HOW THE AUTO-WHEEL ENGINE WORKS.

AN ELEMENTARY ARTICLE FOR BEGINNERS.

THE majority of cyclists who see an Auto-Wheel running along the road have very little idea as to how the engine works. Those who visited the recent Show had an excellent chance of studying the "internals" of the engine by the aid of the sectional model which was staged upon the Auto-Wheel stand. For those who did not have an opportunity of visiting the Show two illustrations are reproduced, showing the Auto-Wheel in sections, and I shall, in simple language, explain to the uninitiated how the engine works.

I have always maintained that one of the easiest methods of understanding the working of a petrol engine is to bear in mind the action of an old muzzle-loading gun. After a shot had been fired, and it became necessary to reload the gun, a certain quantity of black powder was poured down the muzzle of the barrel. On top of this a wad of paper or similar material was placed and the powder compressed tightly with a ram-rod. About an ounce of shot was then poured down the barrel and another wad placed on top of this. In order to explode the powder and consequently to expel the shot from the barrel a cap was placed over a nipple. When the cap was sharply struck, a spark ignited the compressed powder, which immediately detonated with the effect desired. This method of operation is very closely carried out in a petrol engine, except that, instead of black powder, we have petrol vapour.

A reference should now be made to the two drawings which illustrate this article. Attention should first be given to the piston. This is an exceedingly strong, hollow iron casting, which is provided with three piston rings fitting into grooves in the piston. These piston rings are always inclined to expand, and consequently the piston is provided with a very good seating against the cylinder walls.

Across the inside of the piston runs a short bar, to which is attached the connecting rod. The other end of this rod, which can be clearly seen, is in turn connected with a crank, which projects through the crankcase, and to which the flywheel is fixed. To this crankshaft, inside the crankcase (which in the photograph is, of course, shown in section), is keyed a small pinion or cog, which in turn meshes with a larger pinion (Fig. 2) which drives—through a shaft—the driving chain sprocket (Fig. 1). From here the road wheel is driven by a short chain.

I have outlined the course that the power takes when the piston is pushed downwards, and will now proceed to show how this is brought about.

It will be observed by a reference to Fig. 1 that the piston is practically at the top of its stroke, and if the flywheel, which will be observed on the far side of the engine, is rotated, it will take a downward course. We will suppose, therefore, that this flywheel is rotated slowly, and consequently the piston starts to travel down by the cylinder. Now, it will be readily understood that, as it is impossible for air to leak upwards past the piston, a vacuum will be formed at the top of the cylinder, or, in other words, a considerable suction will be exerted on both of the valves, which are clearly marked in the photograph.

The exhaust valve is provided with a very strong spring, which prevents it rising off its seating, but the inlet valve is provided with a very light spring, and the latter, owing to the suction exerted by the piston, which is being forced downwards, opens, giving free access to the carburetter. Now, in this carburetter is situated a very small jet, which in turn is connected to the petrol. Suction is, therefore, exerted on this jet, and petrol is drawn into the engine in the form of a very fine spray. It can be readily understood, however, that pure petrol will not provide an explosive charge, so it is necessary to mix air with it. Therefore, a small air hole is situated in the carburetter in order to dilute this petrol, and so provide a highly-explosive mixture.

When the piston travels to the end of its stroke, the space above it is filled with the petrol vapour. If we continue to rotate the flywheel, the crankshaft will push the connecting rod upwards, and, of course, the piston will naturally begin to take an upward direction, too. The inlet valve, which has been sucked open by the piston, naturally closes immediately the suction ceases, and the compression of the petrol vapour which has been sucked into the cylinder commences just as the black powder was compressed by the ram-rod in the muzzle-loading gun I referred to.

The piston then travels to approximately the position which is shown in the photograph. It will be understood that now the petrol vapour is compressed to a very high degree, and consequently is of a more explosive nature. At this moment a spark jumps the points of the sparking plug, this spark being provided from the magneto, which is situated in front of the engine.

The magneto is of too intricate a nature to discuss here, but it may be said to be an instrument which provides a very strong electric current. This current is so strong that it will leap across an intervening space from one point of metal to another.

