

No. 649,839.

Patented May 15, 1900.

T. J. HART.
TUBE CLEANER.

(Application filed Mar. 1, 1899.)

(No Model.)

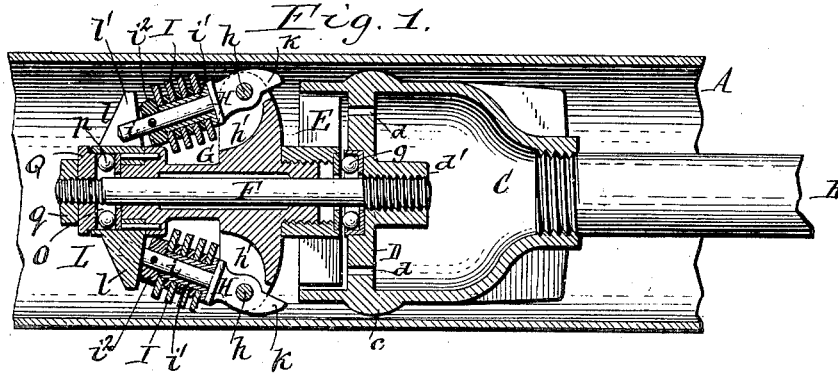


Fig. 4.

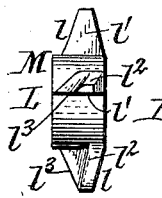


Fig. 2.

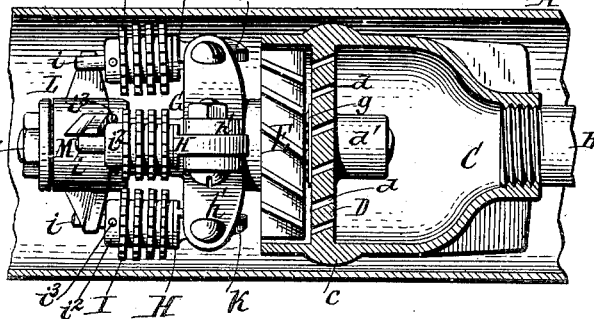


Fig. 5.

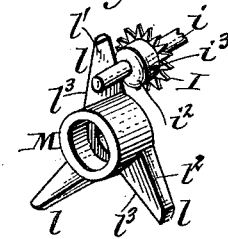


Fig. 6.

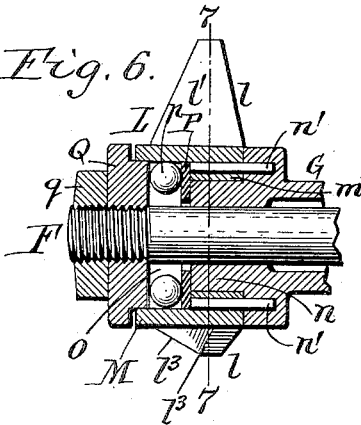


Fig. 3.

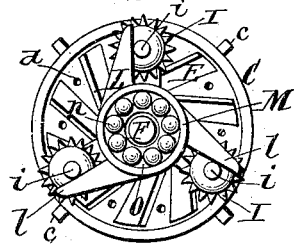
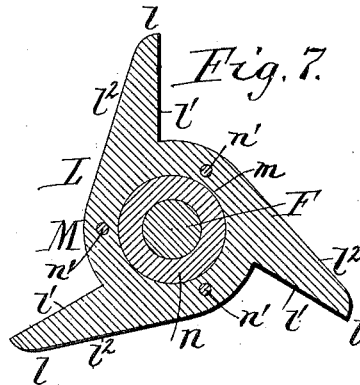


Fig. 7.



Witnesses:
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UNITED STATES PATENT OFFICE.

THOMAS J. HART, OF BUFFALO, NEW YORK, ASSIGNOR TO THE SHERWOOD MANUFACTURING COMPANY, OF SAME PLACE.

TUBE-CLEANER.

SPECIFICATION forming part of Letters Patent No. 649,839, dated May 15, 1900.

Application filed March 1, 1899. Serial No. 707,287. (No model.)

To all whom it may concern:

Be it known that I, THOMAS J. HART, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Tube-Cleaners, of which the following is a specification.

