

UNITED STATES PATENT OFFICE.

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EXHAUST-SILENCER.

994,028.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGE CARL PALMER, a citizen of the United States, and a resident of Stamford, county of Fairfield, and State of Connecticut, have invented a new and useful Improvement in Exhaust-Silencers, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawing wherein—

Figure 1 is a sectional view on line 1—1 indicated in Fig. 2; Fig. 2 a sectional view on line 2—2 indicated in Fig. 1; Fig. 3 a side elevation of the pan; and Fig. 4 a detail view of the hollow shaft and of the fan blades mounted thereon.

My invention relates more particularly to internal combustion engines and consists of the improved exhaust silencer, or muffler, as they are sometimes called, hereinafter more fully described and specified in the claims, into which the exhaust gases from the working cylinder of such an engine are discharged and by means of which the exhaust gases are practically noiselessly expanded, and the noise, produced by the exhaust, dissipated without obstructing or resisting their exhaust, and without creating any back pressure upon the exhaust valve of the engine, and whereby the exhaust is assisted, the gases being drawn out and practically noiselessly expelled.

This improved exhaust silencer comprises the casing *a*, preferably circular in shape, a correspondingly shaped pan *d*, set in the casing concentrically therewith, being supported on studs *f'* and secured in its place by screws *f*, screwed through its bottom into the studs *f'*. The heads of these screws are countersunk in the bottom of the pan *d*, so that its interior is smooth and even. Instead of thus fixing the pan within the casing, the pan may be screwed onto the cover *b* in the same way as the cover *b* is secured to the rim of the casing by the screws *c*. It is, however, preferable, and more convenient for the purpose of assembling the parts, to secure the pan to the bottom of the casing upon the studs *f'*, as hereinbefore explained.

The rim of the pan *d* is perforated, the perforations *i* extending, in the arrangement shown in Fig. 3, from near the inlet pipe *m*, and gradually increasing in size, for about two-thirds or five-sevenths of the cir-

cumference of the pan, to about where the extension of the axis of the inlet pipe *m* would strike the rim of the pan, where the perforations are largest. The rim of the pan adjoins closely the inner surface of the cover *b*, whereby casing *a* and pan *d* are closed. By this cover *b*, secured upon the rim of the casing by screws *c*, also the space *p* between the pan *d* and the interior of casing *a* is inclosed. The discharge pipe *n* is preferably cast in one piece with the cover and turned to divert the flow of the gases; it is, however, not essential to the operation of the silencer as designed.

An inlet into the interior space of the pan *d* is provided in the rim of the pan, and pipe *m*, set therein, extends through the rim of the casing, its projecting end being flanged or otherwise adapted for attaching the silencer to the exhaust pipe of the engine. Circular openings are made in the center of the bottom of the pan, and in the center of the cover *b*, wherein the ends of the hollow shaft *g* are fitted. Concentrically with the central opening in the bottom of the pan, a boss is cast on the outside of the casing *a*, wherein a screw-threaded hole *t'* is made, and the screw *u*, having a conical and hardened point *u'*, is screwed in and secured in its adjusted position by the screw-nut *u*². The hollow shaft *g* is rotatably supported on screws *u* and *v*. A correspondingly screw-threaded bore is drilled in the boss *w*, cast on the wall of the discharge pipe *n*, and screw *v*, pointed and hardened like the screw *u*, is screwed in and locked in its adjusted position by screw-nut *v'* in the same manner, and the shaft *g* being provided on its ends with spiders *g'* and *g*², having correspondingly shaped depressions in their centers into which the points of the screws *u* and *v* enter. Spider *g'* is formed of flat cross-bars, set flush with the end of the shaft *g*, the arms of spider *g*² project outwardly.

