

A. A. HULL.
 FLUE CLEANER.
 APPLICATION FILED JAN. 20, 1911.

1,018,826.

Patented Feb. 27, 1912.

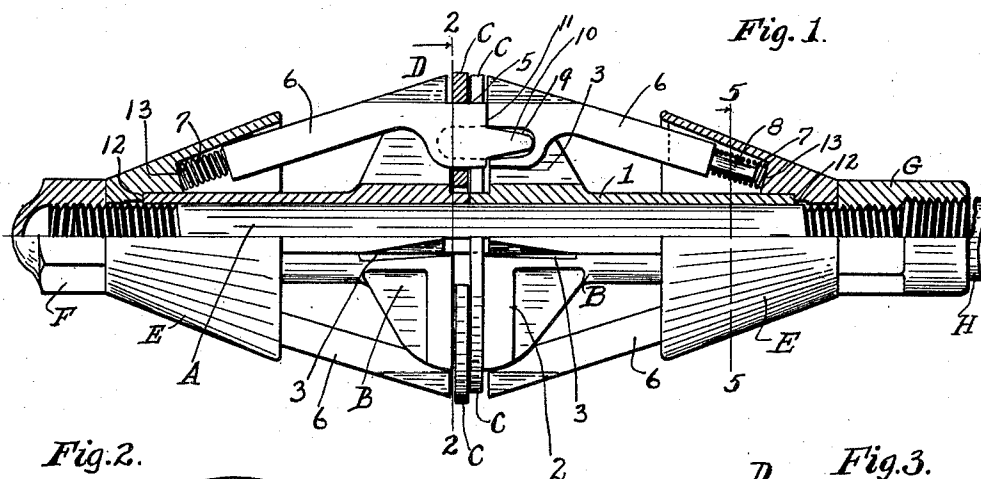


Fig. 2.

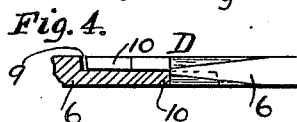
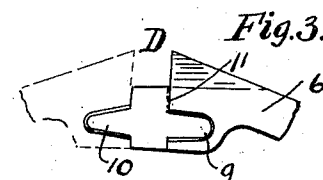
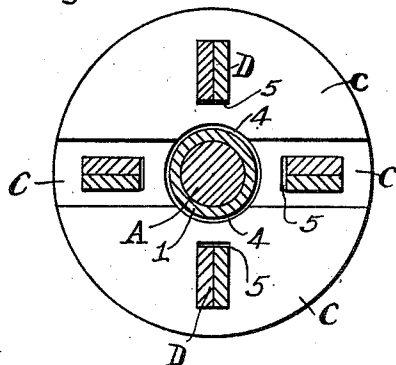


Fig. 5.

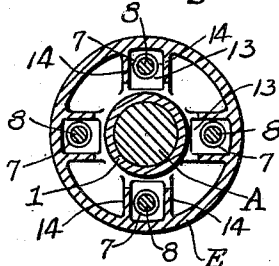


Fig. 6.

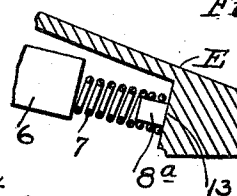
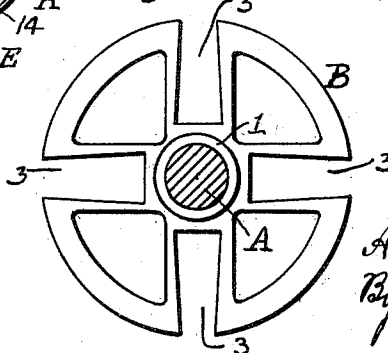


Fig. 2a



WITNESSES
 Carrie P. Ivy
 Wm. Whaley

INVENTOR
 Alfred A. Hull
 By Cyrus K. E. He
 Attorney

UNITED STATES PATENT OFFICE.

ALFRED A. HULL, OF KNOXVILLE, TENNESSEE.

FLUE-CLEANER.

1,018,826.

Specification of Letters Patent.

Patented Feb. 27, 1912.

Application filed January 20, 1911. Serial No. 603,716.

To all whom it may concern:

Be it known that I, ALFRED A. HULL, a citizen of the United States, residing at Knoxville, in the county of Knox and State of Tennessee, have invented a new and useful Improvement in Flue-Cleaners, of which the following is a specification, reference being had to the accompanying drawing.

My improvement relates particularly to that class of flue cleaners which embody transverse members having scraping edges designed to bear outward against the inner face of a boiler tube while the cleaner is reciprocated longitudinally within the tube.

The object of the invention is to produce such a flue cleaner in a form adapted to simple and effective operation and economical manufacture.

In the accompanying drawings, Figure 1 is a side elevation of a flue cleaner embodying my improvement, portions being broken away; Fig. 2 is a section on the line 2—2 of Fig. 1, looking toward the right; Fig. 2^a is a section on the line 2—2 of Fig. 1, looking toward the left; Figs. 3 and 4 are detail views of the meeting ends of two arms forming one of the toggles; Fig. 5 is a section on the line 5—5 of Fig. 1, looking toward the right; Fig. 6 is a detail view of a modification.

