

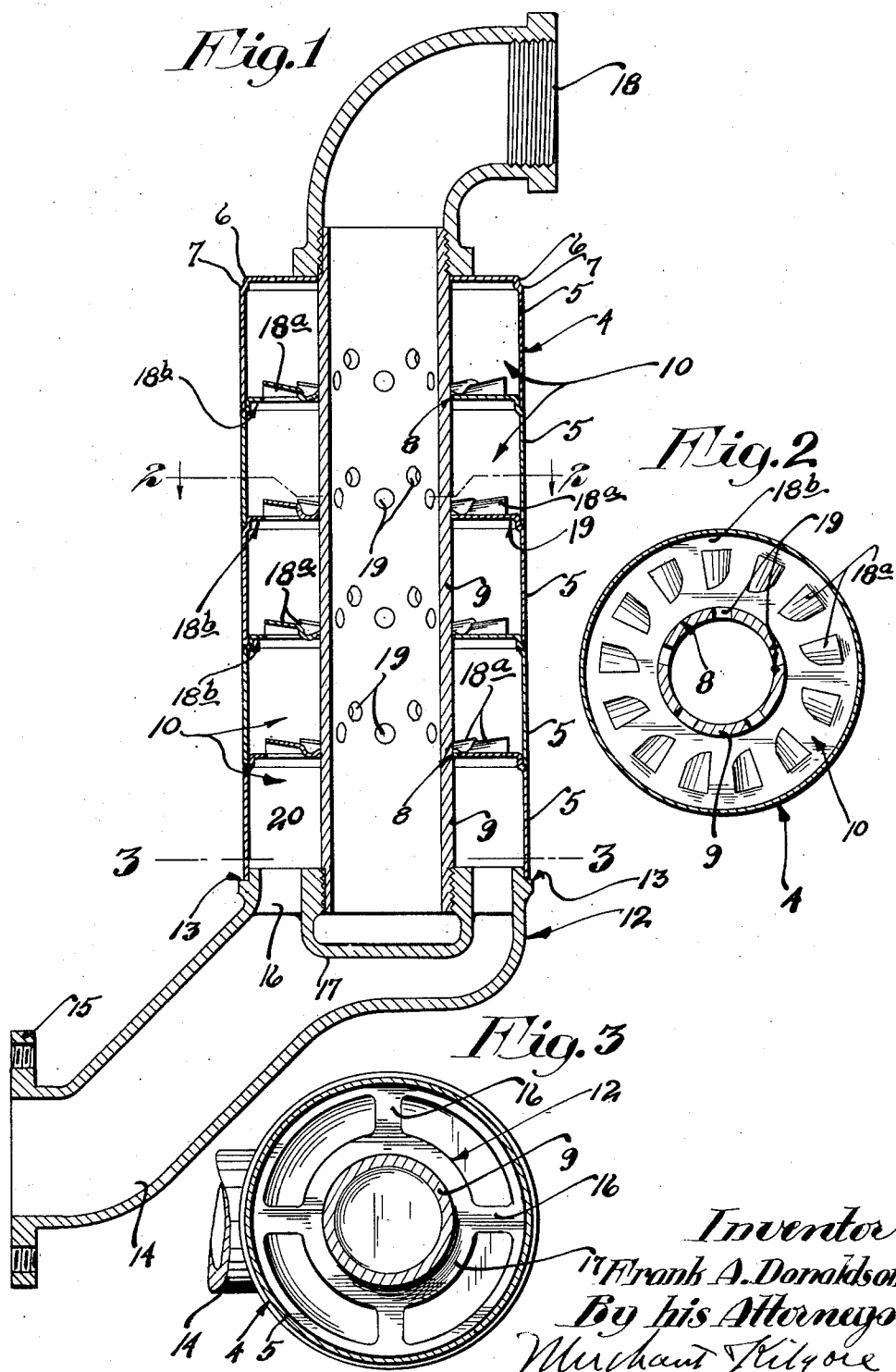
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SPARK ARRESTER FOR INTERNAL COMBUSTION ENGINES