Blades *k*, *k'*, *k*² and *k*³ are secured to the hollow shaft *g*, as shown in Fig. 4, and snugly fitted into the pan. They reach closely to the interior of the rim of the pan *d* and their width is nearly equal to its depth, only a slight clearance being allowed between them and the bottom of the pan and the cover *b* of the casing. When the exhaust gases from the engine are discharged, they enter through the inlet pipe *m* into the

pan *d*, and striking against the blades *k*, *k'*, *k*², etc., cause the hollow shaft *g* to rotate in the direction of the arrow indicated in Fig. 2, their force being exerted upon the blades *k*, *k'*, etc., thus driving the shaft *g*. As the shaft rotates, the blades, moving with it, permit and drive the exhaust gases through the perforations *i* into the space *p*, between the rim of the pan and the casing *a*, each blade progressing in the same direction, exerts in turn a pressure upon the exhaust gases before assisting in their escape from the pan. The space *p* in the casing between the rim of the pan and the outer wall of the casing, communicates through the hollow shaft *g* with the outlet pipe *n*, and there is, consequently, no resistance to the expansion of the exhaust gases in the pan and to their outflow. Accordingly, they escape rapidly and silently through the perforations *i* into the space *p* and through shaft *g* and the discharge pipe *n* into the atmosphere, and there is no other noise produced except the slight buzzing of the blades as the hollow shaft *g* rapidly rotates. It should be understood that in practical operation of the silencer, the shaft *g* rotates continuously, the exhaust gases entering it, in rapidly following puffs, with each opening of the exhaust valve of the engine. Then the action of the blades *k*, *k'*, *k*² and *k*³ becomes to be practically that of an exhaust fan, and consequently, instead of there being a resistance to the entry of the exhaust gases into the pan, there is rapidly developed a partial vacuum therein, and the gases are drawn in, expand freely and immediately upon entering the pan, and are being continuously driven out.

My improved exhaust silencer requires to be of comparatively small size, 6, 8, and 10 inches in diameter and not over two inches wide. Its parts may be produced of thin castings or pressed out of sheet metal; one of ten inches in diameter being sufficient to dispose of the exhaust of an internal combustion engine, of such capacity as is used on automobiles or boats. It is easily and rapidly applied or affixed to the exhaust pipe of any engine and does not require any care whatever.

I claim as my invention:

1. A silencer for the exhaust of an engine, comprising a casing; a circular pan, smaller than the casing and provided with perforations in its side wall, and with a circular opening located centrally in its bottom, se-

cured concentrically in the casing some distance from its bottom; a cover for the casing, having a circular opening, located in alinement with the circular opening in the bottom of the pan; an outlet pipe, connecting with the opening in the cover; a hollow shaft, set in the circular openings of the pan and of the cover, and means for rotatably supporting the shaft; a series of blades secured to the shaft; an inlet into the pan and a pipe connected thereto through the casing and adapted to be connected to the exhaust pipe of the engine.

2. A silencer for the exhaust of an engine, comprising a cylindrical casing, a correspondingly shaped pan, but shallower and of a smaller diameter, secured concentrically therein some distance from the bottom of the casing, and having a series of perforations in its rim and a circular opening in its bottom; a cover secured to the casing, having a circular opening, located in alinement with the circular openings of the pan; an outlet pipe, connecting with the opening in the cover; a hollow shaft set in the circular openings of the pan and of the cover, and means for rotatably supporting the shaft; a series of blades secured to the shaft; an inlet into the pan and a pipe connected thereto through the casing and adapted to be connected to the exhaust pipe of the engine.

3. A silencer for the exhaust of an engine, comprising a casing; a circular pan, smaller than the casing and provided with perforations in its side-wall, and with a circular opening located centrally in its bottom, secured concentrically in the casing some distance from its bottom; a cover having a circular opening, located in alinement with the circular opening in the bottom of the pan, fitted to close the casing and the pan; an outlet pipe, connecting with the opening in the cover; a hollow shaft, set in the circular openings of the pan and of the cover, and means for rotatably supporting the shaft; a series of blades secured to the shaft and extending to the rim of the pan and laterally from the bottom of the pan to the inner face of the cover; an inlet into the pan and a pipe connected thereto through the casing and adapted to be connected to the exhaust pipe of the engine.

GEORGE CARL PALMER.

Witnesses:

JAMES E. BRINCKERHOFF,
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