Referring to said drawings, A is a central shaft screw-threaded at each end.

B, B are guide members loosely surrounding said shaft and meeting each other at the middle of said shaft. Each such guide member has a sleeve, 1, and near its inner end a spider-form head, 2, having four equidistant radial slots, 3, the slots of one of said members standing opposite the corresponding slots of the other of said members. Two pairs of scraper plates, C, are placed between said guide members, each plate being nearly semicircular and having a notch, 4, for receiving the tubular end of the adjacent guide member, B, and having an aperture, 5, for receiving a toggle, D, the space between the heads of the guide members being a little more than the thickness of two of the scraper plates. Said plates are placed in pairs, the two plates of one pair being at opposite sides of the shaft, A, and in a plane to which said shaft is perpendicular and the two plates of the other pair being similarly opposite each other and in

a plane parallel and adjacent to said first mentioned pair; but one of said pairs is turned ninety degrees upon said shaft with reference to the other pair, so that the spaces between the opposing edges of the plates of one pair are at right angles to the spaces between the opposing edges of the other pair of said plates and said four spaces are equidistant from each other and the four apertures, 5, are equidistant from each other.

Since each of the four toggles extends through one of the equidistant apertures, 5, said toggles are equidistant from each other, and each of said toggles has its arms slanting toward the shaft, A, from the joints toward the free ends of said arms. Therefore each of the four toggles is in a plane which is radial to the axis of the shaft, A. And each toggle is made elastic or yielding toward the shaft, A, being normally pressed away from the shaft by an elastic member or members (the springs, 7) suitably associated with the toggle. In the form shown in the drawings, each toggle is composed of two arms, 6, and a coiled spring, 7, surrounds a stud, 8, located on the outer end of said arm and made shorter than the spring, so that it may be said the spring constitutes an elastic end of the toggle arm.

In the modification shown in Fig. 6, the stud, 8, is omitted from the toggle arm, and the spring, 7, surrounds a stud, 8^a, formed on the abutment, 13, of the retaining member, E. In this form, as well as in the form shown in Fig. 1, the spring constitutes an elastic member interposed between the toggle arm and the abutment or a relatively stationary member of the structure and the toggle, and in both cases the toggle is elastically supported so as to yield to pressure toward the shaft and to move outward upon the removal of said pressure. When the spring is applied to the arm as shown in Fig. 1, it may be said that the spring constitutes a flexible or elastic portion of said arm.

The joint of the toggle may be made in any suitable manner. In the particular form shown in the drawings, which is the preferred form, the alternate sides of the arms have a recess, 9, at their meeting ends for receiving the rounded portion, 10, of the companion arm. The ends thus made to overlap extend through or rest in the aper-

ture, 5, of one of the scraper plates, C, and support the latter. And at the same time said arms extend between the adjacent ends of the other pair of said plates. The body of each toggle arm extends outward approximately as far as the outer edge of the plate supported by said toggle and has a shoulder, 11, in approximately the plane of the inner face of the head, 2, of the adjacent guide member, B, which shoulder is adapted to combine with said head in forming an abutment or wall for limiting the lateral movement of the adjacent scraper plate. And such extended portions of said arms are adapted to aid in guiding the tool by bearing against the inner face of the boiler tube when the tool is being inserted and reciprocated in said tube. Said extensions are made of metal which will wear away faster than will the scraper plates, thus always leaving said plates standing outward far enough to bear against the inner face of the boiler tube.

The toggles, D, and the guide members, B, are held in position by hollow cone-form retainers or retaining members, E, loosely surrounding the shaft, A, and the outer ends of the toggle arms and bearing against the outer ends of the guide members, B. Each such retainer has an annular abutment, 12, to bear against the tubular end of the member, B, and four abutments, 13, one for each of the four springs, 7, located within said retainer. And at each side of each of the toggle arms each retainer has guide faces, 14, by which the adjacent toggle arm is held against lateral movement. At one end of the tool, the retaining member, E, is held in position upon the shaft, A, by a nut, F, threaded upon the end of said shaft. At the opposite end of the tool, the other retaining member is held upon said shaft by a nut, G, threaded upon said shaft.

By driving the nuts, F and G, toward each other until the retainers press the guide members against each other, endwise pressure is put upon the spiral springs, 7, whereby the meeting ends of the toggle arms are pushed outward away from the shaft, A. But by placing pressure upon the middle of each toggle, it may be pressed toward the shaft, A, because such pressure will compress said springs and to the extent of such compression shorten the toggle arm or allow said arms to move toward the abutments, 13. Thus the four scraper plates are carried yieldingly at a short distance from the meeting tubular ends of the guide members, B, and in such position that their curved edges will form approximately a circle which should be a trifle larger than the interior diameter of the tubes to be cleaned.