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SPARK ARRESTER FOR INTERNAL COMBUSTION ENGINES

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This invention relates to a device for arresting sparks that are created by the explosion of an internal combustion engine and hence prevent the same from being delivered to the open atmosphere. These sparks are in the form of very hot particles of carbon that are discharged from the explosion chambers of an internal combustion engine with the exhaust gases. Such sparks are often blown into the atmosphere in large quantities from engines that are employed in implements such as: tractors, threshing machines, harvesting machines, wood-sawing machines, and the like that are used in agricultural and wooded sections, and large crop and forest losses, due to fire caused by such sparks, are reported yearly.

It is, therefore, the main object of this invention to provide a very simple device through which the exhaust gases from an internal combustion engine are passed on their way to the atmosphere and which device will arrest sparks carried by said gases and allow only thoroughly cleaned gases to be discharged therefrom to the atmosphere.

In the accompanying drawings, like characters indicate like parts through the several views.

Referring to the drawings:

Fig. 1 is a sectional view of the arrester; Fig. 2 is a section taken on the line 2—2 of Fig. 1; and

Fig. 3 is a section taken on the line 3—3 of Fig. 1.

The manner 4 indicates as an entirety a tubular outer casing, which in its preferred form as illustrated, is made up of a plurality of axially extended cuplike sections 5. Each cuplike section 5 is reduced slightly near its closed end portion at 6 to form an annular shoulder 7. The open end of one section 5 is telescoped over the reduced portion of a preceding section and is seated against an annular shoulder 7 thereon. These shoulders 7 are slightly rounded and will have a slight expanding action on the open end of the next axially extended section when the several sections are pressed together.

In the closed end portion of each of the casing sections 5 is an axial opening 8 and

extended through the casing and through each of the openings 8 is an outlet tube 9, which outlet tube is spaced from the sides of the casing 4 to afford an annular chamber 10. The tube 9 is screw threaded at both ends and, as will appear, said tube acts as a tie rod for holding the axially extended sections together.

The open end of the casing section 5 at the intake end of the arrester is telescoped over the open end of a hollow intake head 12 and is abutted against an annular shoulder 13 thereon. Extending obliquely from this head 12 is a neck 14, near the free end of which is a flange 15, which flange is adapted to be bolted or otherwise detachably secured to the exhaust manifold or the like of an internal combustion engine not shown. The chamber 10 will thus receive exhaust gases from the engine through the neck 14 and intake head 12.

Carried by the head 12 by means of webs 16 is a cap 17 that is internally threaded at its open end portion to receive the screw threaded lower end of the outlet tube 9. When the tube 9 is screwed into the cap 17 it will be held rigidly, in respect to said head and that end thereof will be closed to incoming gases. The upper screw threaded end of the tube 9 projects through the closed end of the casing section at the outlet end of the arrester and an internally threaded elbow 18 is applied thereto, and turned down tightly against the closed end of the said casing section 5. In this manner the casing sections 5 are pressed together between the elbow 18 and the shoulder 13 of the intake head 12, and all of the parts of the arrester are held tightly together.

The closed end portion of the casing section 5 at the outlet end of the arrester forms a closed end for the chamber 10, and the closed end portions of the other casing sections 5 act as compartments forming partitions in said chamber 10. Formed in each of the partitions is a series of circumferentially spaced, oblique, deflecting blades or veins 18a for imparting a whirling motion to spark laden gases passed through the chamber 10 and in the outlet tube 9 at the outlet

side of each partition is an annular series of outlet ports 19, through which ports part of the gases near the inner portion of each intermediate compartment and all of the
 5 gases entering the last compartment are passed to the interior of the tube 9 and thence to the atmosphere. The tube 9, is however, unbroken between its closed, capped end at the intake end of the arrester and the first
 10 series of deflecting blades, and therefore, all of the spark laden gases passed into the chamber 10 at the intake end thereof must pass through the first series of deflecting blades 18a.

