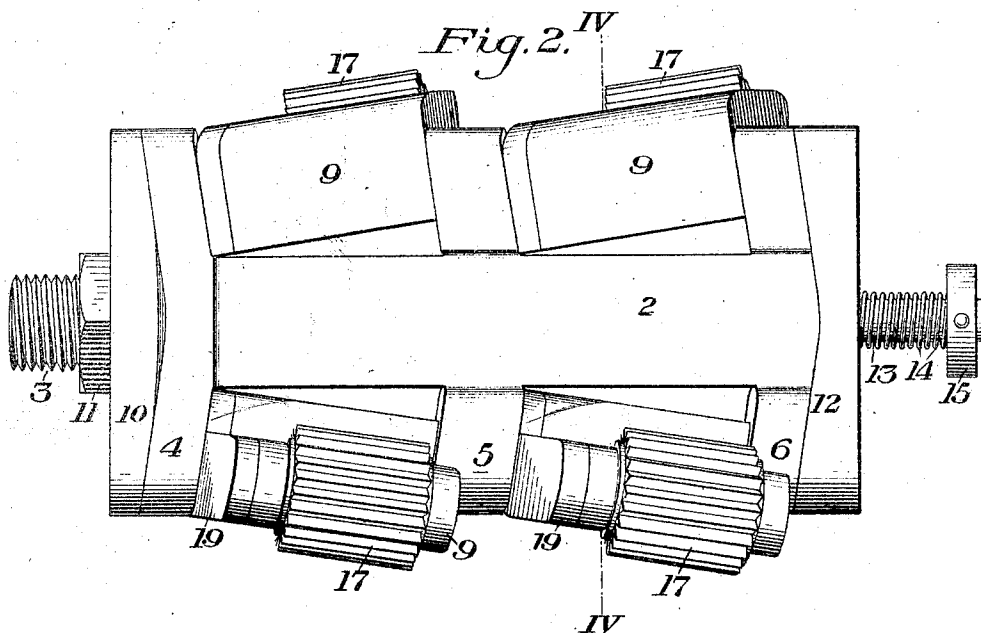


1,036,982.

3 SHEETS—SHEET 1.



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TUBE CLEANER.
APPLICATION FILED FEB. 16, 1910.

1,036,982.

Patented Aug. 27, 1912.

3 SHEETS—SHEET 2.

Fig. 3.

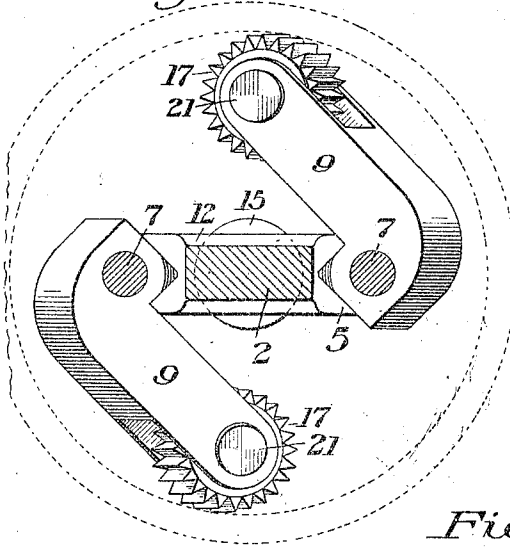


Fig. 4.

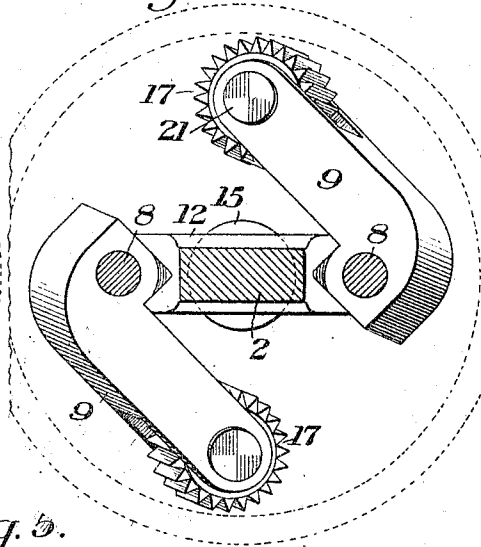


Fig. 5.