The shaft may be regarded as the central or axial body of the tool, and when the parts

are properly assembled, the shaft and the guide members are held rigidly to each other and operate like a single piece constituting the central or axial body of the tool, but for the sake of economy and convenient dismantling these parts are preferably made separately.

In operation, the tool is pushed endwise into and through the boiler tube, each toggle pushing its scraper plate outward against the inner face of the tube with a force proportional to the strength and tension of the springs, 7, of that toggle, and the wall of the tube resisting such outward pressure more or less, according to variation in contour of the inner face of such wall, for when the meeting ends of the toggle arms move toward and from the axial body, the outer ends of said arms move toward and from the abutments, 13, whereby the springs, 7, are put under more or less tension. And since the toggles have individual springs, any one toggle may move independently of all the others, thus allowing any scraper plate to move inward or outward, according to irregularities in the flue. And it will be readily understood that the toggles will yield toward the shaft to allow the scraper plates to pass over irregularities in the inner face of the tube and that the plates are adapted to operate when the tool is moving forward and when it is moving backward in the tube. And to the extent that the space between the heads of the guide members, B, is more than the thickness of two of the scraper plates, said plates may have elastic movement parallel to the shaft. And such space also allows the plates to lean with reference to the surface to be scraped, as is done for effective work with a hand scraping tool. And each toggle is adapted for movement independently of all the other toggles. This allows the scraper plates to conform to the inner surface of the boiler tube at places where the latter is non-cylindrical in cross section. It will be seen that this result could not be attained if the four toggles were arranged to move in unison.

The scraper plates are to be made of very hard steel in order that the curved edges, which do the scraping, may be made sharp and durable. And said plates are of a form adapting them to be made by stamping, after which they are case-hardened. The toggle arms are duplicates and may be made by casting or drop forging and do not require machine work. The guide members, B, and the retaining members, E, may be cast so accurately as to require no machine work. The shaft, A, may be cut from stock rods and thereafter threaded. The nut, F, may be cast or drop forged and then interiorly threaded to receive one end of the shaft, A. The nut, G, may be cast and interiorly threaded at one end to receive one

end of the shaft, A, and interiorly threaded at the other end to receive a handle rod, H, whereby the tool is operated. Thus the only machine work required in the making of the tool is the threading of the ends of the shaft, A, and the threading of the nuts, F and G. And it is to be observed that the two halves of the tool lying at opposite sides of a transverse plane cutting between the pairs of scraper plates are symmetrical and that all the parts of the same kind are interchangeable with each other in assembling and that even the nuts, F and G, may be applied to either end of the shaft, A. And it is to be noted that in assembling the parts of the tool, no securing of parts to each other aside from the threading of the nuts upon the shaft is necessary, the parts being all so formed as to adapt them to interengage and remain in position when the nuts have been applied.

I claim as my invention:

1. In a flue cleaner, the combination of an axial body, scraper plates surrounding said body in planes to which the body is perpendicular, toggles extending lengthwise of said body and supporting said plates and comprising rigid arms, relatively fixed abutments opposite the outer ends of said arms, and an elastic member intervening between the outer end of each of such arm and the adjacent abutment in proper relation to yieldingly resist movement of said arm endwise toward said abutment, substantially as described.

2. In a flue cleaner, the combination of an axial body, scraper plates surrounding said body in planes to which the body is perpendicular, toggles extending lengthwise of said body and comprising rigid arms extending through said plates, relatively fixed abutments opposite the outer ends of said arms, and an elastic member intervening between the outer end of each such arm and the adjacent abutment in proper relation to yieldingly resist movement of said arm end-

wise toward said abutment, substantially as described.

3. In a flue cleaner, the combination of a shaft, tubular guide members surrounding said shaft and abutting against each other and having radially-slotted heads near their abutting ends, scraper plates surrounding said shaft between said heads, yielding toggles extending lengthwise of said shaft and through said slotted heads and supporting said plates, and retaining members surrounding the outer ends of said toggles and bearing against the outer ends of said tubular guide members, substantially as described.

4. In a flue cleaner, the combination of a shaft, tubular guide members surrounding said shaft and abutting against each other and having radially-slotted heads near their abutting ends, scraper plates surrounding said shaft between said heads, toggles extending lengthwise of said body and supporting said plates and comprising rigid arms, retaining members surrounding the outer ends of said toggles and bearing against the outer portions of said toggles and bearing against the outer ends of said guide members, and an elastic member located between the outer ends of each toggle arm and the adjacent retaining member, substantially as described.

5. In a flue cleaner, the combination of an axial body, scraper plates surrounding said body in planes to which said body is perpendicular, and yielding toggles composed of laterally-recessed, overlapping arms extending through and supporting said plates, substantially as described.

In testimony whereof I have signed my name, in presence of two witnesses, this 10th day of January, in the year one thousand nine hundred and eleven.

ALFRED A. HULL.

Witnesses:

C. A. MORSE,
CYRUS KEHR.