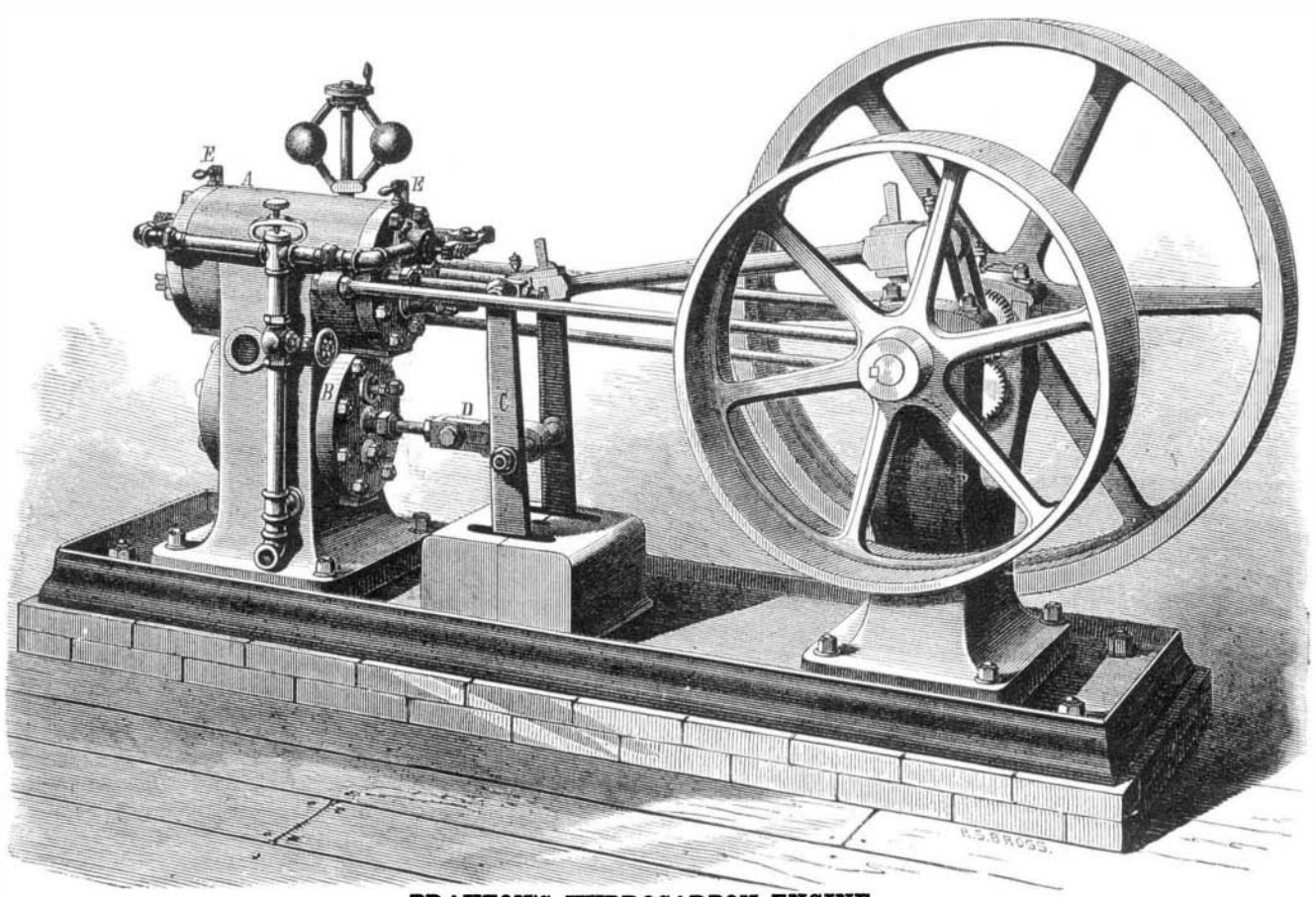
It will be remembered that not long ago we illustrated and described the above-named invention in its then most improved form. Of late, however, the construction of the machine has undergone considerable modifications ; and, as will be seen in the annexed engraving, its construction has been materially simplified. In order to appreciate the nature of this in many respects remarkable motor, which, through its utilization of the gases due to the sudden combustion of oil, may be started or stopped almost immediately, which requires no continuous fire and therefore no furnace, which in brief, costs nothing while not actually in operation, it will be well briefly to review its history as an invention. Thus we shall best exhibit the connection between the present and prior types of machine.

