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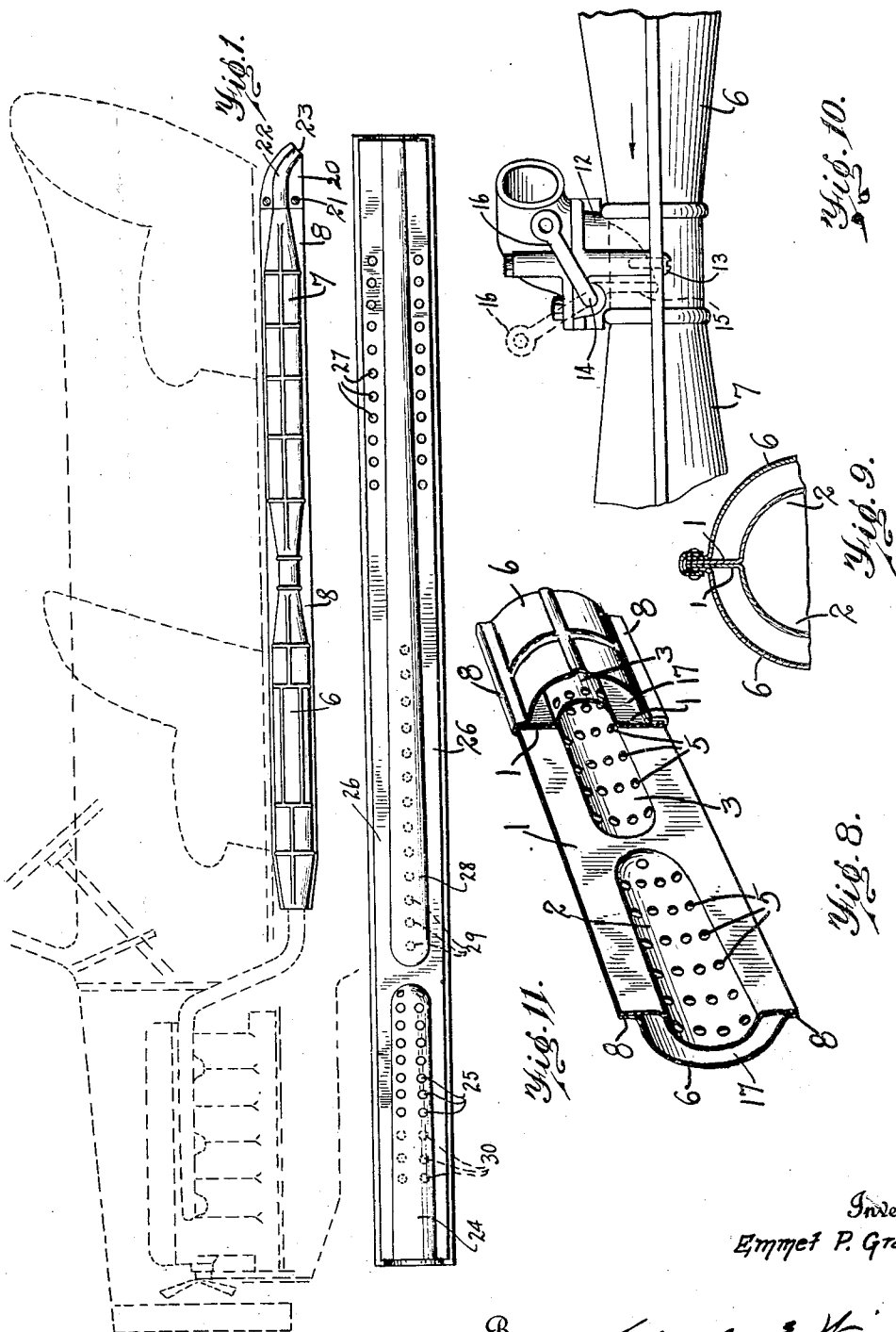
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E. P. GRAY

