G. A. BISHOP.

EXHAUST SILENCER FOR INTERNAL COMBUSTION ENGINES AND THE LIKE.

APPLICATION FILED FEB. 18, 1911.

1,009,216. Patented Nov. 21, 1911.

Fig. 1.

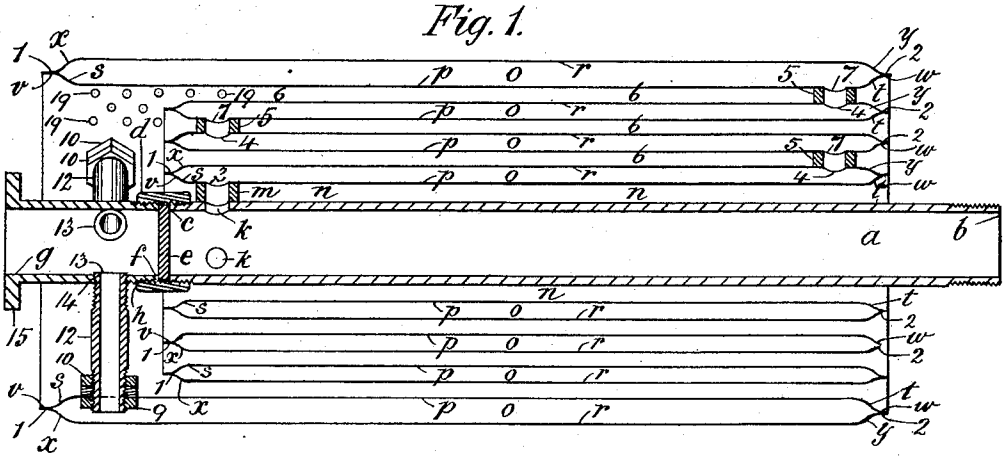


Fig. 3.

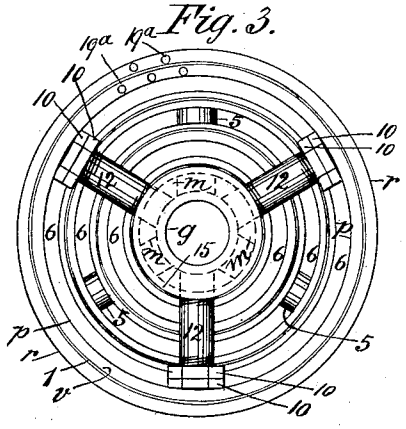


Fig. 9.

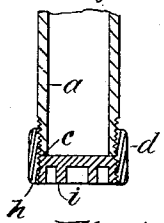


Fig. 10.

Fig. 2

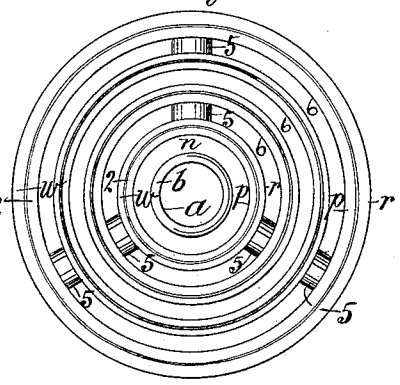


Fig. 4.

Fig. 5.

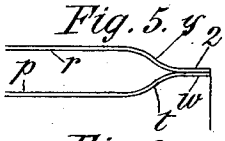


Fig. 6.

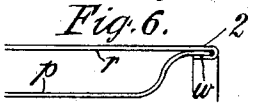


Fig. 7.

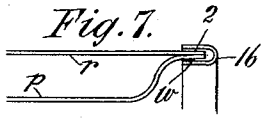
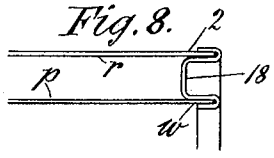


Fig. 8.



Witnesses.
R. A. Bishop
L. S. Beechner.

Inventor:
George Arthur Bishop,
By Julian C. Rowell
Attorney.