In the first engine made by the inventor, Mr. George B. Brayton, a well known engineer who has devoted a quarter of a century to this especial subject, separate charges of hydrocarbon were exploded, the force acting on a free piston to compress air, which in turn expanded upon the crank piston. Subsequently a rack and reversible catch or pawl held the piston, and the vacuum was used in connection with the air pressure. Five engines were built on this principle, only however, to be abandoned when the idea occurred that an explosive mixture could be burned without explosion by utilizing the principle embodied in the Davy Safety Lamp. On reducing this plan to practice, another difficulty was met in the production of a vapor compound which has a tendency to condense under high pressure ; and the effect of the varying temperatures upon the evaporation was a further trouble. The substitution of coal gas for liquid hydrocarbon obviated the trouble ; and, after nineteen years of labor, the inventor found himself possessed of an efficient gas engine, which he patented in 1872, and which subsequently satisfactorily underwent tests made by eminent engineers in this city.

Mr. Brayton now resumed his studies on the oil engine, and after two years he devised a motor wherein a combustible compound is formed by mechanical means, which can (he claims) be used successfully regardless of pressure or temperature. Then followed an improvement in extending the water circulation through the piston, so that the power can be applied to both sides of the same, thus doubling the capacity of the engine. Latterly, the principles have been extended to engines of large dimensions, and thus the oil motor has been developed, so to speak, into a position wherein it may enter into full competition with the steam engine. Although it may never do all that steam has done, it is but just to add that it can do that which never has been accomplished while using steam, namely, that, through the invention, a hundred horse power engine may be almost instantly set in motion by igniting a small burner with a match.

The principles upon which the engine operates are as follows : A small pump feeds the necessary quantity of petroleum into a chamber containing a fibrous substance. An air pump forces through the fibrous compound, which is situated close to the cylinder, the quantity of compressed air necessary to the combustion of the petroleum. The air, in passing through the fiber saturated with petroleum, becomes mixed with the hydrocarbon; and from the combustion of the compound, the expansive force which operates the engine is generated. A small independent pipe keeps a current of air passing through the fiber, and thus continuous combustion is secured. To prevent the combustion of the fiber and the petroleum therein contained, there is, between them and the cylinder bore, a perforated plate which acts upon the principle of the Davy lamp, and thus completely isolates the combustion which takes place in the cylinder. This combustion can only occur as the hydrocarbon and air enter the cylinder; and since this is accomplished gradually, the combustion is gradual, answering exactly to the admission of so much steam. The engine is so constructed as to cut off the supply of hydrocarbon and air at a definite point of the stroke; and the remainder of the stroke is completed from the expanding force of the products of combustion, thus securing the economy due to working expansively. The action of the engine is, therefore, substantially the same as that of an ordinary cut-off steam engine. To keep an equable ratio between the power of the engine and the amount of its load, a pressure diaphragm is provided; while by a very simple arrangement, the supply of oil can be increased or diminished to suit the demands of the duty.

Instead of having guide bars and crosshead guides to guide the piston rods, a novel and simple device is used, as will be seen by referring to our engraving, in which A is the engine cylinder, B is the air pump, and C is a lever connected to the engine and pump pistons. The bottom of this lever is a section of a circle struck off the centre of the piston-rod crosshead journal. As a consequence, the bottom of the lever, C, rolls along a pathway, while still keeping the center of the top crosshead parallel at every point of the stroke, with the pathway, which, being true with the bore of the cylinder, produces a parallel motion without any of the friction due to a sliding motion. The direction in which the fly-wheel revolves is *from* the cylinder (looking at the top of the fly-wheel); and thus the whole tendency due to the angularity of the connecting rod is to keep the lever down upon the pathway on the bed-plate.



BRAYTON'S HYDROCARBON ENGINE.

The first double-acting petroleum engine made by Mr. Brayton ran in Machinery Hall during the Centennial Exhibition. It was entered as a 10-horse engine, but proved upon a friction brake test to give 12½ actual horse power. The 10-horse engine here illustrated contains many advantages over, and im-

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