

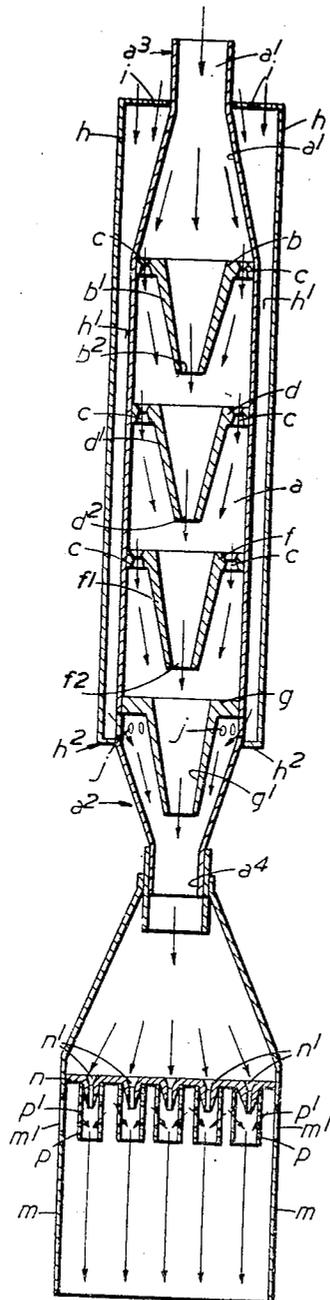
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AIR-COOLED EXHAUST SILENCER

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AIR-COOLED EXHAUST SILENCER

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My invention relates to exhaust silencers for internal combustion engines, and it has for its object to provide an improved construction which will not only effectively perform its function but will at the same time obviate or reduce to a minimum any obstruction to the flow of the exhaust gases.

A silencer according to the invention comprises, as shown in the accompanying drawing to which, in the following description, reference will be made, a tubular casing *a* having at one end a suitable inlet *a'* and at the other end a suitable outlet *a²* for the exhaust gases. Preferably, the inlet of the casing will comprise, as shown, a tapered portion terminating in a cylindrical portion *a³* of appropriate diameter for attachment to the exhaust pipe of an internal combustion engine. The outlet end *a²* of the casing will also preferably be tapered down, as shown, to present a central outlet orifice *a⁴* of suitable diameter.

At the inner or full diameter end of the tapered inlet portion the casing *a* is provided with a transverse plate or baffle *b* presenting a central coned portion *b'* extending in the direction of the outlet and terminating in an orifice *b²* of determined suitable diameter. The plate *b* is also formed, between the larger diameter or inlet end of the coned portion *b'* and the wall of the casing *a*, with a series or ring of openings *c* of suitable diameter and spacing each of which or some of which openings is or are formed, as shown, as Venturi tubes or passages.

Suitably spaced along the casing from the coned plate *b* just mentioned is a second, similar plate *d* having a central coned extension or projection *d'* in the direction of the outlet end of the casing and surrounded like the plate *b* by a ring of openings *c* some or all of which are formed, as shown, as Venturi tubes. The outlet orifice *d²* of the central cone of this second plate *d* is of suitably larger diameter than that of the first plate *b*.

A third plate *f* similar to the two already mentioned is disposed at the inner larger end of the tapered outlet end portion *a²* of the casing *a*, the central cone *f'* of this third plate having an outlet orifice *f²* suitably larger than that of the second plate. The plate *f* is, like the plates *b* and *d*, surrounded by a ring of Venturi openings *c*.

Exhaust gases entering the silencer expand in the tapered inlet portion *a'*, part of them passing through the central cone *b'* of the plate *b* and part through the openings or Venturi-passages *c* surrounding the said cone. The gases then pass to the second or central plate *d* and through its

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central cone *d'* and surrounding passages *c*, and thence to a third plate *f* where the action is repeated, the gases then passing to a fourth coned plate *g* where the action is again repeated, the gases then passing to the outlet *a²*, the plate *g* having, however, no surrounding Venturi passage *c*.