15 The deflecting blades 18a are spaced from the sides of the casing 4 so that an unbroken partition area 18b is presented near the outer portion of each partition, and which unbroken area may be termed a spark bank. Sparks
 20 in a particular compartment that have been thrown outward by centrifugal force caused by the whirling motion imparted thereby, a preceding series of deflecting blades will strike a spark bank 18b at the outlet end
 25 of the compartment, and will whirl therearound until they become spent or quite light at which time they may move inward and be passed through the adjacent series of deflecting blades, and into the next compartment where they will be similarly acted upon.

30 The operation of the device is substantially as follows: All of the spark laden gases taken into the neck 14 will be passed around the cap 17 and into the first compartment at the inlet end of the arrester, and,
 35 as the outlet pipe 9 is unbroken between its capped end and the first partition, all of said sparks and gases will be passed through the first series of oblique, deflecting blades 18a.
 40 These blades 18a will cause the sparks and gases to whirl at relatively high velocity upon entering the following compartment and this whirling action will cause heavier than air particles such as sparks of hot carbon
 45 or the like to be thrown outward toward the outside of the chamber and therefore gases near the inner portion of the chamber around the tube 9 will be clean.

50 The sparks thrown toward the outer portion of the chamber close to the sides of the casing will strike the spark bank 18b at the outlet end of the compartment and will whirl therearound until they become spent or at
 55 least become relatively light at which time they may move inward and pass through the adjacent set of deflecting blades. With the sparks thrown outward and toward the outlet end of the compartment the gases near the inner portion of the compartment close
 60 around the first series of ports 19 in the tube 9 will be clean and freed of all sparks due to the fact that the pressure created within the chamber 10 is greater than that with the tube 9, part of these clean gases will pass
 65 through the said ports to the interior of the

tube and will be exhausted therefrom to the atmosphere without further cleaning action. The balance of the gases will pass through the succeeding series of deflecting blades and
 70 into the next compartment.

The above described process will be repeated in each of the following intermediate compartments, the volume of both gas and sparks being reduced in each of said intermediate compartments or in other words part of the
 75 sparks in each compartment will be caused to whirl around the spark bank 18b at the outlet end thereof until they are spent or materially reduced in weight, part of the clean gases near the inner portion of the compartment will pass through a cooperating series
 80 of ports 19 and the remainder of both sparks and gases will pass through the next series of blades 18a to the next compartment. It should, of course, be understood that the reduced volume of gases passed from one compartment to another will be sped up in their
 85 whirling motion by the action of a series of deflecting blades therebetween.

90 Upon entering the last compartment at the outlet end of the arrester the very materially reduced volume of gases and sparks will again be stepped up in their whirling motion and the sparks will be thrown outward and against the closed end of the casing section
 95 at that end of the arrester where they will be caused to keep whirling until they have become entirely spent, and the gases in said compartment will all be exhausted through the cooperating series of outlet ports 19 to the
 100 interior of the tube and hence to the atmosphere.

The location of each series of outlet ports 9 relative to the deflecting blades, formed in the several partitions of the chamber 10, is
 105 very important. Each series of ports 19 is located close to the outlet side of the preceding series of deflecting blades and is spaced a considerable distance from the following series of deflecting blades or in other words,
 110 they are closed to the intake end of a particular compartment so that a relatively long unbroken tube area is presented ahead of each series of deflecting blades and around which sparks may whirl but through which they
 115 cannot pass. Even very light sparks which may at times come close around the outlet tube will not reverse their direction of travel to such an extent as to reach the series of ports just beyond the series of deflecting
 120 blades through which they last traveled. Sparks passed into the last compartment at the outlet end of the arrester will become possibly trapped and will be caused to whirl until they have become spent or burned up
 125 and it is therefore, not necessary to open the arrester and remove an accumulation of carbon particles or the like.

What I claim is:

1. A spark arrester comprising a tubular 130

outer casing, an outlet tube extended axially within the casing and spaced therefrom to afford an annular chamber, said casing having an intake passage at one end thereof and said tube being closed at the intake end of the arrester, said casing being closed and said outlet tube having an outlet at the end of the arrester opposite the intake, axially spaced deflecting baffles in said chamber between said casing and tube arranged to successively impart a whirling motion to the spark laden gases passed through said chamber and said tube having lateral outlet passages opening between the axially spaced baffles.

