

**Feb. 28, 1939.**

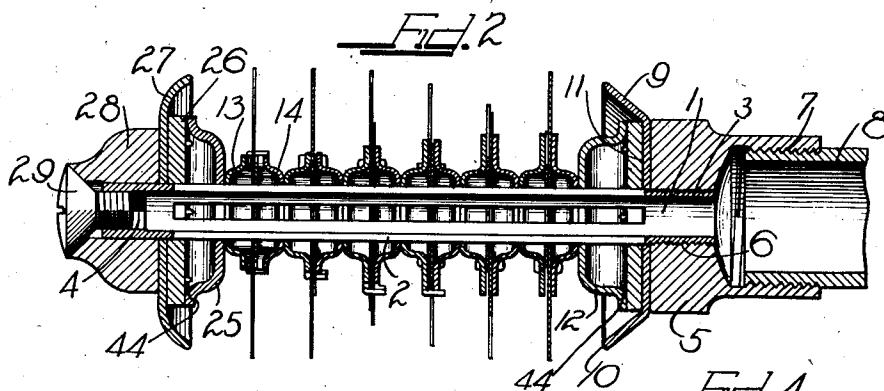
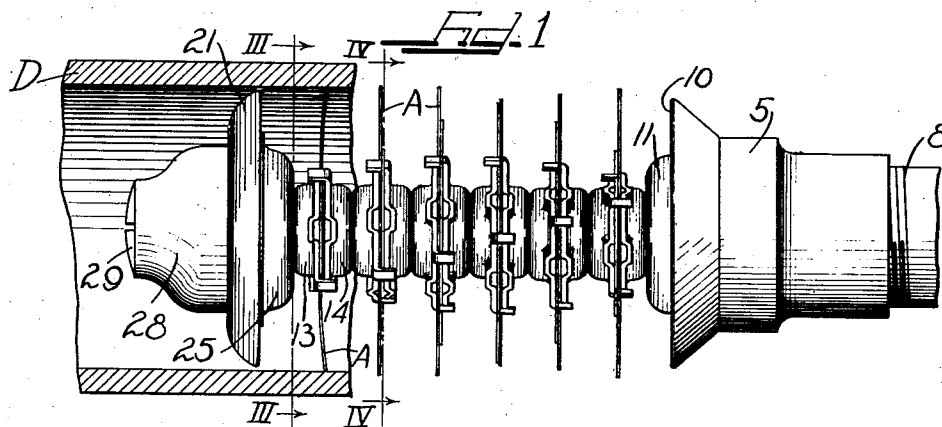
E. W. JACOBSON

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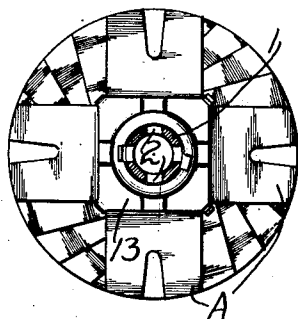
FLUSHING FLUE CLEANER

Filed Nov. 8, 1937

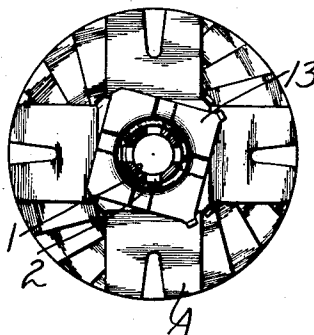
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Ex. 4