MUFFLER

Filed Feb. 17, 1923

2 Sheets-Sheet 1



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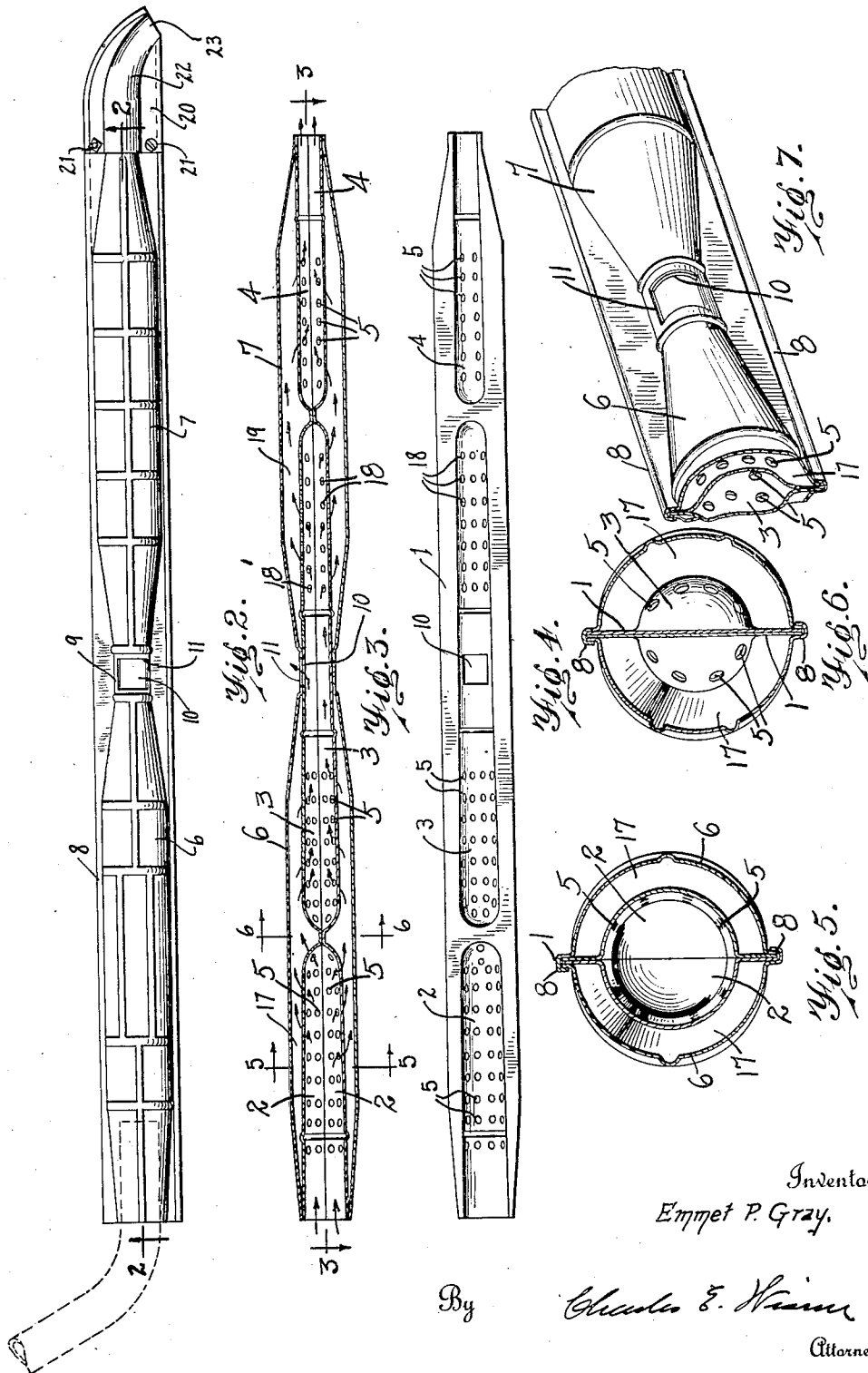
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UNITED STATES PATENT OFFICE.

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MUFFLER.

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This invention relates to mufflers and the object of the invention is to provide a muffler for internal combustion engines in which the back pressure is reduced to a minimum.

