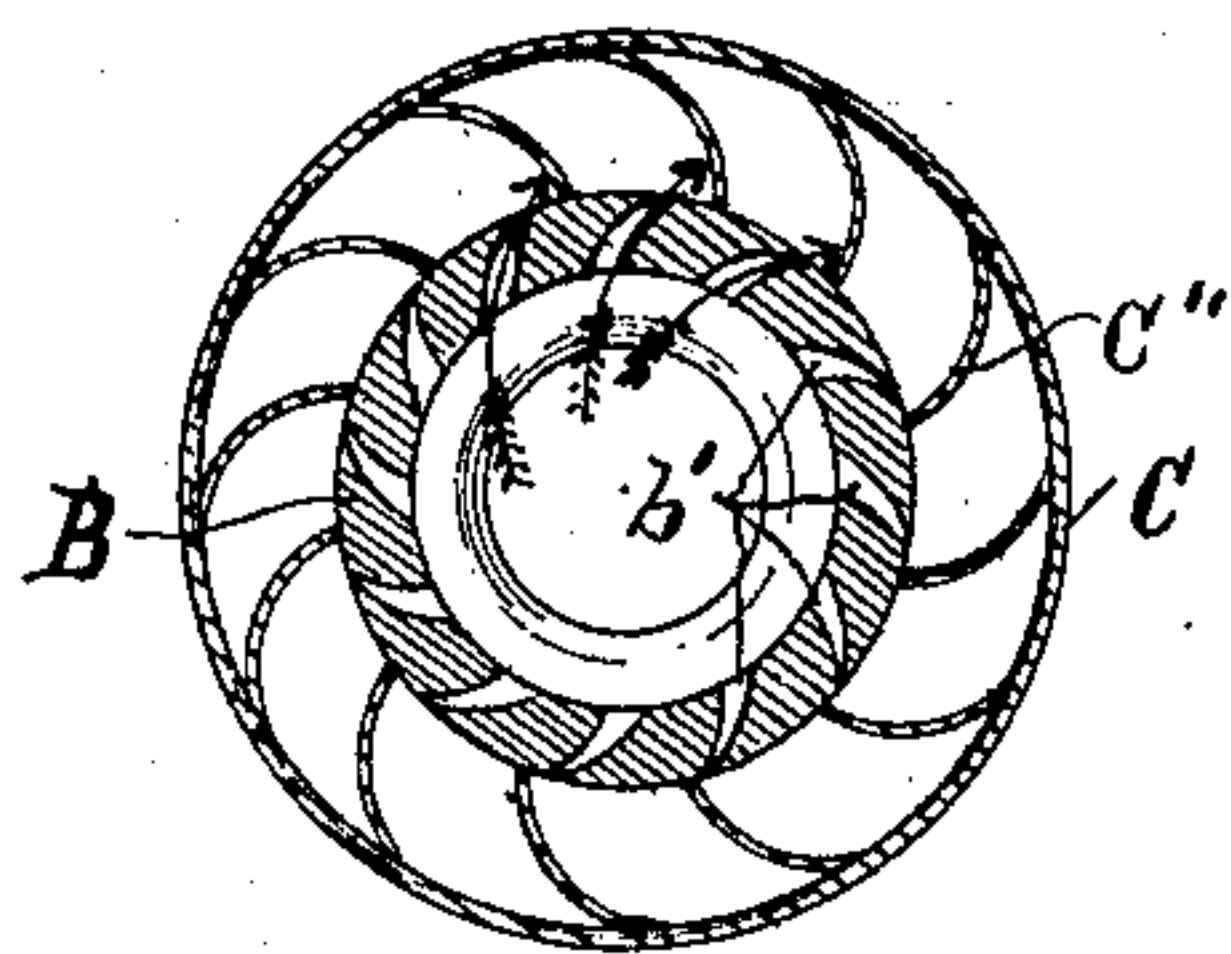