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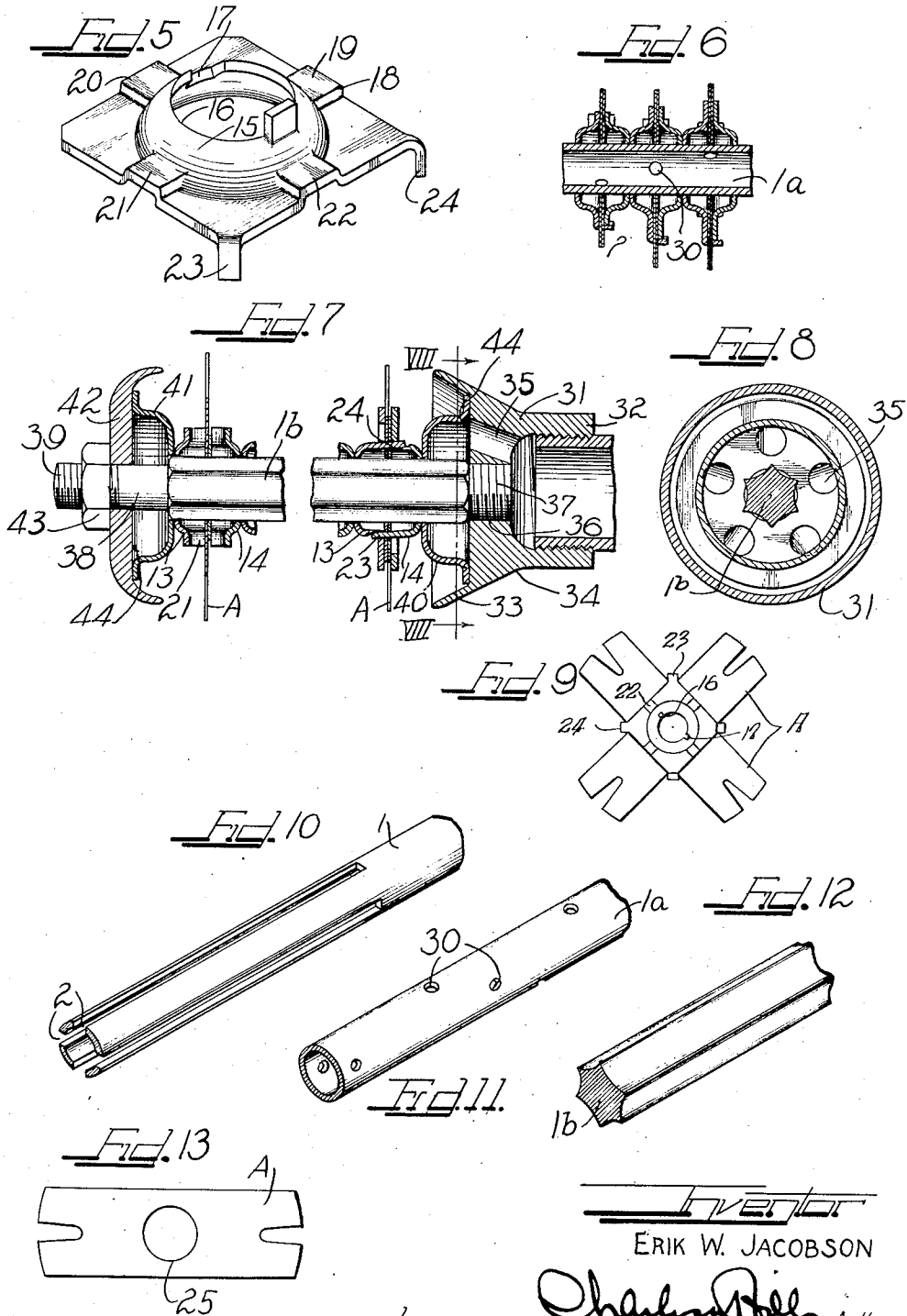
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FLUSHING FLUE CLEANER

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## UNITED STATES PATENT OFFICE

2,148,754

## FLUSHING FLUE CLEANER

Erik W. Jacobson, Chicago, Ill.

Application November 8, 1937, Serial No. 173,379

14 Claims. (Cl. 15—104.05)

The present invention relates to a flushing flue cleaner and more particularly to a flexible blade type of cleaner for removing incrustations from flues in which a fluid may be utilized for softening the incrustations.

5 An object of the present invention is to provide a flue cleaning tool of novel construction adapted for discharging fluid against the incrustated interior of a flue or tube being cleaned to loosen incrustations.

10 Another object of the present invention is to provide a flue cleaner tool with a plurality of flexible blades and improved means for maintaining the blades in predetermined relationship with respect to the stem of the tool.

15 A further object of the present invention is to provide a flue cleaning tool of the class described utilizing a plurality of groups of flexible blades together with means for discharging fluid through the tool and against the interior of a tube or flue while the tool is being manipulated in use.

20 The above, other and further objects of the present invention will be readily apparent from the following description and accompanying drawings.

25 The accompanying drawings illustrate embodiments of the present invention and the views thereof are as follows:

30 Figure 1 is an elevational view of a tool constructed in accordance with the principles of the present invention, and showing an end thereof entered in a fragmental portion of tube.

35 Figure 2 is an axial section through the tool of Figure 1.

Figure 3 is a transverse vertical sectional view taken substantially in the plane indicated by line III—III of Figure 1, with the tube removed.

40 Figure 4 is a similar sectional view taken substantially in the plane indicated by line IV—IV of Figure 1.

Figure 5 is an enlarged isometric view of one of the two halves going to make up one of the spacing members of the present invention.