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE ARTHUR BISHOP, OF LEEDS, ENGLAND.

EXHAUST-SILENCER FOR INTERNAL-COMBUSTION ENGINES AND THE LIKE.

1,009,216. Specification of Letters Patent. Patented Nov. 21, 1911.

Application filed February 18, 1911. Serial No. 609,302.

To all whom it may concern:

Be it known that I, GEORGE ARTHUR BISHOP, a subject of the King of Great Britain and Ireland, residing at Leeds, in the county of York, England, have invented Improvements in Exhaust-Silencers for Internal-Combustion Engines and the Like, of which the following is a specification.

This invention relates to silencers for internal combustion engines and the like, the object being to construct a silencer that will quickly cool the waste gases while they are expanding therein, thereby reducing to a minimum the noises of such gases while emanating from the silencer. To attain these objects, in the improved silencers the exhaust gases are caused to pass from an internally arranged pipe or conduit through ports into a series of annular chambers separated and surrounded by air cooling spaces. The inlet pipe is closed at one end or near one end and in close proximity to such closed end may be formed with two or more orifices or ports, in connection with short cylindrical tubes of the requisite length, or instead of such short tubes, short nipples may be screwed into the said orifices. Around such inlet pipe are placed a number of annular cylindrical chambers concentric therewith arranged with annular air cooling spaces between them and connected together at alternate ends by suitable ports. Each annular cylindrical chamber consists of an internal and external cylinder of suitable diameters to produce the requisite space between them. The outer ends of each internal cylinder are upset or bell-mouthed outward, about half the distance of the required space of the chamber it is to form, and beyond such upset part the ends may be formed with flat or parallel parts to form joints; the outer ends of each external cylinder are necked or reduced in diameter about half the distance of the required space of such chamber and such necked ends may terminate with flat or parallel portions to fit the upset ends of the internal cylinders to form a joint therewith, the said joints being either welded, brazed or soldered together. The internal cylinders of such annular chambers may have formed at or near one end two or more orifices or ports communicating with the annular chamber, while the external cylinders of these annular chambers may also at or near one end have formed two or more orifices or ports also communicating with the annular chambers. The first annular chamber being placed over the inlet pipe with its inlet ports registering with the outlet ports of such inlet pipe the parts are secured together by either welding, brazing or soldering. The outlet orifices or ports of this annular cylindrical chamber being furnished with short distance pipes equal to the required air space between one annular chamber and its next surrounding one, are connected to the inlet orifices of the next surrounding annular cylindrical chamber, and so on until the requisite number of annular chambers are secured together. The outer annular cylindrical chamber may in some cases have formed through the thickness of its internal cylinder at suitable distances from either end, inlet and outlet orifices or ports, such outlet ports then being connected to or with the exhaust pipe by suitable connecting pipes. In some cases such internal cylinder of the outer annular chamber may have a number of exhaust orifices formed through its thickness, and deliver the cooled gases into the air space between it and the adjacent annular chamber. In small exhaust silencers such delivery orifices may conveniently be made in the upset and necked ends of the outer annular chamber. The exhaust pipe may be connected to the outer end of the inlet pipe, by a screw coupling, a stop piece being placed between the ends of both pipes which are then screwed tightly together to form a sealed or closed joint between them.

I will now proceed to further describe the invention by the aid of the accompanying illustrative drawings, in which—

Figure 1 is a sectional elevation of a silencer constructed according to this invention. Figs. 2 and 3 are respectively views of the inlet and exhaust ends of such silencer. Figs. 4 to 8 are part sectional views showing different methods of joining the cylinder ends together, hereinafter referred to. Figs. 9 and 10 illustrate an alternative method of closing the end of the inlet pipe, hereinafter referred to.