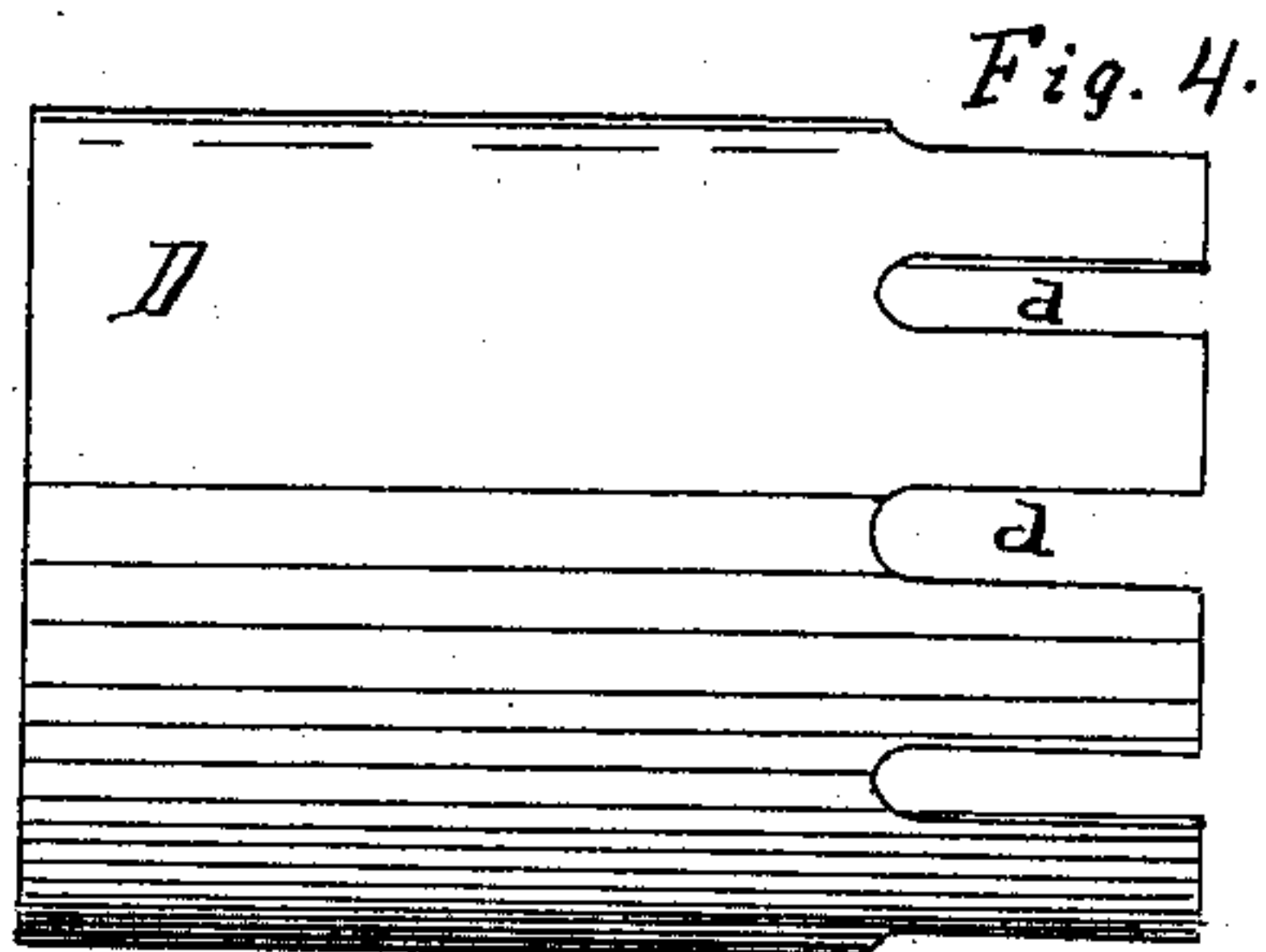
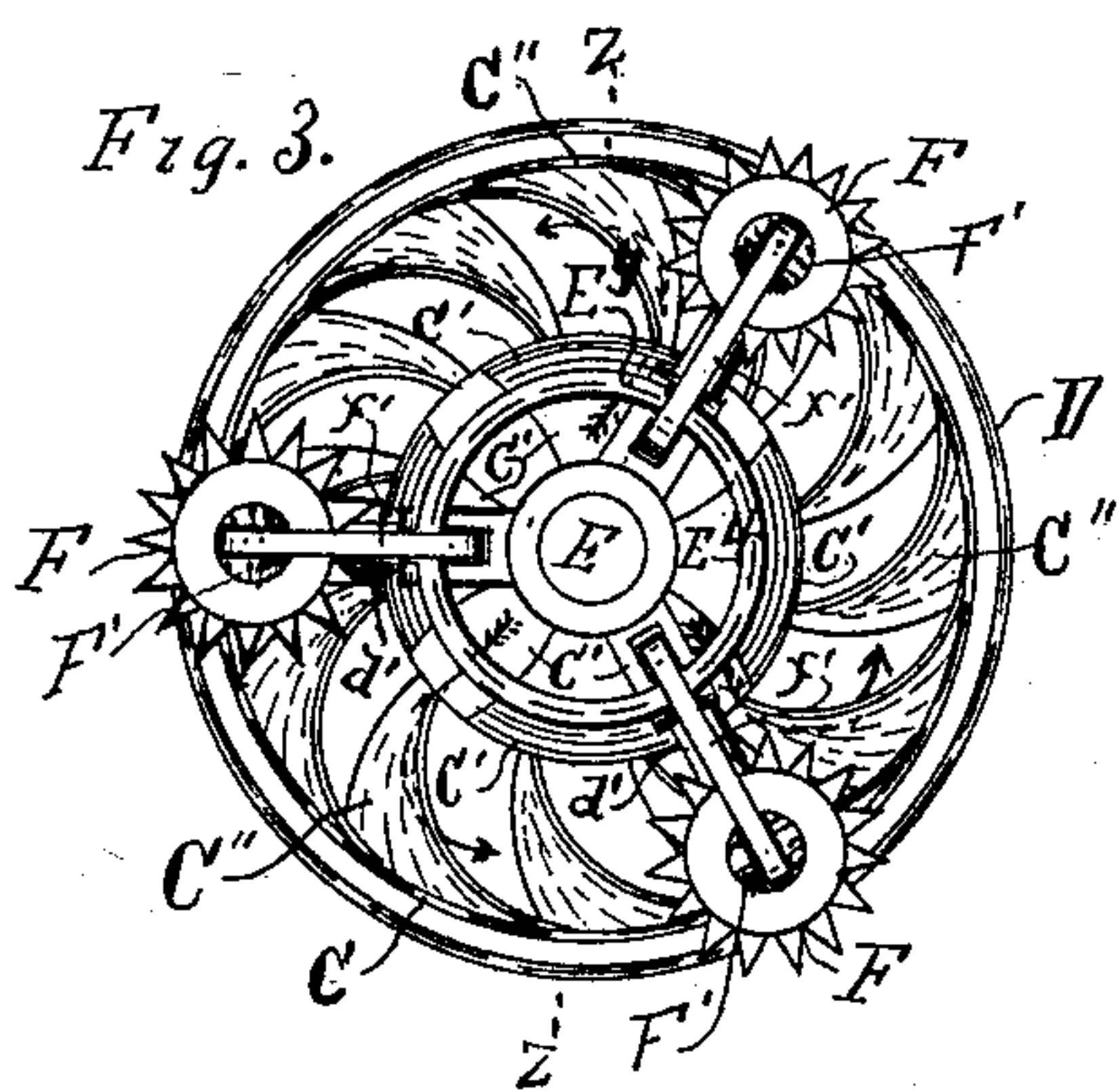