45 Figure 6 is a fragmental axial sectional view through a fragmental part of a hollow stem provided with a plurality of openings for fluid discharge with groups of blades arranged on it.

50 Figure 7 is a fragmental view partially in axial section and partially in elevation showing a fluted stem together with spacing members adapted for discharging fluid substantially radially of the stem, and also showing cooperative relationship of the two halves of a spacing member and a pair of blades.

Figure 8 is a transverse sectional view taken substantially in the plane indicated by line VIII—VIII of Figure 7.

Figure 9 is an end view of a unit assembly showing the relationship of the parts.

Figure 10 is a fragmental isometric view of one form of fluid discharge stem.

Figure 11 is an isometric view of another form of fluid discharge stem.

Figure 12 is a fragmental view of a fluted stem, and

Figure 13 is an elevational view of one of the blades used with the halves, one of which is shown in Figure 5.

The drawings will now be explained:

15 The flue cleaner illustrated in Figures 1 to 4 inclusive includes a hollow stem 1, having a portion of its length slotted as at 2 for fluid discharge. As shown in Figure 2, one end of the stem 1 is exteriorly threaded as at 3 and the other end is interiorly threaded as at 4.

A head 5 having a bored and threaded portion 6 and enlarged bored and threaded portion 7 is threaded onto the end 3 of the tube 1. Threaded into the portion 7 of the head is a pipe 8 to which may be attached a handle for oscillating the tool in use and to which is attached a hose for supplying fluid to the interior of the tube 1 for discharge therefrom against the interior of a tube being cleaned.

30 Resting against the head 5 is a dish-shaped circular member 9 arranged with its flange 10 directed away from the head and toward the other end of the stem 1.

Against the inner face of the member 9 is a washer 11, surrounding the stem, and against this washer rests the marginal portion of a cup shaped spacer 12. The washer 10 as well as the spacer 12 are centrally apertured to pass over the stem 1.

40 Between the spacer 12 and the other end of the stem 1, are groups of blade assemblies arranged, in the present instance, with two blades per assembly, the blades of an assembly being at right-angles to each other.

45 A blade assembly includes two halves 13 and 14 which together constitute a spacing member for spacing the blades axially in predetermined relationship.

One of the halves is illustrated in Figure 5.

50 The spacer half illustrated in Figure 5 is fashioned from flat metal stock, as substantially square in elevation and is provided with a central boss 15 struck upwardly from the outer surface of the half, and which boss is centrally

apertured at 16 to pass over the stem 1 of the tool. A boss 15 is notched as at 17, which notch extends inwardly from the aperture 16 a slight distance. On the opposite side of the center of the aperture 16, a tongue 18 is struck upwardly from the boss. The tongue 18 and the notch 17 are formed on radial lines but angularly spaced a slight distance from a center line passing through the center of the aperture 16 and either the notch or the tongue. In the drawings, the center line of the notch 17 is displaced approximately 11° or 12° from the center line of the tongue 18. This angular difference might be less or greater as desired, in accordance with the amount of lead required for the cutting edges of the several blades of the tool.

The body of the half is formed with depressions 19, 20, 21 and 22 which extend above the outer surface of the half and on their inner surfaces constitute channels or passages between the interior of the boss 15 and the side margins of the half. These portions are arranged at approximately 90° apart, with respect to the center of the aperture 16. At two adjacent corners, lugs 23 and 24 are formed which, when the two halves are assembled together, extend toward the other half of the spacing member. The lateral distance between the lugs 23 and 24 of the half of Figure 5 is substantially that of the width of a blade A, utilized in the described blade assembly.

The blade A is of substantially H-shape in elevation and is provided with a central aperture 25 for passing over the stem 1 of the tool to assemble the blades on the same.

Figure 9 is an end view of a unit assembly including two halves and two blades A utilized in a blade assembly. The lugs 23 and 24 of the half C extend toward the half B but when the two halves are assembled inclosing two blades A between them, the lugs of the half B engage against the margin of the half B opposite to that carrying the lugs of the half B.

In assembling a blade assembly on the stem 1, one of the halves is applied over the stem, and against the spacer 12 at the right-hand end of the tool of Figure 2, with the boss of the half against the spacer 12. Next a blade A is applied over the stem and positioned between the lugs 23 and 24 of the half. This maintains the first blade A in predetermined angular relationship with respect to the first half. The next blade A is applied over the stem 1 and with one margin of the blade lying against both of the lugs of the half which is against the spacer 12. This arrangement maintains the second blade A in predetermined angular relationship with respect to the first blade. The second half is then applied with its lugs embracing the side margins of the first blade and contacting the opposite margin of the second blade.