This invention relates to that class of cleaners which are employed for removing the scale from the interior surface of the water-tubes of steam-boilers and which comprise a rotary head which is rapidly rotated by a turbine wheel and arms which carry the cutters and which are pivoted to this head in such manner that the cutters are thrown out by centrifugal force and brought in contact with the scale to be removed. The cleaner is usually provided with a tubular handle through which the steam or other actuating fluid is supplied to the turbine wheel and by which the cleaner is moved through the water-tube in removing the scale therefrom.

The object of this invention is to connect the cutters and their movable arms with the rotary head in a simple and effective manner and to provide the rotary head with an advance cutter which cuts into the scale in advance of the cutters on the movable arms and removes any excessive thickness of scale.

In the accompanying drawings, Figure 1 is a longitudinal section of my improved tube-cleaner, showing the cutters on the movable arms thrown in. Fig. 2 is an elevation, partly in section, showing the cutters on the movable arms thrown out. Fig. 3 is a front elevation with the nut and cap removed. Fig. 4 is a detached elevation of the advance cutter. Fig. 5 is a perspective view of the same and of one of the disk cutters. Fig. 6 is a longitudinal section, on an enlarged scale, of the front end of the rotary head and the advance cutter mounted thereon. Fig. 7 is a cross-section in line 7 7, Fig. 6.

Like letters of reference refer to like parts in the several figures.

A represents a boiler-tube.

B represents the tubular handle of the cleaner, and C the shell or casing, which is secured to the front end of the handle. The latter is connected at its rear end, (not shown,) as usual, by a flexible pipe with the steam-

boiler or other source of supply for the actuating medium. To reduce the friction of the shell against the tube in moving it back and forth in the same, the shell is made smaller than the internal diameter of the tube and provided with longitudinal ribs *c*, which hold the shell out of contact with the tube.

The casing is provided at a short distance from its open end with a diaphragm D, having apertures *d*, through which the steam or other actuating medium issues against the turbine wheel E, which is arranged in the overhanging front part of the casing and adjacent to the outer side of the diaphragm D. The latter is provided with a central hub *d'*, in which is secured an arbor F, which projects forwardly from this diaphragm and beyond the open front end of the casing.

G represents the rotary head or sleeve which is mounted on the arbor F, so as to turn thereon and which carries the cutters and the turbine wheel. The latter is secured to the rear end of the head adjacent to the diaphragm D, and in order to reduce the friction between the head and the diaphragm, which results from the backward thrust of the cutters, a ball-bearing *g* is preferably interposed between the head and the diaphragm.

H represents the movable cutter-arms, which are connected at their rear ends by transverse pivots *h* to lugs or ears *h'*, formed on the enlarged rear portion of the head G adjacent to the turbine wheel, so that these arms can swing at their front ends toward and from the axial line of the cleaner. These arms are provided with forwardly-projecting longitudinal journals *i*, which carry the usual serrated steel cutter-disks I. These cutters are preferably mounted upon sleeves *i'*, applied to the journals *i*, in order to prevent the cutters from wearing these journals. The cutters are spaced by interposed washers, as usual, and are held on the sleeves and the latter on the journals by washers *i''* and cotter-pins *i'''*, applied to the front ends of the journals.

k represents a rearwardly-projecting stop formed on the rear end of each cutter-arm in such a position that it comes in contact with the rear portion of the head G when the desired limit of outward movement of the cut-

ters has been reached. The contact-surfaces of the stop and rotary head are preferably so arranged that the outward movement of the cutters is arrested before the axial line of the cutters becomes parallel with the axial line of the head. This causes the axial lines of the several sets of cutter-disks to converge forwardly when the cutters are in their outermost position, so that the resistance which the cutters encounter in entering the scale will tend to swing the front ends of the cutters inwardly. This inward pressure is counteracted by the centrifugal force, which tends to swing the cutters out against the scale and holds them to their work. The inwardly-inclined position of the cutters prevents the latter from catching in the scale and being wedged outwardly as the cleaner is pushed forward through the tube.

L represents the advance cutter, which is secured to the front end of the rotary head, so as to cut into and remove any excessive thickness of scale before the disk cutters enter the same. This cutter is provided with as many outwardly-projecting arms *l* as there are pivoted cutter-arms *H*—three being shown in the drawings. The front face *l'* of each of these arms stands parallel with the axis of the rotary head and sufficiently in rear of the center line of the adjacent cutter-journal *i* to enable the front portion of such journal to rest against this flat front face and find a support or abutment on the same as the rotary serrated cutters do their work. The disk cutters stand in rear of these supporting-arms, and the front portions of the journals extend forwardly across the flat faces of the supporting-arms far enough to furnish a good support at the front end of the journal in all positions of the pivoted arms on which the disk cutters are mounted. These supporting-arms *l* are beveled at the front, the rear face *l''* of each arm being arranged at an acute angle to the longitudinal front face, forming a front cutting edge *l'''* on each arm. This cutting edge is preferably inclined backwardly from the base to the free end of the arm, as shown in Figs. 1, 4, and 5.