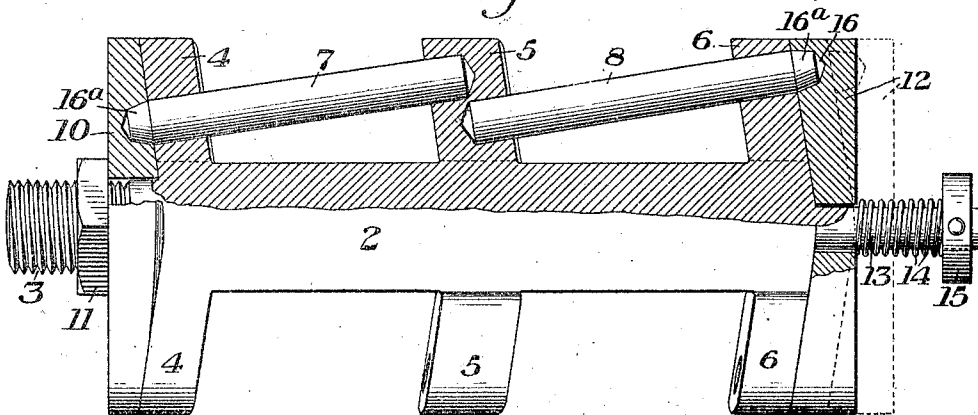
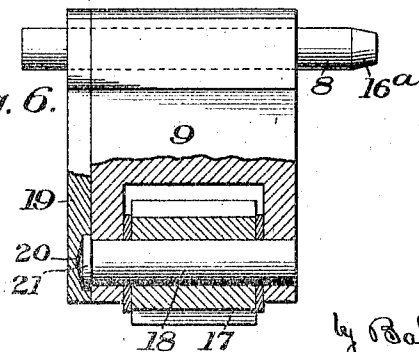


Fig. 6.



WITNESSES

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3 SHEETS—SHEET 3.

Fig. 7.

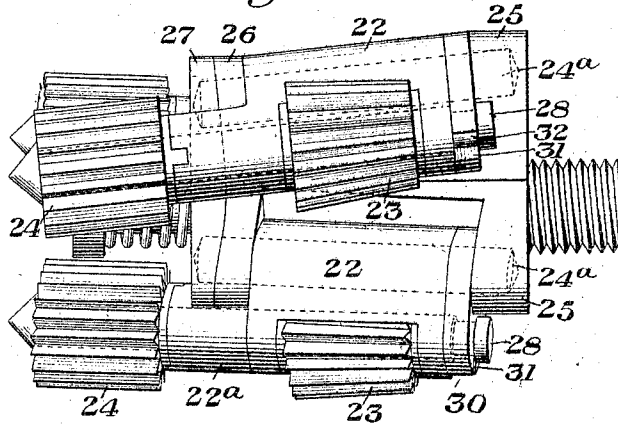


Fig. 8.

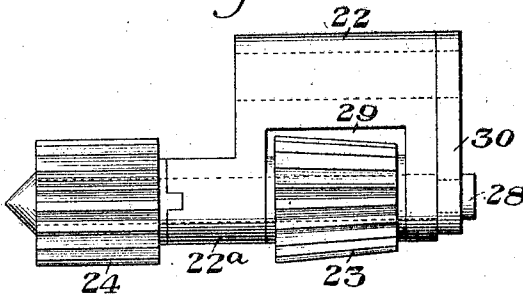


Fig. 9.

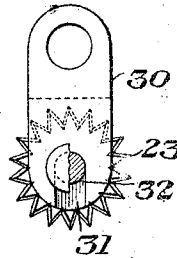
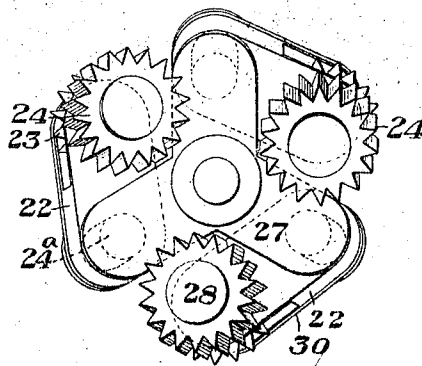


Fig. 10.



WITNESSES

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UNITED STATES PATENT OFFICE.

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TUBE-CLEANER.

1,036,982.

Specification of Letters Patent.

Patented Aug. 27, 1912.

Application filed February 16, 1910. Serial No. 544,165.