In this manner the various blade assemblies are made along the stem until the requisite number of assemblies has been achieved whereupon an end spacer 25 is applied over the stem 1, a washer 26 applied against the spacer, a cup member 27 then applied against the washer 26, a head 28 applied over the extremity of the stem and a screw 29 threaded into the interiorly threaded portion 4 of the stem and against the head 23 to maintain the blade assemblies in operative relationship. The halves and the blades of the various blade assemblies are maintained in proper relationship by axial pressure exerted by application of the screw 29 to the stem.

During the assembly of the various halves of

the spacing members, the lug or tongue 18 of one will engage the notch 17 of an adjacent spacer and thus angularly arrange the adjacent spacer to provide a lead or spiral arrangement of the cutting ends of the blades in the completed tool.

The spiral arrangement of the various blades may be readily observed from an inspection of Figures 3 and 4 of the drawings which illustrate also the relative angular relationship of adjacent spacer halves for securing the spiral or angular arrangement of the blades.

Various and sundry means may be provided for discharging fluid from the stem against the interior of a tube or flue being cleaned.

Figures 2 and 10 illustrate the stem 1 as having elongated slots 2 formed in a portion of its surface through which fluid, such as water, an emulsion or other suitable liquids may be discharged.

Figure 11 illustrates a stem 1a which is provided with a plurality of openings 30 formed in its surface and which constitute outlets for the fluid within the stem.

The stem illustrated in Figures 7 and 12 is fluted, the flute constituting passageways for the fluid along the length of the stem.

When the fluted stem is utilized, a head 31 having an interiorly threaded skirt 32, is provided. The head has a divergent mouth 33 with a partition 34 cast in it through which partition are divergently directed bores 35 forming passageways through the partition. The partition 34 is centrally apertured as at 36 and threaded to engage the threaded end 37 of the fluted stem 1b. The other end of the stem is reduced in diameter at its other end as at 38 with its extremity threaded at 39. Engaging against the partition 34 of the head 31 is a cup shaped spacer 40 which serves as an abutment for the first of the blade assemblies heretofore described.

When the proper number of blade assemblies have been arranged on the stem 1b, a cup shaped spacer 41 is applied in the manner illustrated in Figure 7 and against this is a cup shaped head 42 held in place by a nut 43 on the end 39 of the stem.

When the blade assemblies, including the two half members 13 and 14, are assembled with the included blades, about any of the described stems, the tool, after having been attached to the pipe 8 and a suitable hose connected to the pipe, is then inserted in a flue or tube D to be cleaned. The provision of the cup shaped member 27 of the form of the invention illustrated in Figures 1 and 2 and of the member 42 of Figure 7 protects the blades of the tool when inserted in a flue or tube and breaks down some of the incrustations in the tube so that the following blades may escape being subject to too heavy cutting action as the tool is introduced for cleaning purposes. When the tool is introduced and it is necessary to utilize a liquid for use with it, the liquid is admitted through the stem and is discharged through the orifices or passages in the halves of the spacer members, substantially radially, through the depressions 19, 20, 21 and 22 as illustrated in Figure 5 and Figure 7.

When the stem is slotted as shown in Figures 1, 3, 4 and 10, a greater amount of liquid is discharged than would be were the stem of the form of that shown in Figure 11. Where the fluted stem is utilized, a greater quantity of fluid would be discharged than with a stem such as 1a.

In any event the tool of the present invention enables the utilization of liquid for use in con-

nection with flue cleaning tools of such nature as to soften the incrustations to a point where the blades of the tool will be freed from too heavy strain in the cleaning operation.

5 Usually such a tool is moved back and forth through the tube and sometimes is oscillated.

The manner of mounting the blade assemblies on the stem of the tool of the present invention is such that the blades as a unit may be oscillated or rotated about the stem if the incrustation in a flue is so hard as to prevent oscillatory movement of the blades. This feature is provided to prevent breakage of the blade in the event of such occurrence. The axial tension imposed on the blade assemblies by the nuts or screws at the ends of the stem is such as to ordinarily prevent relative rotative movement between the blades and the stem. However, relative movement is possible when the incrustated matter in the flue being cleaned is too hard to yield to the action of the blades.

The blades A are made preferably of watch spring steel stock and are blanked generally in the form illustrated in Figure 13. The ends of the blades are struck on radii having a center in the center of the aperture 25, with the ends of the blades notched to provide legs at the extremities.

