

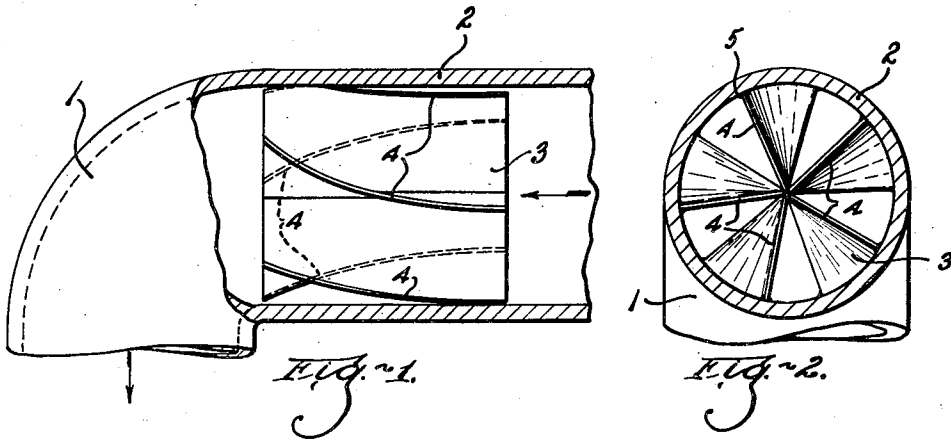
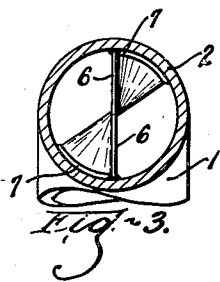
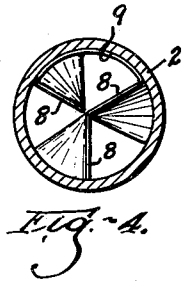
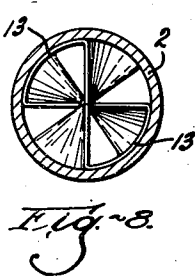
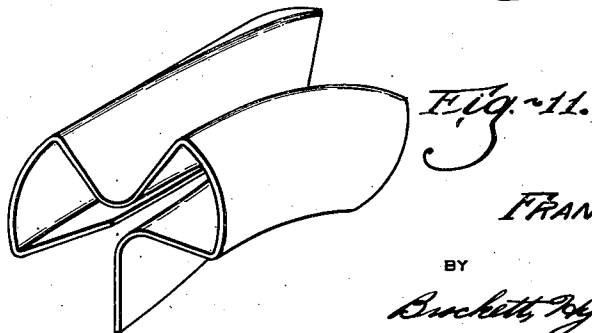
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F. R. HIGLEY

1,974,110

CURVED CONDUIT

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1,974,110

CURVED CONDUIT

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9 Claims. (Cl. 137-112)

This invention relates to improvements in the type of conduit having a curved way, that is, to a pipe device having a through passageway, the entrance to which is adapted to receive the flow from one direction and the conduit being adapted to change the direction of this flow so that the conduit discharge opening, at the opposite end of the way, will discharge the flow in another direction.

10 An example is the ordinary elbow pipe fitting adapted to interconnect a pair of straight pipe lengths angularly related but in a common plane. Methods of pipe fitting, such as employing threaded and flanged joints, are rapidly being supplanted by welded joints wherein the inner pipe surface is substantially uninterrupted at its joints, and turbulence caused by joints is practically negligible, so that loss of head about the curve may be considered as only that produced by the bend or curve itself. This would be obviously true in a passageway having an integral wall such as is found, for example, in the cast intake manifold of an internal combustion engine.

My copending application, Serial No. 581,342, filed December 16, 1931, illustrates and describes an arrangement for reducing the turbulence and consequent loss of head in a curved conduit way, wherein the absolute path of a unit of volume in the stream along said way is caused to be helical, with such angular advancement about the mean path of the way, as said mean path extends along the curve of said way, that the absolute paths of all units of volume are substantially equal. The means appearing in said copending application, for this accomplishment, are located in the bend or curve itself.

The invention of this application comprises a modification of that of said copending application in that means are employed for the same purpose, but located in a straight pipe section ahead of the bend. The arrangement is thus one simpler and less expensive, as will appear, and one equally useful in many instances.

Generally, therefore, the objects of this invention are improvements over the disclosure of said copending application.

Further objects and advantages are in part obvious and in part will appear more in detail hereinafter and in the accompanying drawing in which Figs. 1 and 2 are side and end views, respectively, of an embodiment of the invention, the near side of the pipe appearing in Fig. 1 being broken away to show details of the parts therein; Figs. 3 to 10 inclusive are end views corresponding to that of Fig. 2 but showing more

practical modifications; and Fig. 11 is a perspective view of the insert part of another modification.

With reference now to the drawing and particularly Figs. 1 and 2 thereof, 1 is a curved part and 2 a straight part of a conduit or pipe wherein flow is to be had from right to left, as indicated by the arrows. 3 indicates, generally, means inserted within the straight part 2 of the pipe, just ahead of the bend 1 thereof, for the purpose of imparting to a stream moving through said pipe, a twisting or angular motion. The part 3 here shown comprises five fins or vanes 4, each radially disposed to divide the flow into five equal passageways. As indicated, Fig. 1, each fin 4 at its upstream end is parallel to the general direction of flow through the straight pipe section. Each fin is deformed to have increasing angularity in a common direction from its upstream end, about the pipe center, so that each fin at its downstream end has maximum angularity. Thus the mean path of flow through each of the five passageways between fins commences parallel with the center line of the straight pipe section, but moves thereabout as it advances, in a helical direction of increasing pitch until a maximum ratio of twist about the center line, to advance therealong, is had, at the point of departure from between the fins. The angle of departure is equal for all of the fins and consequently for all of the paths of flow therebetween, and is such that as the stream leaves the fins and progresses through the curve of the part 1 of the conduit, its rotational component of inertia will cause the stream as a whole to rotate about its center substantially 180° between entrance into and departure from the conduit curve.