When the petrol vapour is at its

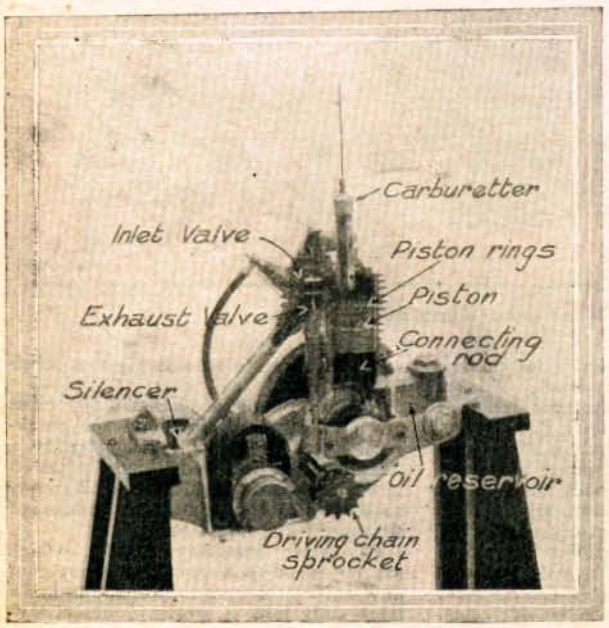


Fig. 1.—The latest Auto-Wheel in section.

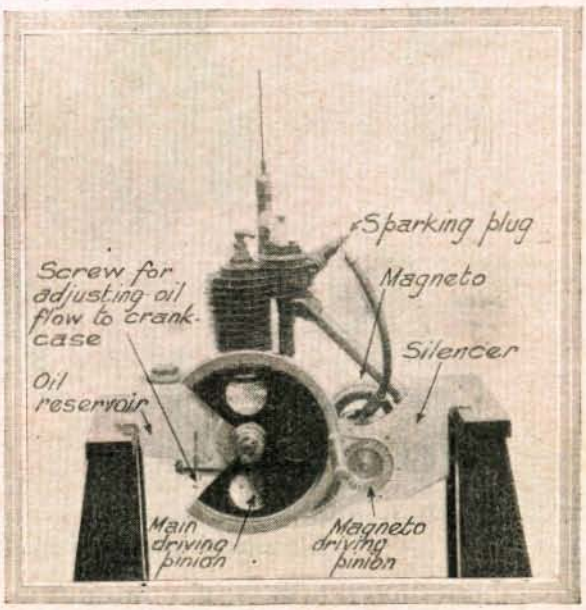


Fig. 2.—Another sectional view, showing the off side.

Auto-Wheel Engine (contd.).

highest point of compression, this spark takes place at the sparking plug, and the petrol vapour is exploded just as was the powder in the muzzle-loading gun to which I previously referred.

It will be seen that it is impossible for the force of this explosion to escape or expand in any direction except by pushing the piston downwards, which it does with very great force. This force is transmitted from the top of the piston, down the connecting rod to the crankshaft, through the main driving pinion to the driving-chain sprocket, and thence to the wheel.

We will now suppose that the piston has reached the bottom of its stroke. It will be realized that the cylinder is now full of flaming gas, which has expanded to almost its full extent. It will be necessary, therefore, to clear this burnt gas out of the cylinder, and this is where the exhaust valve, which is also clearly marked, comes into operation. At this point the exhaust valve is lifted off its seating by the action of a cam, which is in direct communication with the other parts of the Auto-Wheel and works in strict conformity with the other operations of the engine. This exhaust valve is, therefore, lifted from its seating, and as the piston travels upwards the waste gases are forced out down the silencer pipe to the silencer, thus producing the popping noise.

When the piston reaches the top of its stroke, practically all the waste gas has been cleared out of the cylinder, and the exhaust valve returns to its seating. The piston is now ready to suck in a fresh charge of gas, which it does in the manner already described, and we have an exactly similar series of operations as before. It will thus be realized how eminently simple a petrol engine is, when one gives it a little consideration. From an outward appearance and to the inexperienced eye it seems to be complicated, but in reality is not so.