The halves of the spacer members are fashioned from flat metal stock as heretofore described, with the bosses 15 on the front or obverse faces and with the lugs 23 and 24 extending axially from said faces rearwardly. The offset portions 19, 20, 21 and 22 are raised relatively to the front or obverse faces of these halves to thereby form passages or outlets in the reverse faces of the halves.

While the present invention has been described with blade assemblies of two blades per assembly, it is to be understood that the single blade assembly set forth in applicant's Patent No. 2,026,680 dated January 7, 1936 might be substituted with a hollow stem, and used for flushing in a manner as herein described.

45 The blade assemblies set forth in applicant's copending application, Serial No. 149,826, filed June 23, 1937, might be utilized with hollow stem for use in supplying a flushing flue cleaner of the type herein described.

50 Preferably in order to permit oscillatory or rotative movement of the blade assemblies of the present invention, the halves of the spacer members which are against the spacers 12 and 25 of Figure 2 and spacers 40 and 41 of Figure 7, do not have the outstanding tongues or lugs 18.

55 Referring to Figures 1, 3, 4, 7 and 9, it may be observed the manner in which the lugs 23 and 24 of the halves of the blade assembly spacers cooperate with the cutting blades.

60 The fact that the halves of the spacing members afford bearing surface for the blades at distances radially spaced from the stem 1, prevents such undue bending of the blades in service as would otherwise cause breakage of some of the blades.

65 Since the blades A are of similar form and construction, they may be used interchangeably without selection. The same is true of the halves of the blade assembly spacers except as to the end-most halves which engage against the large spacers at the ends of the stems.

70 The dish-shaped member 9 of Figures 1 and 2 and the head 31 of Figure 7 serve to protect the blades as the tool is removed from a flue or tube following a cleaning operation.

It will be observed that the construction of the halves of the blade assembly spacers, as well as of the blades themselves, is such that the cost of manufacture may be reduced to a minimum with the result that an effective flushing type 5 flue cleaning tool may be manufactured to sell at a reasonable price.

The cups 12, 25, 40 and 41 are notched as at 44 in their peripheries to allow liquid to escape from the ends of the tool to flush foreign matter from 10 the blades and heads and to direct the liquid along the tool.

The invention has been described herein more or less precisely as to details, yet it is to be understood that the invention is not to be limited 15 thereby, as changes may be made in the arrangement and proportion of parts, and equivalents may be substituted without departing from the spirit and scope of the invention.

The invention is claimed as follows: 20

1. A flue cleaning tool including a stem, a plurality of flexible cleaning blades on said stem, means axially spacing said blades in predetermined manner, said spacing means being provided with fluid orifices, and said stem being constructed to convey fluid to said orifices for discharge therethrough against the interior of a tube, except for said orifices said spacing members making liquid sealing contact with said blades. 30

2. A flue cleaning tool including a hollow stem; a plurality of flat, thin cleaning blades on said stem with their lengths at right angles to the stem; means axially spacing said blades in predetermined manner; said means having liquid 35 passages for discharging liquid radially of the stem; and said stem having means for liquid flow from its hollow interior to said liquid passages in said spacing members.

3. A unit for flue cleaning tools of the class described, comprising a flexible cleaning blade 40 and an attaching and spacing member formed in halves for securing said blade to a stem, each half of said member having an apertured hub for mounting on the stem of a tool and having lugs at two adjacent corners extending axially toward the other half for engaging the side margins of said blade to maintain the blade and said halves in fixed angular relation and to secure said flexible cleaning blade between said halves and said lugs, said halves and said lugs being maintained in operative relation with said blade by axial pressure applied to said halves. 45

4. A unit for flue cleaning tools of the class described, comprising a flexible cleaning blade 55 and an attaching and spacing member formed in halves for securing said blade to a stem, each half of said member having an apertured hub for mounting on the stem of a tool and having lugs at two adjacent corners extending axially toward the other half for engaging the side margins of said blade to maintain the blade and said halves in fixed angular relation and to secure said flexible cleaning blade between said halves and said lugs, said halves and said lugs being maintained 60 in operative relation with said blade by axial pressure applied to said halves, and each of said halves having a fluid outlet formed in it.

5. In a flue cleaning tool of the flexible blade 70 type, a stem for fluid flow, said stem having a fluted portion, a plurality of blades and hollow spacers arranged along said stem, said spacers and fluted stem portion providing a fluid passageway along the stem, and said spacers being formed 75

to provide for fluid flow from said passageway substantially radially of the stem.

