

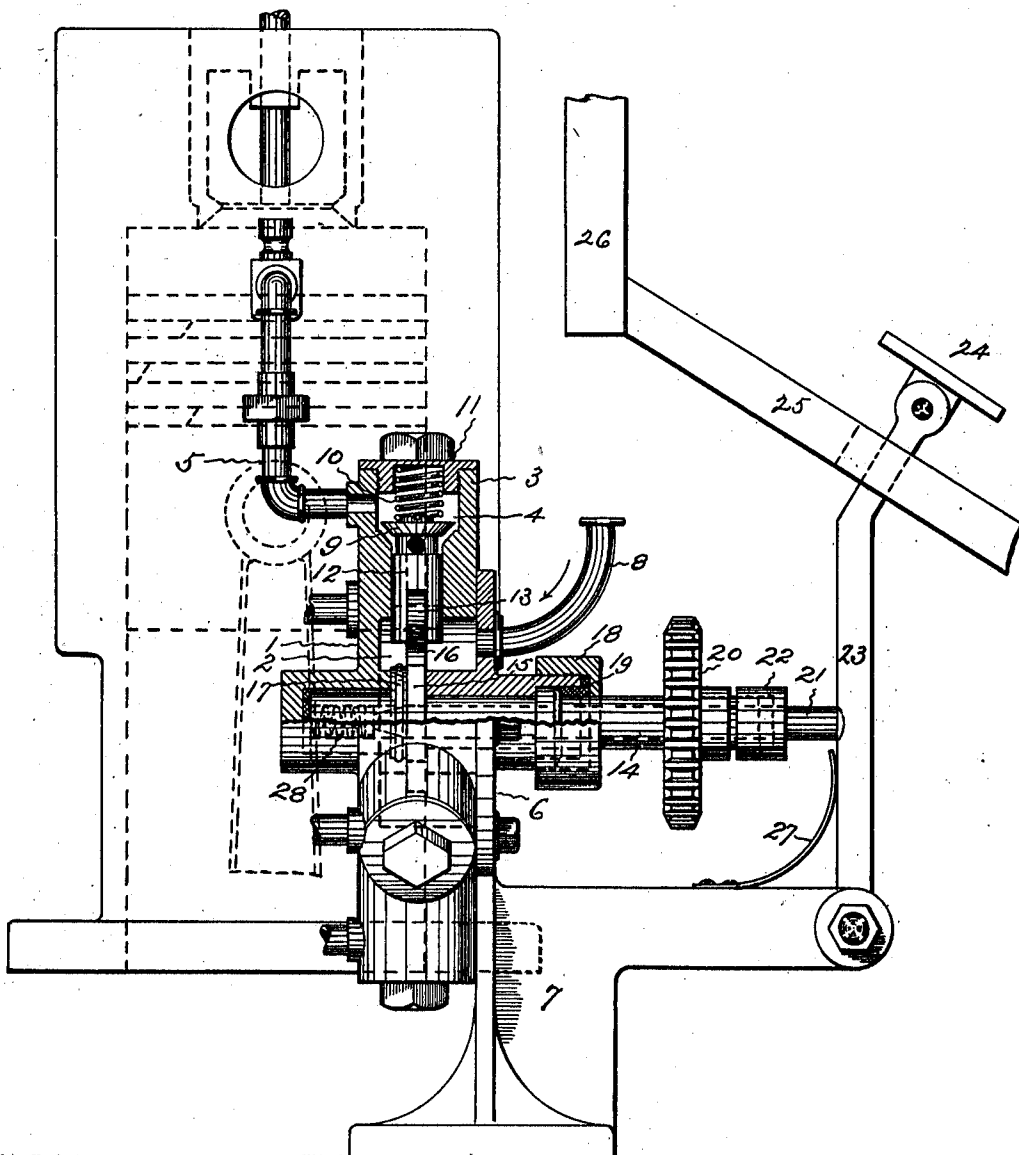
F. SLATER.
 STARTER FOR INTERNAL COMPUSTION ENGINES.
 APPLICATION FILED JULY 19, 1910.

1,004,485.

Patented Sept. 26, 1911.

2 SHEETS—SHEET 1.

Fig. 1



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 by
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2 SHEETS—SHEET 2.