The outer end *b* of the inlet pipe *a* of the silencer is adapted to be secured to the exhaust port or passage of the engine, and the inner end *c* of the pipe has screwed thereon a coupling *d* within which is placed a suitable metal disk *e* which is tightly screwed

against the pipe end *c* by the end *f* of an exhaust pipe *g* which is screwed into the extending end *h* of the coupling *d*. When the exhaust pipe *g* is not required the end *c* of the inlet pipe may be closed by a screwed plug *i* fitted into the coupling *d* and tightly against the end *c* of the pipe as shown in Figs. 9 and 10. In proximity to the closed end *c* the inlet pipe is formed with two or more orifices or ports *k* in communication with short cylindrical tubes *m* the length of which corresponds to the width of the air spaces *n* it is desired to form around the inlet pipe *a* and constituting the first annular chamber. If desired the short tubes *m* can be constituted by short nipples screwed into the tube *a*.

o are annular chambers each consisting of an internal and external metal cylinders *p* and *r* of the requisite diameters, length and thickness, to produce the desired annular space *o* between them. The ends *s* and *t* of each internal cylinder *p* are upset or bell-mouthed outward to about half the distance of the annular space or chamber *o* it is to form and beyond such upset parts are short flat or parallel parts *v* and *w* to form joints. The outer ends *x* and *y* of each external cylinder *r* may be bottle necked or reduced in diameter to about half the distance of the annular space or chamber *o* it is to form, such necked ends *x* and *y* may terminate in flat or parallel portions 1 and 2, to fit the corresponding flat parts *v* and *w* of the upset ends *s* and *t* of the internal cylinder *p*, the said ends being then either welded, brazed or soldered together.

At or near the end *v* each internal cylinder *p* is formed with two or more orifices or ports 3 communicating with the annular space *o* while the external cylinders *r* near the end 2 thereof are each formed with two or more similar orifices or ports 4 also communicating with the annular chamber *o*. The ports 4 are furnished with short tubes 5 which are secured thereto, the length of such tubes determining the width of air spaces 6 between one annular chamber and its surrounding annular chamber. The first cylinder *p* having upset ends *s* and *t* is placed over the inlet pipe *a* its inlet ports 3 registering with the ports *k* and tubes *m* to which they are secured by either welding, brazing or soldering. The external cylinder *r* is next placed over its corresponding internal cylinder *p* the plain parts 1 and 2 of their necked ends *x* and *y* fitting the plain parts *v* and *w* of the upset ends of the cylinder *p* they then may be either welded, brazed or soldered together. In like manner the next internal cylinder *p* may be placed over the first external cylinder *r*, its inlet ports 7 registering with the outlet ports 4 and secured thereto as described, also in like manner the external cylinder may be placed on the internal cylinder *p* the ends being secured together also as described, and so on until the last annular chamber is placed in position. The inlet ports 7 of the internal cylinder *p* of the last annular chamber *o* are formed near its end *w* and the outlet ports 8 may be formed near the outer end *v*, the external cylinder *p* with its necked ends *x* and *y* will then be plain as shown.

Fixed into the outlet ports 8 by means of lock nuts 9 and 10 are the ends 11 of outlet pipes 12, the other ends 13 of which are screwed into orifices 14 in the exhaust pipe *g*. The exhaust pipe *g* may be provided with a flange 15 as shown in Figs. 1 and 3.

Sometimes the plain ends *w* and 2 of the annular chambers *o* may be strengthened by a channeled ring 16 placed over them and either brazed or soldered thereto as shown in Fig. 4.

The external cylinders *r* may have their outer ends 1 and 2 turned inwardly so as to embrace the ends *v* and *w* of the upset ends of the internal cylinders as shown in Fig. 6; or the two ends may be embraced and strengthened by a channeled ring 16 placed on them and secured by brazing or soldering, as shown in Fig. 7.

In some cases the two ends *v* and *w*, and 1 and 2 of the internal and external cylinders *p* and *r* may be plain and secured together by an annular ring 18 that is channeled internally and externally cupped, the whole being soldered or brazed together.