This rotational amount will be desirable regardless of the amount of bend in the curved section, so that if the bend 1 were only 45° instead of 90°, as illustrated, the fins may be pitched to have less angle of departure than that shown; while if the amount of bend in the elbow were greater than the 90° shown, the fins would have to be pitched to have a correspondingly greater angle of departure. In any case, the entrance angle of the fins should be zero, or in other words, their upstream ends should lie in the general direction of the straight pipe part 2.

The fins 4 may be of any suitable material considering that of the pipe and the nature of the liquid or gas to be passed therethrough. Thus, as in an inlet manifold for an internal combustion engine, the pipe may be of cast iron

and the fins may be of sheet metal. They may be welded, soldered or otherwise connected with each other and secured with the pipe. In the case of an inlet manifold, a lining of vitreous enamel providing a substantially frictionless surface may be employed and may serve to form the fillets indicated at 5, Fig. 2, whereby the fins are secured with the pipe sides.

The invention is particularly applicable to an inlet manifold, wherein extreme velocities of flow are had with high frequency pulsations or alternations. It will be obvious that the pitch of the fins at their downstream end will cause them to obstruct reverse flow, in the direction opposite that indicated by the arrows. While the five-fin arrangement shown in Figs. 1 and 2 is theoretically efficient, it is not as practical a one from the viewpoint of manufacture, as are some of the modifications hereinafter referred to.

Fig. 3 shows a pair of oppositely extending fins 6 formed as by a single piece of sheet metal diametrically disposed in the straight pipe section 2 and, of course, having pitch of increasing amount as in the form of Figs. 1 and 2. Fillet members 7 of soft rubber or the like are here employed to position the diametrical partition member.

Fig. 4 shows an arrangement wherein three integral fins 8, disposed at 120°, are provided from a single sheet of metal, the peripheral part 9 connecting two of the fins 8 and having spring characteristics tending to expand the parts against the pipe walls.

Fig. 5 shows a generally triangular arrangement wherein the fins 10 are non-radially disposed, and divide the passage into a central one of generally triangular section surrounded by three passages of lozenge-shaped section. This form is preferably of spring metal so that it may be inserted in a position by flexing the central parts of three fins inwardly toward each other, so that upon release, these parts will tend to straighten and thus expand the three points 11, at their extremities, against the pipe walls, the fins 10 having pitch, as before, to impart the desired twist to the stream.

The form of Fig. 6 is similar to that of Fig. 5 except that only two fin members 12 are employed, of spring metal so that they will tend to open from each other and may thus be conveniently inserted into the pipe and when released, will secure themselves therein.

The form of Fig. 7 is of S shape in section, and likewise of spring metal so that it will be self-securing, the metal tending to straighten.

In Fig. 8 the section is cruciform, with opposed peripheral parts 13 adapted to grip the pipe walls.

The form of Fig. 9 will be recognized as a modification of the form of Fig. 6.

In Fig. 10 is shown a form dividing the pipe opening into six similar passages. Here again the insert comprising the fin parts will expand to grip the pipe sides.

In Fig. 11, the form is that adapted to divide the pipe opening into five substantially equal passages, as was done in the form of Figs. 1 and 2, the insert of Fig. 11, however, being adapted to seat by expansion, as in the case of the insert of Fig. 10.

What I claim is:

1. In a conduit having a curved way, means located ahead of said way, and constructed and arranged to impart, to a stream approaching said way, such rotating motion that said stream will revolve substantially 180° during its progress along said way.

2. In a conduit having a curved way, vane means located ahead of said way and constructed and arranged to impart, to a stream approaching said way, such rotating motion that said stream will revolve substantially 180° during its progress along said way.

3. In a conduit having a curved way and a straight approach thereto, means located in said approach and constructed and arranged to impart such rotating motion to a stream flowing therethrough, that said stream will have a half revolution of twist during its progress along said curved way.

4. In a conduit having a curved way and a straight approach thereto, vane means located in said approach and constructed and arranged to impart such rotating motion to a stream flowing therethrough, that said stream will have a half revolution of twist during its progress along said curved way.

5. In combination with a conduit having a curved way, vane means located ahead of said way and constructed and arranged to gradually impart to a stream approaching said way, such rotating motion that said stream will revolve substantially 180° during its progress along said way.

6. In combination with a conduit having a curved way, an approach thereto having vane means constructed and arranged to impart to a stream entering said way by said approach, such rotation about the center line of said way that said stream will revolve substantially 180° during its progress along said way.

7. In a conduit having a curved way and a straight approach thereto, vane means located in said approach to impart rotating motion to a stream flowing therethrough, said vane means being constructed and arranged to resiliently engage the sides of said approach for securement in the latter.

8. In a conduit having a curved way and a straight approach thereto, vane means located in said approach to impart rotating motion to a stream flowing therethrough, said vane means having peripherally located parts arranged to engage the side walls of said approach, and having resilient parts arranged to provide yieldable expansibility of said peripherally located parts against said walls, whereby said vane means is removably self-secured in said approach.

9. In a conduit having a curved way and an approach thereto, vane means located in said approach and constructed and arranged to cause such gradual rotative acceleration to a stream flowing through said approach, that said stream will be caused to revolve by its inertia, substantially 180° during its progress along said way.

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