To all whom it may concern:

Be it known that I, WILLIAM S. ELLIOTT, of Pittsburgh, Allegheny county, State of Pennsylvania, have invented a new and useful Improvement in Tube-Cleaners, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are plan views of one form of tube cleaner embodying my invention and looking at the cleaner in different positions; Figs. 3 and 4 are, respectively, sections on the lines III—III and IV—IV of Figs. 1 and 2; Fig. 5 is a view partly in plan and partly in section of the body portion of the cleaner with the freely swinging arms removed, but showing two of the arm pivots in position; Fig. 6 is a detail view of one of the arms removed and partly broken away to show the manner of journaling the cutter wheel; Fig. 7 is a plan view showing a modification; Fig. 8 is a detail plan view of one of the freely swinging arms of Fig. 7 removed; Fig. 9 is an end view of Fig. 8; and Fig. 10 is an end view of Fig. 7.

My invention has relation to tube cleaners, and more especially to that class of tube cleaners in which the tools or cutters are carried by swinging arms, which, under the centrifugal action of rotation of the cleaner within the tubes to be cleaned, exert a rapid succession of hammer-like blows upon the scale or other deposit to be removed.

My invention provides a cleaner of this type, in which the freely swinging arms instead of being arranged to swing in planes which are either transverse to the axis of the tube being cleaned or are longitudinal with respect to such axis, as heretofore, are arranged to vibrate in planes which are oblique with respect to the axis of the cleaner and tube. By reason of this oblique arrangement of the freely swinging arms, the cutting tools carried thereby are caused to exert a combined hammer blow, cutting action and scraping action upon the scale to be removed, which is peculiarly effective. Furthermore, the cutting tools usually employed for this purpose consist of wheels or rollers having longitudinally extending cutting teeth, and these teeth by the oblique arrangement of the arms above specified, instead of being presented to the scale in lines parallel to the axis of the tube, are caused

to attack the scale at an angle, thereby preventing any tendency of the cutters to track and making their action much more effective.

A further object of my invention is to provide means of simple and convenient character for retaining in place the pivots for the freely swinging arms, and also the pins or shafts upon which the cutters are mounted, whereby the parts may be quickly assembled and taken apart, and which obviates the use of rivets or other fastenings of a kind likely to work out of place in use.

Referring first to that form of my invention which is shown in Figs. 1 to 6, inclusive, the numeral 2 designates the body portion of a cleaner head, which has at its rear end a threaded projecting stud 3, for the attachment of the head to an actuating motor or other driving means. The head is provided with a plurality of obliquely extending arms or projections 4, 5 and 6, which are provided with bearings for the pins 7 and 8, upon which the freely swinging arms 9 vibrate. In the drawings, I have shown four of these freely swinging arms, two being mounted at each side of the longitudinal axis of the head. The pin 7, upon which the two rear arms are mounted, are inserted through openings in the rear arms or projections 4, and through the freely swinging arms into their bearings in the intermediate arms or projections 5, which bearings extend only partially through said arms. These pins are retained in place by means of the keeper 10, which is slipped over the threaded stud 3, and is secured against displacement by a nut 11, or other suitable means. The pins 8, upon which the two front swinging arms are mounted are inserted in a similar manner through openings in the front arms or projections 6, and are retained in place by means of a keeper 12. This keeper is mounted to slide on the projecting stud 13, and is normally held against the front face of the arms 6 by means of a spring 14, seated on said stud, between the keeper and the collar 15. The inner faces of the keepers 10 and 12 are provided with recesses or bearings 16, to receive the pointed end portions 16^a of the pins. By slacking the nut 11, the keeper 10 may be readily moved back and turned partly around, to permit either pin 7 to be removed. The pins 8 can be removed

in a similar manner by pressing the keeper 12 forwardly against the tension of the spring 14, and turning it partly around. In this manner any one of the arms can be readily removed and replaced when necessary.