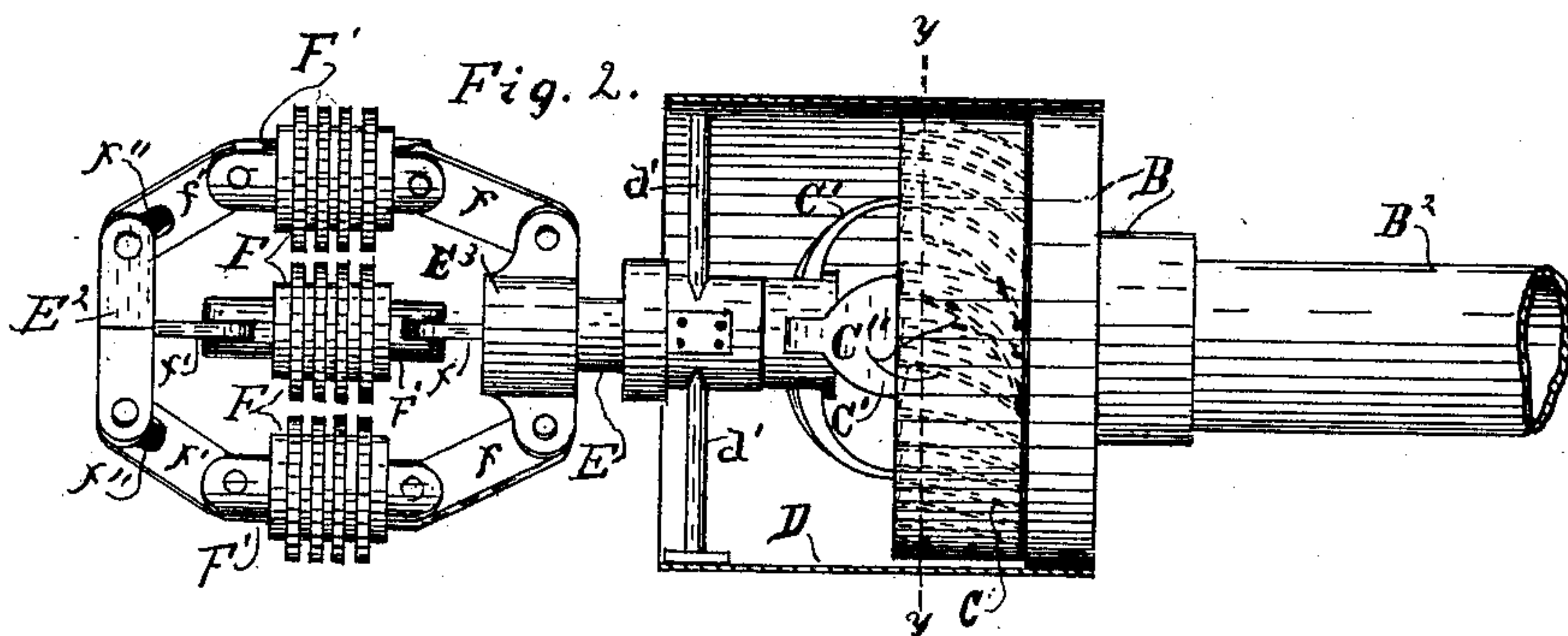