Another object of the invention is to provide a muffler of very simple construction and of consequent low manufacturing cost and having an efficiency above that of mufflers of the usual type. A further object of the invention is to provide a muffler of the character described which is adapted to replace the normal exhaust pipe extending beneath the body of the automobile and which when secured in place has no parts to get out of order and rattle. Another object of the invention is to provide a muffler in which the flow of gases therethrough is in one general direction due to the design and length of the muffler so that the exhaust gas is not turned back upon itself as is the case with the short cylindrical types of mufflers. A further object of the invention is to provide a muffler in which the exhaust gases enter the intake end thereof in distinct impulses from the internal combustion engine and are discharged at a steady uniform pressure so that the noise of the separate explosions is completely done away with. Another object of the invention is to provide a muffler to which a heater may be attached intermediate its ends at a point where the gases are partially expanded so that the impulse of the separate explosions is considerably reduced before the gases are carried to the heater. These objects and the several novel features of the invention are hereinafter more fully described and claimed and the preferred form of construction by which these objects are attained is shown in the accompanying drawings in which—

Fig. 1 is a view of the muffler as used with an automobile of the usual type.

Fig. 2 is a side view of a muffler embodying my invention.

Fig. 3 is a section taken on line 2—2 of Fig. 2.

Fig. 4 is a section taken on line 3—3 of Fig. 3.

Fig. 5 is a section taken on line 5—5 of Fig. 3.

Fig. 6 is a section taken on line 6—6 of Fig. 3.

Fig. 7 is a perspective view of the central portion of the muffler.

Fig. 8 is a perspective view showing how the parts are secured together.

Fig. 9 is a section showing an alternative manner of securing the parts together.

Fig. 10 is a view showing the construction of the valve secured to the center of the muffler.

Fig. 11 is a view with the upper half of the outer casing removed showing an alternative type of interior arrangement of the muffler.

As shown in Figs. 1 and 2 the muffler is adapted to be connected at the forward end to the exhaust manifold of the internal combustion engine and when used on automobiles the muffler takes the place of the usual long exhaust pipe and extends beneath the automobile body. The muffler comprises two duplicate inner parts one of which is shown in Fig. 4. Each part 1 is provided with recessed portions 2, 3 and 4 which are half round in cross section shown in Figs. 5, 6 and 8. The portion 2 is of greater diameter than the portion 3 and the portion 3 is of greater diameter than the portion 4 the said portions tapering in diameter from the forward end to the rear end of the member 1. The two parts 1 are positioned with the flat flanges engaging as shown in Fig. 5 and as the two parts 1 are exact duplicates the portions 2, 3 and 4 when placed together form cylindrical recesses. The portions 2, 3 and 4 are provided with a multiplicity of small apertures 5. The outer casing is also composed of two duplicate parts one of which is shown in Fig. 2. Each half of the outer casing comprises two semi-cylindrical portions 6 and 7 of greater diameter than the portions 2, 3 and 4 of the members 1 and are adapted to fit thereabout as shown in Fig. 5. A peripheral flange 8 is provided about each portion of the outer casing and one flange on each portion of the outer casing is adapted to be bent over the flanges of the portions 1 and flange 8 of the opposite casing as shown in Fig. 5. The several flanges thus secured together are then welded together so as to form a leak proof joint to prevent the escape of exhaust gases. The portions 6 and 7 are reduced in diameter at the center as shown in Figs. 9

and 3 and the reduced portion 9 thus formed fits closely about the center of the portions 3 of the members 1 as shown in Fig. 3. One of the members 1 of the muffler is provided with a square aperture 10 and one-half of the outer casing is provided with an aperture 11 in the portion 9 which registers with the aperture 10 as shown in Figs. 2, 4 and 7. As shown in Fig. 10 a valve portion 12 is provided having an aperture registering with the apertures 10 and 11 of the muffler and this valve portion is secured to the muffler by the screws 13 which extend through the flanges of the muffler and into threaded apertures provided therefor in the valve portion 12. A rotatable shaft 14 is provided to which the valve 15 is secured and an arm 16 is provided which may be moved to the dotted position shown in Fig. 10 to close the valve. When the valve is in the open position shown in dotted lines in Fig. 10 it extends down through the apertures 10 and 11 and restricts the passageway thus causing the gases to pass upwardly through the valve and through a heater which may be connected thereto as will be readily understood, the direction of flow of the gases being indicated by the arrow at the right of Fig. 10. When the valve is closed by moving the lever 16 to the dotted position the passageway for the exhaust gases is not restricted and the entire quantity of exhaust gases may pass directly through the chamber 3 of the muffler.