The inner faces of the arms 4, 5 and 6, between which the swinging arms are mounted, are oblique to the axis of the head, and the pins 7 and 8 are also placed obliquely, so that the swinging arms will vibrate in planes which are, in general, transverse with respect to the longitudinal axis of the head, but which are somewhat inclined with respect to such axis, the outer ends of the arms being slightly behind their forward ends. The inner faces of the rear projections 4 and 5 are also preferably inclined with respect to the planes of the upper and lower surfaces of the head, so that the two rear arms not only swing in the oblique transverse planes, above described, but are also set in inclined planes. 17 designates the cutter wheels, which are loosely journaled on pins 18, seated in the forked outer end portions of the swinging arms. These cutter wheels are preferably provided with longitudinally extending teeth, which, by reason of the oblique position of the arms, before described, are caused to attack the scale in a manner to exert a cross cutting action thereon, and thereby prevent tracking. The inclination of the two rear arms, above described, is such that when the arms are moved outwardly into working position, the teeth of the cutters carried by the two rear arms are substantially parallel throughout their length with the inner surface of the tube. The cutters of the two forward arms, however, which are not inclined in this manner, present their teeth preferably at an angle to the inner surface of the tube, so as to give a tapered cut. That is to say, the forward ends of the teeth will first gradually attack the scale, and as the tool advances, the teeth act to gradually increase the depth of cut and the rear cutters following with their teeth substantially equally distant from the interior wall of the tube, will effectively remove portions of the scale left by the forward cutters and will leave the tube with a clean interior surface.

In order to prevent displacement of the pins 18, upon which the rotary cutters are mounted, and to enable any one of these pins to be quickly removed to permit a new cutter wheel to be inserted, I employ the keepers 19, which fit against the ends of the arms and swing with the arms, each keeper being provided with a recess or bearing 20, in its inner face, which engages the head 21 of the pin 18. When any one of the arms is removed, its keeper comes with it, and the pin 18 can then be readily withdrawn to

allow a cutter wheel to be removed and replaced.

In the modification shown in Figs. 7, 8, 9 and 10, I have illustrated a tube cleaner which, instead of having two sets of freely swinging arms arranged one in front of the other, is provided with a single set of three arms 22, each of which carries two cutter wheels 23 and 24. These arms swing on the pins or pivots 24^a, which are seated in the arms or projections 25 and 26 of the head and are retained in place by a keeper 27, which is similar to the keeper 12, before described. The two cutter wheels of each arm are mounted on a single journal shaft 28, the rear cutters 23 turning within cut-away portions 29 of the arms, while the forward cutters 24 are overhung by means of the extensions 22^a of the arms. The pins or shafts 28 are retained against displacement by means of the keepers 30, each of which is provided with a slot 31, which engages a recess 32, in the rear end of the pin or shaft. In the construction shown in these figures, the forward cutter wheels are of cylinder form, so that they will have a gradually increasing cut in the manner before described. The rear cutter wheels 23, however, are of cone form, so that when the arms are in working positions, the edges of the cutting teeth will be substantially equidistant from the inner wall of the tube, this tapering of the cutter wheel serving the same purpose as the inclination of the rear arms in the form first described. In fact, in the form first described, instead of employing this feature of the double inclination of the arms, I may use tapered or cone cutters on the rear arms of similar character to those shown in Figs. 7 and 8. In either of the forms shown, straight or tapered cutters may be employed, as may be desired, depending upon the angle of the arms. Each of the cutter wheels is preferably of such a length that a line drawn on the circumference of the wheel parallel to the longitudinal axis of the head will intersect the edges of at least two adjacent cutting teeth. This gives the wheels a cross-cutting action which greatly increases the effectiveness of the action.

Instead of employing elongated cylinder cutters I may use a plurality of relatively thin cutting disks or wheels, arranged side by side, and capable of either joint or separate rotation.

It will also be obvious that the keepers for retaining the pivots for the freely swinging arms and the shafts or pins for the cutter wheels may be of various forms, the object being to provide keeper means which will effectively prevent displacement of these pins and pivots, and which can be readily moved to permit of their removal when necessary.

The operation of the invention will be readily understood from the foregoing description.

The rapid vibratory movement of the arms under high speed of rotation within the tube to be cleaned, combined with the oblique arrangement of the arms, makes the action peculiarly effective in thoroughly cleaning the interiors of tubes.

While in the particular form of my invention described and illustrated in this application, I have shown the freely swinging arms arranged in planes which are generally transverse, I intend to cover by the broader claims herein: tube cleaners, in which the freely swinging arms are arranged in oblique longitudinal planes in the manner shown and described in my copending application, Serial No. 544186.

I claim:

1. A tube cleaner comprising a head, a swinging arm pivoted at its inner end portion to said head and extending outwardly therefrom, said arm having its pivotal axis extending in the same general direction as the longitudinal axis of the head but inclined to said axis, and a cutter wheel journaled to the opposite end portion of the arm, said cutter having its axis substantially parallel to the axis of the arm and also having longitudinally extending cutting teeth; substantially as described.