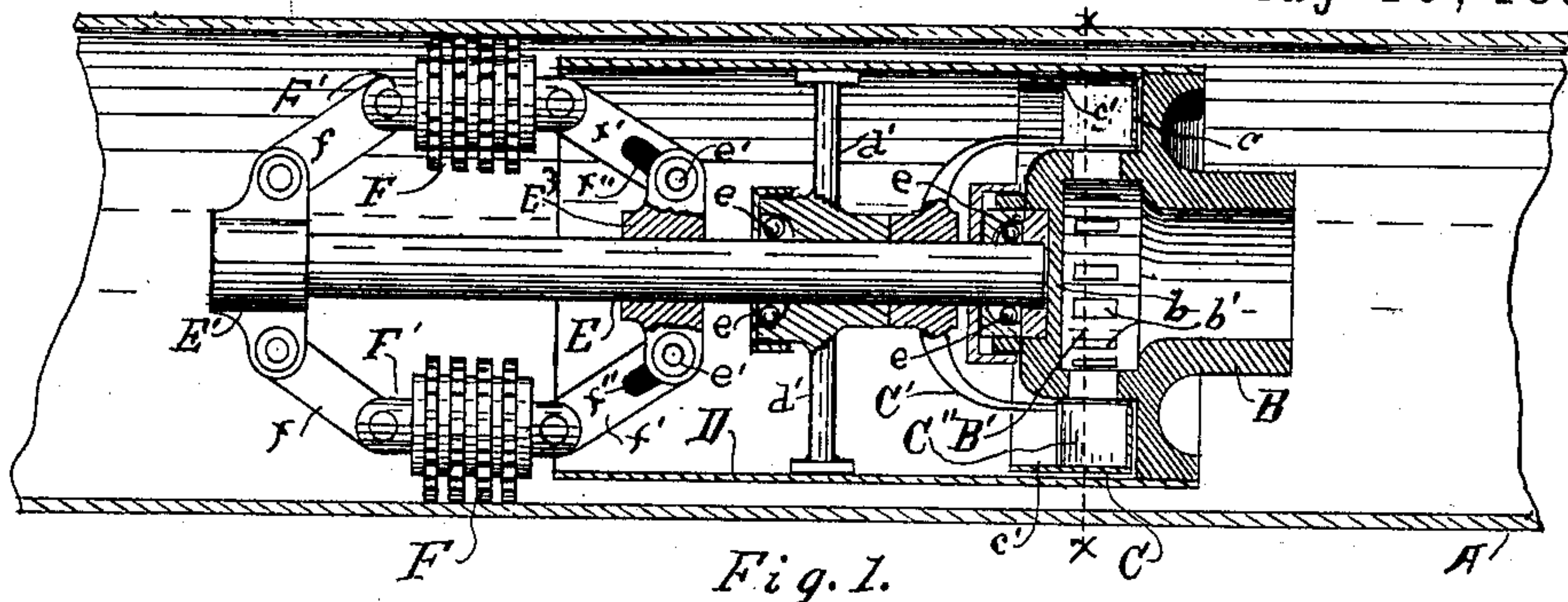