Fig. 4

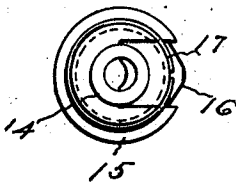


Fig. 3

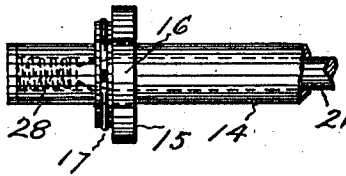
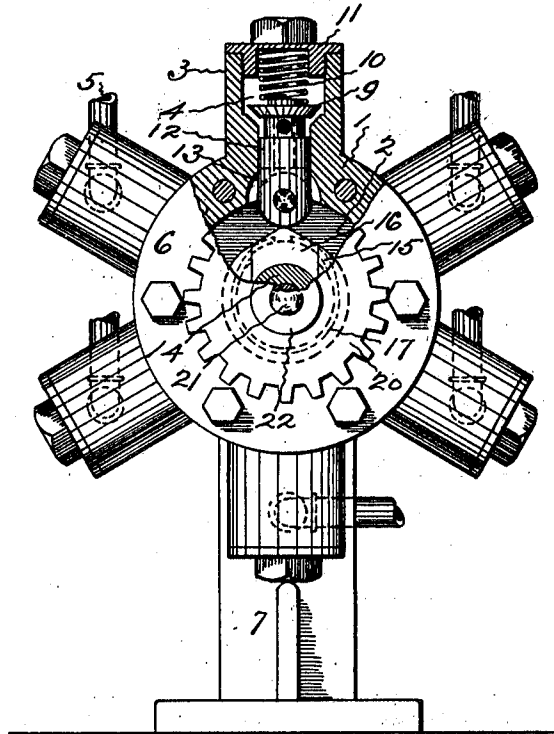


Fig. 2



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UNITED STATES PATENT OFFICE.

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STARTER FOR INTERNAL-COMBUSTION ENGINES.

1,004,485.

Specification of Letters Patent. Patented Sept. 26, 1911.

Application filed July 19, 1910. Serial No. 572,764.

To all whom it may concern:

Be it known that I, FRANK SLATER, a citizen of the United States, residing at New Britain, in the county of Hartford and State of Connecticut, have invented a new and useful Improvement in Starters for Internal-Combustion Engines, of which the following is a specification.

This invention relates to the class of apparatus provided for starting internal combustion engines by means of compressed air.

The object of the invention is to produce a simple apparatus of this character which can be readily designed for application to single or multiple cylinder internal combustion engines of the ordinary types, but which is particularly adapted for use in connection with multiple cylinder automobile engines.

This apparatus which may be termed an "air timer", has a chamber adapted to be connected with an air pump or a reservoir containing air compressed by a pump, and has valved passages designed to communicate with pipes that lead to the several engine cylinders. In the chamber and on a shaft that may be directly connected with, or may be driven indirectly from the usual timing cam-shaft which actuates the engine intake and exhaust valves, is an adjustable cam, which when collapsed runs idly, but when expanded engages and opens the valves that control the passages from the chamber to the engine cylinders, and allows the compressed air to flow to the cylinders in such order as to set the engine running. The cam is expanded for this purpose by a connection from a lever that may be moved by foot or by hand.

Figure 1 of the accompanying drawings shows a side view of an embodiment of the invention which is designed for starting a six cylinder automobile engine, parts of the case surrounding the compressed air chamber being cut in central vertical section and an engine cylinder being outlined. Fig. 2 shows a face view of the starter with a part of the case broken away. Fig. 3 shows a plan of the adjustable cam and a portion of its hollow shaft. Fig. 4 shows a face view of the cam.

The case 1 containing the chamber 2 has a number of radially projecting hubs 3 containing passages 4. The hubs desirably equal in number the number of cylinders of the engine with which the starter is used.

The passages in these hubs are connected by suitable pipe connections 5 with the several cylinders, preferably part way up the side at the point where the openings are made, for the usual relief cocks. The connections are made from the hubs to the various cylinders in the same sequence as the cylinders are fired. One side of the chamber is closed by the plate 6 which is bolted to the face of the casing. This plate is preferably cast on the bracket 7, which is provided for attaching the device to the frame of an automobile. A pipe 8 leads to the chamber in the case from an air pump which may be located at any convenient point, and may be run by any desired part of the engine, or this pipe may lead from a reservoir containing air compressed by the pump.