2. A tube cleaner comprising a head, a swinging arm pivoted at its inner end portion to said head and extending outwardly therefrom, said arm having its pivotal axis extending in the same general direction as the longitudinal axis of the head but inclined to said axis, and a cutter wheel journaled to the opposite end portion of the arm, said cutter having its axis substantially parallel to the axis of the arm and also having longitudinally extending cutting teeth, each tooth having its cutting edge substantially equidistant throughout its length from the longitudinal axis of the head; substantially as described.

3. A tube cleaner comprising a head, a plurality of swinging arms pivoted at their inner end portions to the head and extending outwardly therefrom, said arms having their pivotal axes extending in the same general direction as the longitudinal axis of the head but inclined thereto, and cutter wheels journaled to said arms and having teeth extending in the direction of the axes of the wheels, said cutters being arranged in front and rear sets, the teeth of the cutter wheels of the front set being farther from the axis of the head at their forward ends than at their rear ends, while the teeth of the cutters of the rear set are substantially equidistant from said axis throughout their length, substantially as described.

4. In a tube cleaner, a head or carrier hav-

ing a freely swinging arm, a cutter wheel journaled to said arm, a pin on which the wheel is mounted, and a keeper engaging one end of said pin, said keeper being mounted to swing with said arm and pivoted to swing about the pivotal axis of the arm; substantially as described.

5. A tube cleaner, comprising a head having projecting portions, a cutter-carrying arm pivoted to said projections, the pivot for said arm consisting of an endwise removable pin having a closed seat in one of said projections and extending through the other projection, and a keeper member arranged to prevent endwise outward movement of the pin and capable of a combined outward and angular movement to free the pin, substantially as described.

6. A tube cleaner, comprising a head having projecting portions, a cutter-carrying arm pivoted to said projections, the pivot for said arm consisting of an endwise removable pin having a closed seat in one of said projections and extending through the other projection, and a keeper member arranged to prevent endwise outward movement of the pin and capable of a combined outward and angular movement to free the pin, together with means for normally preventing such movement of the keeper member, substantially as described.

7. A tube cleaner, comprising a head having projecting portions, a cutter-carrying arm pivoted to said projections, the pivot for said arm consisting of an endwise removable pin having a closed seat in one of said projections and extending through the other projection, and a keeper member arranged to prevent endwise outward movement of the pin and capable of a combined outward and angular movement to free the pin, the keeper member normally engaging the pin to prevent angular movement of said member, substantially as described.

8. A tube cleaner, comprising a head having projecting portions, a cutter-carrying arm pivoted to said projections, the pivot for said arm consisting of an endwise removable pin having a closed seat in one of said projections and extending through the other projection, a keeper member arranged to prevent endwise outward movement of the pin and capable of a combined outward and angular movement to free the pin, the keeper member normally engaging the pin to prevent angular movement of said member, and spring means for normally preventing outward movement of said member, substantially as described.

9. In a tube cleaner, a head or carrier having a freely swinging arm provided with a slot therein, a cutter wheel mounted in said slot, a pin on which the cutter is mounted, and a keeper engaging one end of said

pin, said keeper being mounted to swing with said arm, substantially as described.

10. In a tube cleaner, a head or carrier having a freely swinging arm provided with a slot therein, a cutter wheel mounted in said slot, a pin on which the cutter is mounted, and a keeper engaging the end of said pin, said keeper being mounted to swing with said arm, and consisting of a piece which is mounted on the arm pivot and is normally held against movement away from the pin by engagement with the head, substantially as described.

11. A tube cleaner having a plurality of swinging arms arranged to rotate in transverse planes oblique to the longitudinal axis of the cleaner, and a plurality of toothed cutters carried by each arm and arranged in sets, one set in front of another, the teeth

of the cutters of one set being at a different angle to the longitudinal axis of the head than the teeth of the cutters of another set, substantially as described.

12. A tube cleaner comprising a head, a swinging arm mounted thereon, a pivot for said arm seating in bearings in the head, and a keeper engaging one end of the pin, the head having an extension, and there being a spring seated on said extension and bearing against the extension at one end and against the keeper at its other end; substantially as described.

In testimony whereof, I have hereunto set my hand.

WILLIAM S. ELLIOTT.

Witnesses:

GEO. B. BLEMING,
GEO. H. PARMELEE.