(No Model.)

S. J. GUNN.  
TUBE CLEANER.

No. 603,762.

Patented May 10, 1898.



Witnesses.

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# UNITED STATES PATENT OFFICE.

SHELTON J. GUNN, OF GRAND RAPIDS, MICHIGAN.

## TUBE-CLEANER.

SPECIFICATION forming part of Letters Patent No. 603,762, dated May 10, 1898.

Application filed November 1, 1897. Serial No. 657,095. (No model.)

*To all whom it may concern:*

Be it known that I, SHELTON J. GUNN, a citizen of the United States, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Tube-Cleaners, of which the following is a specification.

My invention relates to improvements in appliances for cleaning the scales from water-tubes in steam-boilers; and its objects are, first, to provide for washing any refuse from scales that may be thrown back of the jacket of my motor by the cutting-tools when cutting the scale from the tubes; second, to provide for my cleaner a water or steam motor that will utilize the entire force of the incoming current of water or steam, whichever may be used; third, to provide for carrying several sets of rotary serrated cutters to the surface of the tube, exactly parallel therewith, and at the same time have each act independent of the other; fourth, to avert any obstruction to the free outflow of the propelling force from the motor; fifth, to reduce the friction of the propelling-shaft to the minimum, and, sixth, to provide for using my cleaner on bent tubes. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a boiler-tube and my appliance on the line  $z z$  of Fig. 3. Fig. 2 is the same with the tube removed, showing a modified form of hanging the cutters to act in bent tubes. Fig. 3 is an end view of the same, showing the links supported by a ring. Fig. 4 is an elevation of the jacket, and Fig. 5 is a cross-section of my supply-pipe and motor on the line  $x x$  of Fig. 1.

Similar letters refer to similar parts throughout the several views.

In the accompanying drawings, A represents a section of a water-tube, and B represents the base or supply-chamber of my motor. This supply-chamber is arranged to receive the propelling force from the supply-pipe  $B^2$ , said propelling force being allowed to enter this chamber, but cut off of its direct course by the resisting-wall  $b$  and forced to escape through the ports  $b'$  in the direction indicated by the arrows in Fig. 5, so that it will strike the buckets  $C''$  of the motor C nearly at right angles. These buckets are

made upon the order of a screw-propeller, as indicated in Fig. 3, so that the propelling force is exerted thereon until the instant of leaving said buckets and escapes therefrom with a twisting motion, so that it will be thrown forcibly to the surface of the tube and will wash around it instead of passing through in a direct line and barely rinsing the surface. These buckets are contained in a case C, having a back wall  $c$ , which prevents the propelling force from coming in contact with the back wall of the jacket, and with the projecting peripheral rim  $c'$  averts all danger of the motor "wallowing" in the surplus of propelling element. The buckets approach this peripheral rim upon an easy spiral incline, so that there is no jar as it passes from the buckets and no check in its motion as it passes from the motor.

