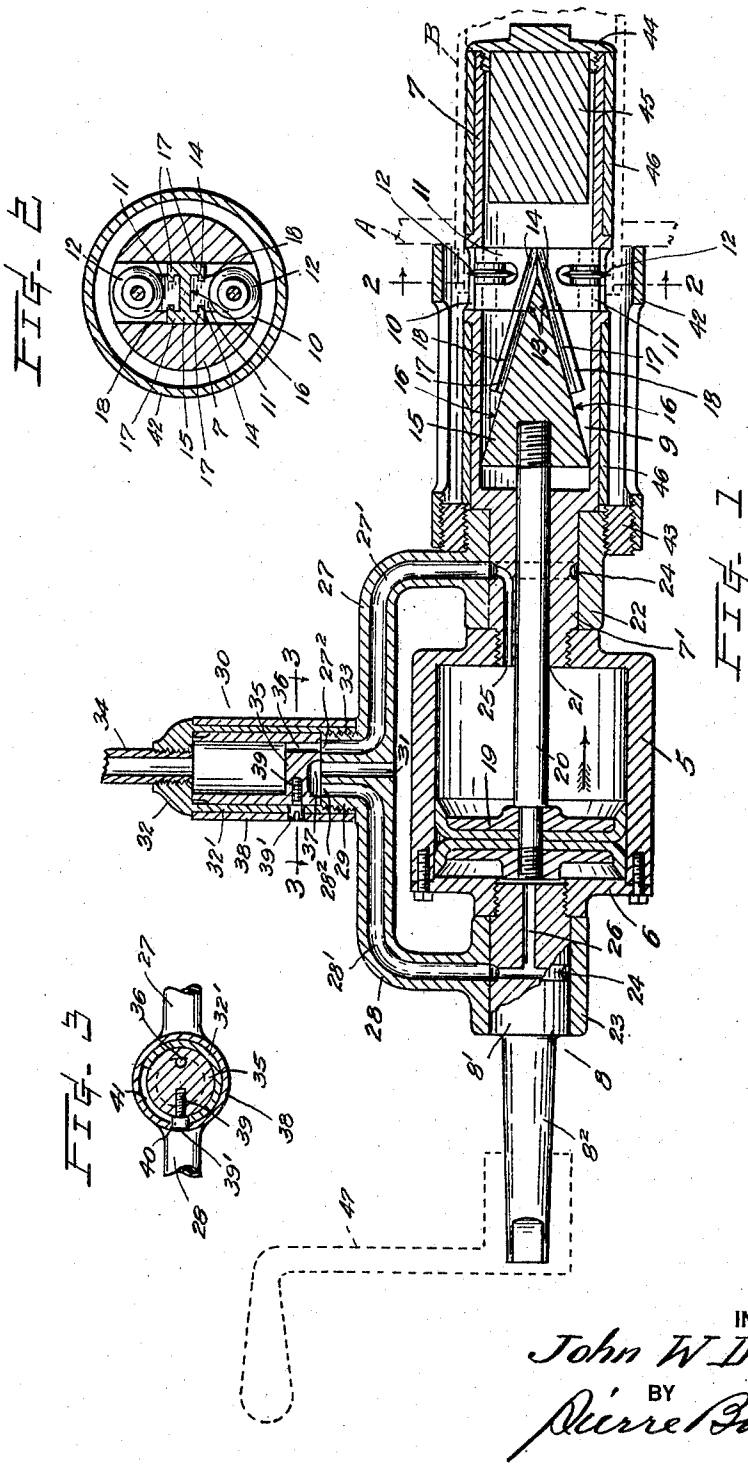
J. W. DOYLE.

FLUE CUTTER.

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FLUE-CUTTER.

1,316,145. Specification of Letters Patent. Patented Sept. 16, 1919.

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To all whom it may concern:

Be it known that I, JOHN W. DOYLE, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Flue-Cutters, of which the following is a specification.

This invention relates to flue cutters and, more specifically, to improvements in the flue cutting devices shown and described in U. S. Patent No. 806,878, issued to me Dec. 12, 1905.