In the passage in each hub is a valve 9 that is normally held to its seat by a spring 10 that thrusts between the head of the valve and a plug 11 that is screwed into the end of the hub. The stem 12 of each valve, which stem is preferably hollow, extends into the chamber, and its inner end is provided with a roll 13.

Extending through the plate and into the case is a tubular shaft 14, and mounted on this shaft in the chamber is a cam disk 15. This cam disk has a movable cam block 16 that may be held retracted by an annular spring 17 which encircles a boss on the side of the disk and a boss on the side of the block. A gland 18 with a packing 19 is provided to prevent leakage of air around the shaft. On the outer end of the shaft is a drive wheel 20, which may either be a sprocket or a gear. This drive wheel is designed to be connected with a similar wheel on the shaft which carries the cams that actuate the intake and exhaust valves of the several cylinders at the proper time. Consequently, when this device is installed, the cam disk with its movable cam block are driven coincidently with the cam shaft, and thus the cam in the starter is timed with the engine intake and exhaust cams.

A rod 21 extends through the tubular shaft bearing the drive wheel and into the cam disk beneath the loose cam block. A gland 22 is provided to prevent leakage of air around this rod. A lever 23 that is pivoted to the supporting bracket engages the outer end of this rod. This lever may be provided with a foot pad 24, located near the foot board 25 back of the dash 26 at the

front of the automobile. A spring 27 is arranged to normally hold this lever back. The inner end of the rod which is engaged by this lever is tapered and is forced backward by a spring 28 arranged in the case.

- When the lever is pushed forward whether by foot or hand, the rod is pushed in and its tapered end engages and forces out the cam block which is loosely mounted in the cam disk on the shaft that is driven from the timing cam shaft. This action causes the cam block to lift the valve that it is adjacent to, and permits the compressed air to flow through the starter to the proper cylinder to move the engine pistons. As the expansible cam is driven from the timing shaft, the cam block will always be adjacent to the right valve to let the compressed air into the cylinder which is in condition to be driven. As long as the lever is pressed forward, and the rod is pushed in, the cam remains expanded and so engages the several valves in the starter as to allow the air to flow to the engine and keep it in motion. When the lever is released, it is thrown back, and the spring in the casing forces the rod back so that the cam block is allowed to retract. Then none of the valves are opened, and no air passes to the engine cylinders. By this means an engine may be started without cranking.

The invention claimed is:

1. A starter for an internal combustion engine having a case with an inlet adapted to be connected with a supply of compressed air, and a plural number of radially extending hubs with outlets adapted to be connected with a number of cylinders, a valve located in each hub, a cam rotatable in the case, and mechanically operated means for causing the cam to be radially extended so as to engage with and move the valves radially.

2. A starter for an internal combustion engine having a case with an inlet adapted

to be connected with a supply of compressed air, and a plural number of radially extending hubs with outlets adapted to be connected with a number of cylinders, radially arranged valves located in the chambers in the hubs between the inlet and outlets, a cam rotatable in a fixed plane in the case, and means for causing the cam to be radially extended so as to engage with and open the valves.

3. A starter for an internal combustion engine having a case with an inlet adapted to be connected with a supply of compressed air and an outlet adapted to be connected with a cylinder, a valve located in the case between the inlet and the outlet, a cam disk rotatable in the case, a block movable radially of the cam disk, and a longitudinally movable rod for moving the cam block outwardly.

4. A starter for an internal combustion engine having a case with an inlet adapted to be connected with a supply of compressed air and an outlet adapted to be connected with a cylinder, a valve located in the case between the inlet and the outlet, a tubular shaft extending into the case, a cam disk mounted on said shaft in the case, a cam block movable outwardly on said disk, and a rod movable through the shaft and adapted to move the cam block outwardly.

5. A starter for an internal combustion engine having a case with inlet and outlet openings, a valve controlling the passage to each outlet, an adjustable cam rotatable in the case, means for rotating the cam, a rod for adjusting the cam outwardly so that it will engage with the valves, means for adjusting the cam inwardly so that it will run idle, and a lever for operating said cam adjusting means.

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