I prefer that the ports  $b'$  be made broad at the opening from the chamber and terminate with a very thin jet-like orifice as it opens into the motor, as by this construction I am enabled to utilize the entire impelling force of the escaping element not only by natural expansion, but by its direct impact upon the buckets.

To give the propelling element a direct flow from the motor, I attach its supporting-arms  $C'$  to the inner edges of the bucket, so that there is no obstruction from the motor to the case. These arms are secured to the propeller-shaft E, as indicated in Figs. 1 and 2, between the hub  $E^3$  and the wall  $b$ , the shaft being supplied in these bearings with a series of antifriction-balls  $e$  to reduce as much as possible the friction of the revolving shaft.

The motor is contained in an enveloping cylinder or jacket D, which in the ordinary cleaner shown in Fig. 1 projects well beyond the supporting-spider  $d'$  to carry the escaping water or steam from the motor to close contact with the cutters F, so that it will take its first effect upon the pulverized scale at the instant that it is torn from the surface of the tube. In the cleaner for use upon bent tubes it is necessary to cut this jacket short, as in Fig. 2, to give as much flexibility to the cleaner as possible.

For the purpose of washing any pulverized scale from between the jacket and the tube, which often wedges in in consequence of the



near proximity of the jacket to the cutters, I form a series of openings  $d$  in the back end of the jacket, so that water may flow through and mingle with the scale back of the jacket and wash it out. I find it advisable to terminate these openings just back of the discharge end of the motor, as on the line  $z z$ , so that there will be no danger of the water rushing through with sufficient force to flood back upon the operator.

In the ordinary cleaner the shaft E extends beyond the hub  $E^3$  far enough to receive and support the hub  $E'$ , and I pivot to these hubs, as at  $e'$ , links  $f$  and  $f'$ , to the opposite ends of which I pivot the shaft  $F'$ , upon which I support a series of revoluble serrated disks F, which are caused to revolve by contact with the surface of the tube and the rapid rotary motion of the shaft E. The links  $f'$  are provided with slots  $f''$ , so that they may slide in their pivot-bearing to admit of the cutters or disks F to have a lateral motion, so that the centrifugal force caused by the revolving of the shaft E may force them against and into the scale on the surface of the tube.

When constructing the cleaner for use on bent tubes, I make the shaft shorter, cutting it off at the hub  $E^3$ , and support the outer ends of the shafts  $F'$  by means of an adjustable link, as  $E^2$ , or a ring  $E^4$ , so arranged that the cutters may adjust themselves to the curvature of the tube. With this form I reverse the links  $f$  and  $f'$  and arrange the slots  $f''$  to act with the outer bearing for the purpose of giving to this bearing a greater flexibility.

The propelling medium may be either water, steam, or air under pressure.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a tube-cleaner, a motor having spiral buckets, in combination with a shaft, serrated rotary cutters driven by said shaft, pivotal links connecting said cutters with permanent bearings on said shaft, the links at one end of the cutter-heads being closely pivoted both to the bearing and the head and the links at the other end being adjustably connected so that each head is capable of lateral adjustment independent of the others to permit the cutters to adjust themselves to the surface of the tubes, substantially as and for the purpose set forth.

2. In a rotary tube-cleaner, a motor having spiral buckets and a back and peripheral walls to prevent backward or radial escape of water, arms connecting the inner edges of the buckets with the propelling-shaft, a propelling-shaft, rotary serrated cutters connected at one end to said shaft by pivotal links, and the opposite ends connected by pivotal links to an adjustable link so that it may adapt itself to bent tubes, substantially as and for the purpose set forth.

3. In a rotary tube-cleaner, a rotary motor, a shaft propelled by said motor, a series of shafts each supporting a series of independently-rotating cutters, links for pivotally connecting said cutter-shafts to the propeller-shaft, and a jacket open at the front end and having lateral ports at the back end for the free passage of water, substantially as and for the purpose set forth.

Signed at Grand Rapids, Michigan, October 27, 1897.

SHELTON J. GUNN.

In presence of—

JAMES CILLEY,  
ITHIEL J. CILLEY.