The object of the present invention is the perfecting of the patented devices referred to to render the same more efficient in operation, and of less weight and less expensive in construction.

With these ends in view, the invention consists in the novel construction, adaptation and combination of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a longitudinal vertical sectional view of a flue cutter embodying my improvements; and Figs. 2 and 3 are transverse sectional views through 2—2 and 3—3 of Fig. 1.

Referring to said drawings, the numeral 5 designates a cylinder having a removable head 6 and rigidly connected at its opposite ends to a mandrel 7 and a stub shaft 8 disposed in axial alinement with each other. Said mandrel is provided with a longitudinally disposed chamber 9 and slot 10 communicating therewith and arranged diametrically of the mandrel.

11 represents blocks movable radially in said slot and carrying rotary cutter wheels 12. The inner ends of said blocks are formed with sloping faces 13 and parallel thereto in the respective blocks are provided grooves or ways 14. 15 represents a wedge-shaped body arranged for axial movements in the mandrel chamber 9, the opposite faces 16 of said body being sloped to correspond with the sloping faces 13 of the respective blocks. Said body is also provided with L-shaped ribs 17 each having an inturned element 18 engaging in the adjacent way of a block and serving with the juxtaposed faces of the body 15 and blocks 11 to effect movements of the blocks and cutter-wheels radially of the mandrel as the body is advanced or retracted.

A piston 19 is provided in the cylinder and connected to the body by a rod 20 extending through a bore 21 between the cylinder and mandrel chambers.

According to the present invention, I provide a frame having boxes 22 and 23 in which are respectively journaled parts 7^1 and 8^1 of the aforesaid mandrel and shaft. The above named parts 7^1 and 8^1 are formed with peripheral grooves 24 which communicate by ducts 25 and 26, as shown in Fig. 1, with the opposite ends of the cylinder bore.

Frame boxes 22, 23 are connected by tubular arms 27 and 28 with a hub 29 which constitues the base of a valve chest, indicated generally by 30, which is operatively connected by passages 27^1 and 28^1 leading from ports 27^2 and 28^2 through said arms to the cylinder ducts 25 and 26. An exhaust passage 31 also leads through said hub to the external atmosphere.

As illustrated, the valve chest referred to includes a dome 32 having a cylindrical wall 32^1 having an end rigidly secured to the hub 29 by the provision of interengaging screw-threads 33. 34 represents a pipe connection for the admission of a power agent, such as compressed air, into said valve chest.

35 represents a circular valve rotatable upon the extremity of the hub 29 and provided with a port 36 adapted to be revolubly moved into register with a selected one of the ports 27^2 or 28^2 and is also provided with a cavity 37 arranged to make communicative connection between the exhaust passage 31 and the port 27^2 or 28^2 which is out of register with the valve port 36.

To regulate said valve I couple the same to an operating sleeve 38 rotatable on the wall 32^1, said coupling consisting preferably of a headed bolt 39 which is screwed into a threaded hole in the valve. More particularly, the head 39^1 of said bolt is fitted in a hole 40 (Fig. 3) of the sleeve and extends through a circumferentially arranged slot 41 provided in the valve-chest wall 32^1.

42 represents a tube surrounding a portion of the mandrel and connected to the frame box 22 by being screwed upon a bushing 43 which, in turn, is screwed upon the box referred to. The tube 42 serves as a gage to regulate the cutting plane of the wheels 12 when its outer end is juxtaposed with the tube sheet, indicated in Fig. 1 by broken lines A, of a boiler whose tube B is to be cut off at a predetermined distance from the outer sur-

face of said sheet or at a distance therefrom interiorly of the boiler. Small adjustments of the gage may be made by screwing more or less upon the bushing 43, a gage tube of approximately the required length.

44 represents a recessed cap screwed into the outer end of the mandrel into which is socketed a stop 45 of a length to arrest the outward travel of the wedge-body 15 to thereby limit the projection of the cutter-wheels 12.