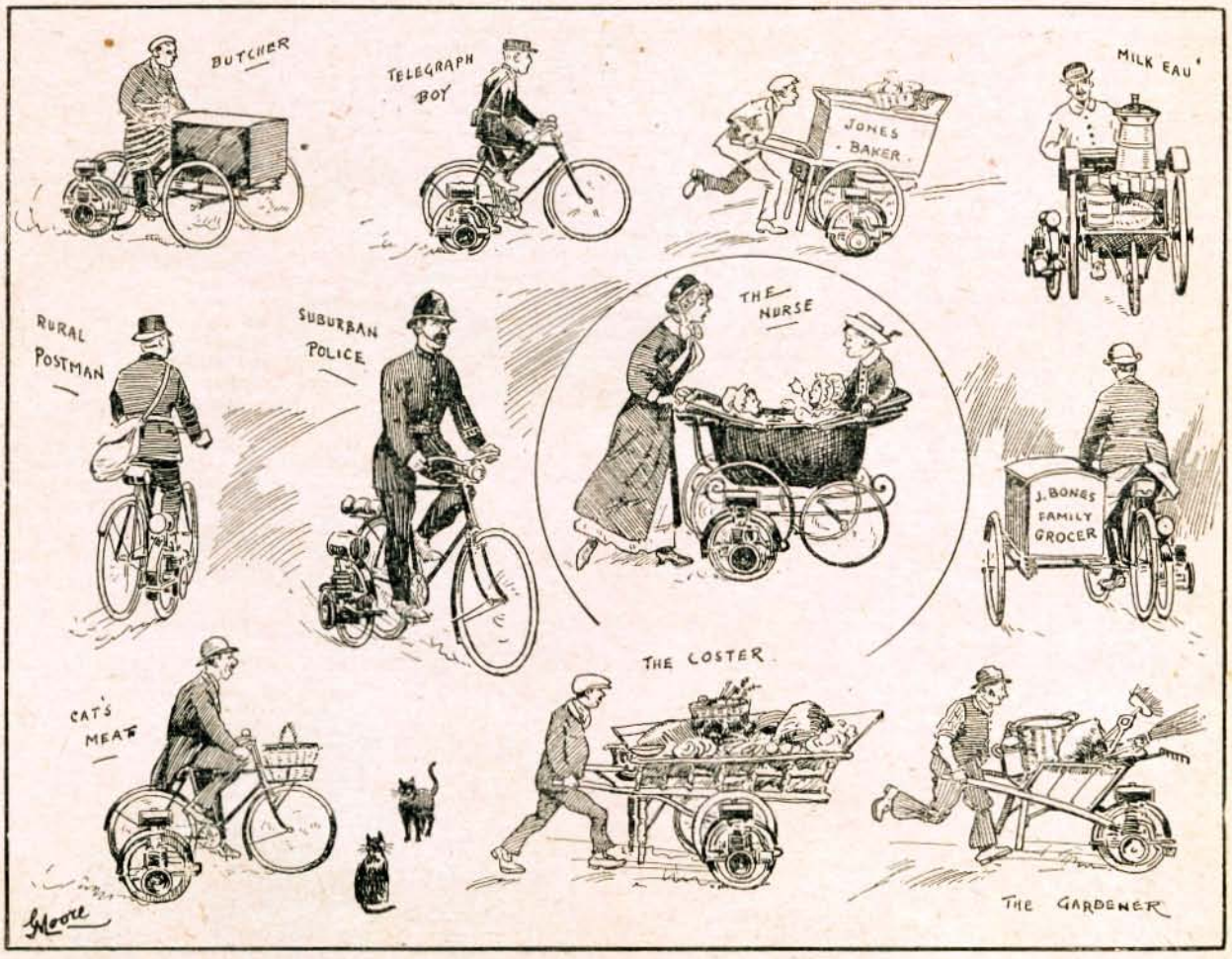
The beginner may now question the use of the outside flywheel. This is merely to produce a more even action of the engine—in other words, it is to prevent the machine proceeding by a series of jerks. A flywheel rotating at a very high speed renders smooth the up-and-down motion of the piston, and enables the latter to be carried over the two dead centres, i.e., when it reaches the top of its stroke and when it reaches the bottom. It will be realized that a great amount of inertia has to be overcome, and, consequently, the use of a flywheel is highly necessary.

And now for a word on lubrication. In Fig. 1 will be observed the oil reservoir, which is filled every 80 miles. It will be understood that when the engine is running at high speed the piston is rushing up and down the cylinder at a very high rate indeed, and, consequently, if the Auto-Wheel is to work successfully, this piston, as well as other bearings in the engine, must be efficiently lubricated, especially as the piston and cylinder become very hot, owing to the flaming gases of the explosion. The oil is led from the reservoir by a passage or duct (Fig. 2) to the crankcase. As the end of the connecting rod dips into the lubricant, the oil is flung all over the cylinder, the consequence being that the working parts are exceedingly well lubricated.

It will be understood that if this oil is given unrestricted flow into the crankcase, it would soon all disappear, so a small screw is provided (this is indicated in Fig. 2) in order to allow this oil simply to drip into the crankcase, instead of flowing in a steady stream.

If there are any points which are not clear to a prospective buyer of an Auto-Wheel, or if they desire to know more fully how it works, I am always ready to answer any questions.

AUTOPED.



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