The cones *b'*, *d'*, *f'* and *g'* and the passages *c* surrounding the cones *b'*, *d'*, and *f'*, not only serve to break up the gases but also to accelerate their flow. It will be apparent that additional plates each constructed as described may be provided in the length of the casing instead of only four being employed, an essential feature or at any rate a preferred feature being that no matter how many coned and apertured plates are provided the outlet orifices of the central cones of the said plates shall gradually increase in diameter from the inlet to the outlet end of the silencer.

The casing *a* is preferably surrounded, as shown, by a tube *h* of such diameter as to present between itself and the casing an annular passage way *h'* of determined area, the inlet end of which is closed by a perforated plate *i*. The outer end of the tube *h* is closed as at *h²* and adjacent this closed end the casing *a* is provided with a ring of holes *j*.

Air entering through the perforations of the plate *i* passes along the space between the tube *h* and the casing *a* and becomes heated. The cone *g'* acts as an injector to draw the heated air along the annular passage *h'*.

The outlet end *a²* of the silencer is preferably provided with a flattened member *m* of fishtail form, in which is located a plate *n* having a series of spaced holes or passages *n'* extending parallel to the longitudinal axis of the silencer. Each of the passages *h'* is surrounded by a short tube *p* having orifices *p'* through which, and through orifices *m'* in the wall of the part *m*, air is drawn through the action of the gases flowing out through the said passages *n'*.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An exhaust silencer for an internal combustion engine, including an elongated tubular casing having an inlet port at one end and an outlet port at the other end; a series of substantially flat and transversely disposed plate portions spaced apart at intervals along the bore of the casing in mutual parallelism and peripherally in full contact with said bore, the plate portions having individual intermediate openings

therein; a series of hollow truncated conical portions occupying the intermediate openings and individually projecting integrally from said plate portions in the direction of the outlet port, the truncated ends of said conical portions having individual orifices which progressively increase in diameter from the inlet port toward the outlet port, and the plate portions each having a series of Venturi passages which are axially substantially parallel to the central axis of said tubular casing and angularly spaced apart in each plate portion so as to surround the conical portion respectively associated with the plate portion involved; and an outer tube coaxially surrounding and spaced from the tubular casing, the outer tube having a perforate inlet end and a closed outlet end extending beyond the hollow truncated conical portion of the extreme plate portion nearest said outlet port, and the cylindrical wall of said tubular casing having an annular row of angularly spaced openings between said extreme plate portion and said outlet port forming open means of communication between the space located between the outer tube and the tubular casing and the outlet port of the latter.

2. An exhaust silencer for an internal combustion engine, including an elongated tubular casing having an inlet port at one end and an outlet port at the other end; a series of substantially flat and transversely disposed plate portions spaced apart at intervals along the bore of the casing in mutual parallelism and peripherally in full contact with said bore, the plate portions having individual intermediate openings therein; a series of hollow truncated conical portions occupying the intermediate openings and individually projecting integrally from said plate portions in the direction of the outlet port, the truncated ends of said conical portions having individual orifices which progressively increase in diameter from the inlet port toward the outlet port, and the plate portions each having a series of Venturi passages which are axially sub-

stantially parallel to the central axis of said tubular casing and angularly spaced apart in each plate portion so as to surround the conical portion respectively associated with the plate portion involved; a flattened hollow extension of fish-tail form secured to the tubular casing at the outlet port thereof and terminating in an open outer end; a transverse plate secured within the intermediate portion of the flattened hollow extension in stationary contact with the interior walls thereof and having a plurality of open tubular members forming nipples communicating through and extending rigidly from the transverse plate toward the open outer end of said flattened hollow extension; and a corresponding plurality of substantially parallel tubes individually surrounding said open tubular members and extending a predetermined distance past the free ends of the latter from said transverse plate and opening toward said outer end of said flattened hollow extension, the parallel tubes having side openings in the walls thereof adjacent the outer open ends of said nipples, and said flattened hollow extension also having a plurality of side openings spaced apart in the wall thereof adjacent to the side openings in said parallel tubes.

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