The flow of exhaust gases is shown more particularly in Fig. 3 in which the gases enter in the direction of the arrows at the left of Fig. 3 and pass outwardly through the apertures 5 in the chamber 2 and thence into the chamber 17 between the inner and outer casings. The gases then pass through the apertures 5 in the chamber 3 and through the chamber 3 and outwardly through the apertures 18 in the opposite end thereof into the chamber 19 between the inner and outer casings and thence through the apertures 5 into the chamber 4 and thence to atmosphere. I preferably provide a tail piece 20 for the muffler composed of two parts which when secured together are secured to the muffler by bolts 21 and form a conduit 22 through which the exhaust gases may pass, the diameter of the conduit 22 decreasing toward the discharge end. Due to the operation of the internal combustion engine the exhaust gases are discharged into the muffler in separate impulses caused by the explosion of gas in the cylinders of the engine but by decreasing the diameter of the chambers 2, 3 and 4 and conduit 22 the flow of exhaust gas is retarded so that it passes from the discharge end 23 uniformly without impulse or sound. In order to produce this result the muffler must be carefully designed so that the restriction to flow is not sufficient to put a

back pressure on the engine but a point will be found where the separate impulses may be merged to produce a continuous flow of exhaust gases from the discharge end without building up pressure in the muffler.

A slightly alternative form is shown in Fig. 11 in which one half of the outer casing has been removed. The exhaust gases enter the chamber 24 of the inner casing and the flanges of the inner casing divide the outer casing into two compartments or chambers extending lengthwise of the muffler. The gases pass from the exhaust manifold into the chamber 24 and through the apertures 25 into the chamber on the upper side of the flanges 26 and pass through the length of the muffler and through the apertures 27 in the flanges 26 into the chamber between the casings on the lower side of the flanges. The gases then pass to the left and enter the chamber 28 through the apertures 29 which are shown in dotted lines and are open to the lower chamber between the casings, the gases passing through the chamber 28 and being discharged therefrom to atmosphere. The chamber 24 is provided with apertures 30 on the lower side which are shown in dotted lines and are open to the chamber between the inner and outer casings on the lower side of the flanges 26. These apertures 30 are provided to relieve pressure when a backfire occurs in the muffler and the exhaust gases pass from the apertures 30 through the lower chamber between the casings and into the apertures 29 and through the chamber 28 to atmosphere. If the apertures 25 were the only means of exit from the chamber 24 a backfire would produce pressure on one side only of the inner casing and would warp the muffler out of shape, but by providing the apertures 30 the pressures are equalized on each side of the chamber 24 so that the inner casing will not be forced out of shape. This type of muffler while not varying greatly from the type shown in Fig. 3 causes the gas to travel a greater distance before being discharged.

From the foregoing description it becomes evident that the device is very simple and efficient in operation, is composed of few parts and is of consequent low manufacturing cost, may be easily assembled and provides a device which accomplishes the objects described.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. A muffler comprising an inner casing, an outer casing thereabout providing a chamber, the outer casing intermediate its length being contracted to engage about the inner casing and dividing the chamber therebetween the casings into two parts, the inner casing being adapted to receive exhaust

gases and being formed of a series of chambers closed one to the other, the chambers of the inner casing having apertures whereby the gas passes from the inner casing to the chamber between the casings and thence to the next chamber of the inner casing, there being an aperture provided in both casings at the intermediate point of contact permitting flow of gases from the muffler subsequent to a partial expansion of the gases, and a valve for controlling the said aperture adapted when moved to open the aperture to extend into the passageway for gases.

2. A muffler comprising an outer substantially cylindrical sheet metal member formed of two flanged parts, an inner sheet metal casing formed of two similar flanged parts, the flanges of both casings being secured together and fixedly supporting the inner casing within the outer casing providing a chamber between the casings closed to atmosphere and the inner casing being formed of separate chambers provided with apertured walls whereby a flow of gases from one chamber to the other in the inner casing passes through the outer chamber, the last of the series of chambers of the inner casing being open to atmosphere.