6. A flue cleaning tool including a stem and a plurality of blades arranged in spaced relation on said stem and having hollow spacers interposed between certain of said blades, said stem being adapted to convey a liquid along it and to the interiors of said spacers, and said spacers between said blades having means providing liquid discharge passages arranged to discharge liquid substantially radially of the stem.

7. A unit blade assembly for a flexible blade type of flue cleaning tool including in combination with a tool stem, a blade and a spacing member of two halves adapted to make surface contact with the opposite faces of said blade, said halves having lugs engaging the blade margins to maintain said blade and halves in fixed angular relation, and said halves having substantially radially extending flanges with axially offset portions therein constituting liquid passages radiating from the centers of the halves for directing liquid flow from the stem against the interior of a tube, said halves making surface contact with said blade between said offset portions to form a liquid seal.

8. A unit blade assembly for a flue cleaning tool including a flat, thin metal blade and a spacer member consisting of two halves adapted to receive said blade between them in a position substantially perpendicular to the axes of the spacer halves; and each half having lugs for engaging the side margins of the blade to maintain the blade and halves in predetermined angular relationship.

9. A unit blade assembly for a flue cleaning tool including in combination with a hollow stem, a blade and a spacer member consisting of two halves adapted to receive said blade between them, each half having a centrally bossed and apertured portion for fitting the tool stem and having a radially extending annular flange with a portion axially offset to form passages radiating from the centers of the bosses for discharging fluid from the stem with nozzle action, fluid conduit means intercommunicating with said hollow stem and said passages, and said bosses making sealing contact with said blade between said passages.

10. A unit blade assembly for a flue cleaning tool having a stem, comprising a pair of apertured flat blades adapted for assembly on the tool stem adjacent each other and disposed substantially perpendicular to said stem, and a spacing member comprising two apertured halves adapted for assembly on the tool stem and to engage said blades in surface contact one on either side of said pair of blades, and said halves having axially extending lugs for engaging the side margins of said blades to maintain them in predetermined angular relationship with respect to each other.

11. A unit for a flue cleaning tool having a stem, comprising a pair of apertured blades adapted for assembly on the tool stem adjacent each other and disposed substantially perpendicular to said stem, and a spacing member comprising two apertured halves adapted for assembly

on the tool stem and to engage said blades in surface contact one on either side of said pair of blades, said halves having axially extending lugs for marginally engaging said blades to maintain them in predetermined angular relationship with respect to each other, and the spacing members of one unit having means for cooperating with the spacing members of an adjacent unit to maintain said units in predetermined angular relationship.

12. A unit for a flue cleaning tool having a hollow stem, comprising a pair of apertured blades adapted for assembly on the tool stem adjacent each other and disposed substantially perpendicular to said stem, and a spacing member comprising two apertured halves adapted for assembly on the tool stem and to engage said blades in surface contact one on either side of said pair of blades, said halves having axially extending lugs for marginally engaging said blades to maintain them in predetermined angular relationship with respect to each other, said spacing members being provided with discharge passages radiating from the centers of the halves, fluid conduit means intercommunicating with said hollow stem and said passages, and said spacing member halves making sealing contact with the blades between said passages.

13. A tube cleaning tool including an apertured, hollow stem through which liquid may be discharged against the interior of a tube; a unit blade assembly on said stem; said unit blade assembly including a flat, thin metal blade centrally apertured to receive said stem and a spacing member of two halves adapted to make surface contact with opposite faces of said blade; said halves having lugs engaging with the side margins of said blade to maintain the blade and halves in fixed angular relation; said halves having substantially radially extending flanges with axially offset portions constituting liquid passages for directing flow of liquid from the stem apertures along the blade and against the interior of a tube; and said halves making surface contact with said blade between said offset portions to form a liquid seal with respect to the blades.

14. A tube cleaning tool including a stem having a portion of its cross-section constructed to convey liquid along said stem for discharge against the interior of a tube; a unit blade assembly on said stem; said unit blade assembly including a flat, thin metal blade centrally apertured to receive the stem and a spacing member of two halves adapted to make surface contact with opposite faces of said blade; said blade and halves having cooperating means for maintaining the blade and halves in fixed angular relationship; said halves having substantially radially extending flanges with axially offset portions constituting liquid passages for directing flow of liquid from said stem along the blade and against the interior of a tube; said passages and said portion of the cross-section of the stem being in liquid communication, and said halves making surface contact with said blade between said offset portions to form a liquid seal.

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