Sometimes, especially in the case of small sized silencers, the outer annular chamber *o* is not connected to the exhaust as in the silencer described, but may have its internal cylinder *p* provided near the outer end *v* with a suitable number of exhaust orifices 19, Fig. 1, opening into the air space 6; or the upset end *s* and necked end *x* may be provided with a number of exhaust orifices 19ª, Fig. 3.

The annular chambers *o* being formed with upset ends *s* and *t* and with necked ends 1 and 2, as shown in Figs. 1, 4 and 5 form suitable inlets to the air passages 6 and facilitate the annular chambers *o* being kept constantly cool.

What I claim is:—

1. In a silencer for an internal combustion engine and the like, a gas inlet pipe, a series of annular chambers with closed ends surrounding said inlet pipe and so spaced as to leave air cooling spaces between them, inlet and outlet ports being formed near opposite ends of said chambers, each of said chambers comprising an inner cylindrical body with outwardly flared or upset ends and an outer cylindrical body with inwardly pressed or necked ends, radially extending conduits between said pipe and the inlet port of the first of said chambers, and radially extending conduits con-

necting the outlet ports of each of said chambers except the outer one to the inlet ports of the next adjacent chamber.

2. In a silencer for an internal combustion engine and the like, a gas inlet pipe, a series of annular chambers with closed ends surrounding said inlet pipe and so spaced as to leave air cooling spaces between them, inlet and outlet ports being formed near opposite ends of said chambers, each of said chambers comprising an inner cylindrical body with outwardly flared or upset ends terminating in parallel end portions and an outer cylindrical body with inwardly pressed or necked ends terminating in parallel end portions, radially extending conduits between said pipe and the inlet port of the first of said chambers, and radially extending conduits connecting the outlet ports of each of said chambers except the outer one to the inlet ports of the next adjacent chamber.

3. In a silencer for an internal combustion engine and the like, a gas inlet pipe closed at one end and formed with outlet ports near said closed end, a series of annular chambers with closed ends surrounding said inlet pipe and so spaced as to leave air cooling spaces between them, inlet and outlet ports being formed near opposite ends of said chambers, radially extending tubular distance pieces connecting the outlet ports of said pipe and the inlet ports of the first of said chambers, and radially extending tubular distance pieces connecting the outlet ports of each of said chambers, except the outer one, to the inlet ports of the next adjacent chamber.

4. In a silencer for an internal combustion engine and the like, a gas inlet pipe, a series of annular chambers with closed ends surrounding said inlet pipe and so spaced as to leave air cooling spaces between them, inlet and outlet ports being formed near opposite ends of said chambers, radially extending conduits between said pipe and the inlet port of the first of said chambers, radially extending conduits connecting the outlet ports of each of said chambers except the outer one to the inlet ports of the next adjacent chamber, an outlet pipe, and radially extending conduits connecting the outlet ports of the outer one of said chambers to said outlet pipe.

5. In a silencer for an internal combustion engine and the like, a gas inlet pipe formed with ports near one end, a series of annular chambers with closed ends surrounding said inlet pipe and so spaced as to leave air cooling spaces between them, inlet and outlet ports being formed near opposite ends of said chambers, radially extending conduits connecting the outlet ports of said pipe to the inlet ports of the first of said chambers, radially extending conduits connecting the outlet ports of each of said chambers except the outer one to the inlet ports of the next adjacent chamber, an outlet pipe co-axial with said inlet pipe and formed with ports, a screw coupling connecting the adjacent ends of said inlet pipe and said outlet pipe, a metallic disk arranged between the adjacent ends of said inlet pipe and said outlet pipe and radially extending conduits connecting the outlet ports of the outer one of said chambers to the ports of said outlet pipe.

Signed at Leeds, England, this second day of February 1911.

GEORGE ARTHUR BISHOP.

Witnesses:
ROBERT EDWIN PEACOCK CRAVEN,
ALFRED EDWARD BROOKE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."