The supporting and cutting arms are mounted on a hollow hub *M*, which is secured to the front end of the rotary head *G*. The latter is provided at its front end with a reduced cylindrical neck *n*, Figs. 6 and 7, and the hub *M* is provided in its rear portion *m* with a cylindrical bore by which it fits around this neck and against the shoulder formed by the same at the front end of the rotary head. The hub is held against turning on this neck by several longitudinal pins *n'*, which are inserted in registering openings formed, respectively, in the rear portion *m* of the hub and in the front portion of the head outside of its neck *n*. The front portion of the bore of the hub is larger in diameter than the cylindrical bore of the rear portion, forming in the front portion of the hub a cylindrical chamber *O*, in which are arranged an annular washer *P* and a circular

row of balls *p*. The washer *P* fits around the front portion of the arbor *F* and against the inner side of the front portion of the hub and is placed against the rear portion of the hub to prevent the pins *n'* from leaving their sockets. The balls *p* are placed against the front side of the washer and are held in place by a cap *Q*, which may enter the cavity of the hub, as shown. This cap is held in place by a screw-nut *q*, applied to the front end of the arbor, and by bearing against the balls holds the hub and the head *G* on the arbor. These balls relieve the forward thrust of the rotary head. The hub *M* and its arms *l* are preferably formed in one piece of steel by drop-forging.

The spider composed of the hub *M* and arms *l* forms a back support for the front ends of the cutter-journals and also an advance cutter, which clears away any unusual thickness of scale before the disk cutters enter the same and relieves the disk cutters of that part of the work.

I claim as my invention—

1. The combination with the rotary head, of longitudinal arms pivoted at their rear ends to said head and free at their front ends, to swing at their front ends toward and from the axis of said head, longitudinal journals formed on the front portions of said arms, disk cutters mounted on said journals, which latter project forwardly beyond said cutters, and a spider which is secured to said head in front of said disk cutters and which has outwardly-projecting arms constructed with longitudinal front faces against which said journals rest loosely in front of said cutters and on which said journals move freely as the arms swing in and out, substantially as set forth.

2. The combination with the rotary head, of longitudinal arms pivoted at their rear ends to said head to swing at their front ends toward and from the same and having longitudinal journals, disk cutters mounted on said journals, and a spider mounted on the front portion of said head and having its outwardly-projecting arms provided with cutting edges for removing the excess of scale in advance of the disk cutters, substantially as set forth.

3. The combination with the rotary head, of longitudinal arms pivoted at their rear ends to said head and free at their front ends, disk cutters journaled on said arms, and outwardly-projecting spider-arms secured to said head in front of said disk cutters, said spider-arms forming back supports for said longitudinal arms and having cutting edges for removing scale in advance of the disk cutters, substantially as set forth.

4. The combination with the rotary head, of longitudinal arms pivoted at their rear ends to said head to swing at their front ends toward and from the same and having longitudinal journals, disk cutters mounted on said journals, and a spider mounted on the

front portion of said head and having its outwardly-projecting arms provided with longitudinal faces which form back supports for the front portions of said journals and also
5 with cutting edges which remove the excess of scale in advance of the disk cutters, substantially as set forth.

5. The combination with the stationary arbor, of a rotary head mounted thereon and
10 provided at its front end with a reduced neck, a spider having its hub fitted around said neck and provided in its front portion with an enlarged bore or chamber, a longitudinal coupling-pin arranged in sockets formed in

the rear portion of said hub and the front 15 portion of said head, a washer arranged in the enlarged bore of the hub against the front end of said pin, antifriction-balls arranged in said bore against said washer, and a cap
20 whereby said balls are held in said chamber and the hub is held on the arbor, substantially as set forth.

Witness my hand this 24th day of February, 1899.

THOMAS J. HART.

Witnesses:

EDWARD WILHELM,
ELLA R. DEAN.