2. A spark arrester comprising a tubular outer casing, an outlet tube extended axially within the casing and spaced therefrom to afford an annular chamber, said casing having an intake passage at one end thereof and said tube being closed at the intake end of the arrester, said casing being closed and said outlet tube having an outlet at the end of the arrester opposite the intake, axially spaced deflecting baffles in said chamber between said casing and tube arranged to successively impart a whirling motion to the spark laden gases passed through said chamber, said tube having lateral outlet passages opening between the axially spaced baffles and between the last series and the closed end of the casing, said outlet passages between the last baffles and the closed end of the casing being spaced from the end of the casing so that an unbroken tube area is presented between the closed end of the casing and the last outlet passages.

3. A spark arrester comprising a tubular outer casing, an outlet tube extended axially within the casing and spaced therefrom to afford an annular chamber, said casing having an intake passage at one end thereof and said tube being closed at the intake end of the arrester, said casing being closed and said outlet tube having an outlet at the end of the arrester opposite the intake, axially spaced deflecting baffles in said chamber between said casing and tube arranged to successively impart a whirling motion to the spark laden gases passed through said chamber, said tube having lateral outlet passages opening between the axially spaced baffles and between the last series and the closed end of the casing, said outlet passages between the last baffles and the closed end of the casing being spaced from the end of the casing so that an unbroken tube area is presented between the closed end of the casing and the last outlet passages, and said tube also being unbroken between its closed end and the first baffles.

4. A spark arrester comprising a tubular casing made up of a plurality of axially extended cuplike sections having an axial opening in the closed end portion of each there-

of, and an outlet tube extended through the axial openings in said sections, said tube being spaced from the sides of said casing to form an annular chamber, said chamber being closed at one end of the arrester by the closed end of the cuplike section on that end of the arrester, the closed ends of the other sections forming partitions in said chamber and each of said partitions having baffling blades or veins formed therein for imparting a whirling motion to spark laden gases passed through the chamber, a head at the end of the arrester opposite the said closed end of the chamber, said head having an inlet to the said chamber and forming a closure for the end of the tube at that end of the arrester, and outlet openings in said tube between each partition and between the last partition and the closed end of the chamber.

5. A spark arrester comprising a tubular casing made up of a plurality of axially extended cuplike sections, an outlet tube extended axially within the casing and spaced from the sides of the casing to afford an annular chamber, said chamber being closed at the one end of the arrester by the closed end of the casing section at that end thereof and said outlet tube extending through the closed end of the said section, the closed ends of the other sections forming partitions in the chamber, an annular series of deflecting blades or veins formed in each of said partitions for successively imparting a whirling motion to spark laden gases passed through the chamber and a hollow head having a peripheral engagement with the open end of the casing section at the end of the arrester opposite the outlet, an intake passage in said head and means carried thereby having detachable engagement with the end of said tube at the intake end of the arrester for securing and forming a closure for the same, and means engageable with the outlet end portion of said tube and the closed outer end portion of the casing section at the outlet end of the arrester for holding all of the axially aligned parts together and outlet ports in said tube at the outlet side of each partition.

6. A spark arrester comprising a tubular casing made up of a plurality of axially extended sections, the casing sections each having one substantially closed end portion and one open end portion, the closed end of the section at one end of the arrester forming a closed end for the casing, and a closed section end at the intermediate portion of the casing forming a partition therein, a head at the end of the casing opposite to said closed end thereof and having peripheral engagement with the open end of the casing section at that end thereof, an intake in said head, a series of deflecting blades or veins formed in said partition near the outer edge portion thereof for imparting a whirling mo-

tion to spark-laden gases passed through the casing, an outlet tube extended axially through the closed outer end of the casing and into the interior thereof, and means for
5 holding the parts together.

In testimony whereof I affix my signature.

FRANK A. DONALDSON.

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