3. A muffler comprising an outer casing of sheet metal formed of two similar flanged parts, an inner sheet metal casing also formed of two similar flanged parts, the flanges of the inner casing extending between the flanges of the outer casing, the several flanges being secured together to seal the same and positioning the inner casing in spaced relation with the outer casing and providing chambers exteriorly of the inner casing and on opposite sides of the flanges thereof, there being apertures provided in the inner casing and flanges whereby gases passing into the inner casing pass into the said chambers on opposite sides of the inner casing and thence to a succeeding chamber of the inner casing.

4. A muffler comprising an outer casing of sheet metal formed of two similar half parts, an inner sheet metal casing enclosed thereby also formed of two similar half parts each provided with flanges and extending longitudinally of the outer casing, the flanges of the inner casing being utilized to support the same centrally within the outer casing and the inner casing being arranged to receive the exhaust gases at one end, and a tail pipe at the opposite end of the inner casing.

5. A muffler comprising an inner casing formed of two parts, each part being formed to provide a series of longitudinal pockets and the two parts when secured together completely enclosing the pockets, an outer casing formed of two parts forming chambers about the inner casing when secured together, the pockets of the inner casing being

apertured to allow communication from one pocket to the outer chamber to the next succeeding pocket.

6. A muffler comprising an outer casing of sheet metal formed of two similar flanged parts together forming a hollow casing, an inner silencing member also of two similar flanged parts together providing a series of hollow chambers in alignment longitudinally and separate one from the other, the inner member being in spaced relation with the outer casing providing a chamber therebetween the flanges of the inner member being supported between the flanges of the outer member and the walls of the inner chambers having apertures, the wall of the outer member being reduced intermediate its length to closely engage the wall of an inner chamber, the arrangement providing for a flow of fluid from an inner chamber to a surrounding chamber and thence to an inner chamber successively from end to end of the device.

7. A muffler formed of sheet metal comprising an outer cylindrical shell of two similar half parts flanged at each edge and an inner silencing member of sheet metal formed of two similar half parts flanged at each edge, each inner half part having depressions formed therein providing separate chambers when the two inner parts are placed together, the flanges of the two inner parts being secured between the flanges of the two outer parts forming two chambers of the space between the inner and outer shells, the walls of the said pockets having apertures providing for communication between the inner and other chambers.

8. A metal muffler comprising an outer sheet metal shell formed of two parts each provided with a lateral flange at each edge, an inner silencing member in spaced relation with the outer shell providing a chamber therebetween, the inner member being formed of two similar parts provided with a lateral flange at each edge and formed to provide a series of longitudinal pockets apertured to provide communication between the inner silencing member and the chamber between the inner and outer members, the flanges of the inner member being secured between the flanges of the assembled outer member, the arrangement providing for an intake of gases at one end and a discharge thereof at the other.

9. In a muffler, an exhaust conduit, the walls of which are flattened intermediate the ends to provide an obstruction preventing the passage of the gases therethrough, the said walls each side of the obstruction being apertured, and an outer casing of sheet metal flattened at its ends to clamp about the tubular member and providing a chamber about the tubular member into which the exhaust gases are discharged from the conduit forward of the obstruction and from which the

gases pass to the exhaust conduit to the rear of the obstruction.

10. In a muffler, a tubular member providing a passageway for exhaust gases, said member having an obstruction intermediate its ends preventing the passage of the gases longitudinally therethrough, said tubular member having apertures forward of and to the rear of the obstruction for the escape and the reentrance respectively of the exhaust gases, and an outer sheet metal shell flattened at its ends to clamp about the tubular member and positioned to receive the exhaust gases discharged from the forward series of apertures and to guide the same to the rear series of apertures.

11. A muffler comprising an outer casing of sheet metal formed of two similar half

parts, the end portions thereof being contracted to form apertures of smaller diameter than the diameter of the casing, an inner sheet metal casing also formed of two similar half parts provided with complementary flanges extending longitudinally of the outer casing, the contracted end portions of the outer casing engaging about and clamping the inner casing at the ends, the flanges of the inner casing being utilized to support the same centrally within the outer casing and the inner casing being arranged to receive the exhaust gases at one end and a tail pipe through which the gases are discharged beyond the muffler at the opposite end.

In testimony whereof, I sign this specification.

EMMET P. GRAY.