46 are wearing tubes removably secured to the mandrel 7. 47 represents a crank-handle fitted on a shank element 8^2 of shaft 8 for rotating the cylinder, mandrel and parts associated therewith, although power driving means may be utilized instead.

The mandrel end of the tool is inserted within a flue B until arrested by the gage 42 contacting with the tube sheet A. The cutter wheels 12 are thereupon coincidentally moved into operative positions by means of the wedge body 15 being advanced through the instrumentality of the power medium being admitted through duct 26 into the cylinder to correspondingly move the piston 20 and the wedge-block connected thereto in the direction of arrow in Fig. 1.

With the cutter wheels in operative positions, the cylinder, mandrel, etc., are rotated by manual or power-actuated devices connected to extremity 8^2 of stub shaft 8 to revolve the cutter wheels and carry the cut around the tube.

The movements of the cutter wheels into or out of operative positions is regulated by compressed air or other fluid power medium being admitted into one end or the other of the cylinder and exhausting from the opposite end. Such control of the power medium is effected by suitably turning the valve 35 as will be understood.

It will be seen from the foregoing that the implement is simple both in construction and operation, and is believed to be a marked improvement on devices of this character hitherto in use.

What I claim is—

1. A flue-cutter comprising a frame provided with axially alined bearing boxes, a valve chest and passages connecting said boxes with ports provided in said valve chest, a cylinder rotatable in said bearing boxes and communicatively connected from its ends through the respective journals with said passages, a valve provided in said chest for controlling the flow of a power medium to and from the cylinder ends through said passages and ducts, a piston operating in said cylinder, a mandrel secured to said cylinder, a cutter slidably mounted in said mandrel, means actuated by the piston for projecting and retracting said cutter, and means for rotating the cylinder and said mandrel.

2. A flue-cutter comprising a frame having spaced bearing boxes formed with passages, a cylinder journaled at its opposite ends in said bearing boxes, ducts extending through the journals and connecting the ends of said cylinder with the adjacent passages, a piston in said cylinder, a mandrel secured to said cylinder, means to impart rotary movement to the cylinder and said mandrel, a cutter movable into and out of said mandrel, means actuated by said piston for projecting and retracting said cutter, and means carried by said frame for controlling the flow of a fluid power medium through said passages and ducts into selected ends of the cylinder for rendering the cutter-projecting and retracting means operative.

3. In a flue cutter, the combination with a hollow mandrel, a cutter slidably mounted therein, a stub shaft, a cylinder intermediate of said mandrel and said stub shaft and rigidly connected to both, said mandrel and stub shaft being provided at opposite ends of the cylinder with journals having peripheral grooves and ducts extending therefrom into the adjacent ends of the cylinder, means acting through the medium of said stub shaft for rotating the cylinder and said mandrel, a piston operating in said cylinder, and means actuated by said piston for projecting and retracting said cutter, of a frame comprising a valve chest, bearing boxes for said journals, arms connecting said boxes with the valve chest, said arms being provided with passages making communicative connections between ports provided in said valve chest and the peripheral grooves of said journals, a valve for regulating the flow of a fluid power agent through the aforesaid frame passages, and means provided exteriorly of said chest for controlling the valve.

4. In a flue cutter, the combination with a hollow mandrel having a slot extending diametrically therethrough, a block provided in said slot for movements radially of the axis of said mandrel, a wedge-shaped body provided in the mandrel and engaging said block, a stub shaft, a cylinder intermediate of said mandrel and said stub shaft, and rigidly connected to both, said mandrel and stub shaft being provided at opposite ends of the cylinder with journals having peripheral grooves and ducts extending therefrom into the adjacent ends of the cylinder, means acting through the medium of said stub shaft for rotating the cylinder and said mandrel, and a piston provided in the cylinder and operatively connected for axial movements to said body, of a frame comprising a valve chest, bearing

boxes for said journals, arms connecting said boxes with the valve chest, said arms being provided with passages making communicative connections between ports provided in said valve chest and the peripheral grooves of said journals, a valve for regulating the flow of a fluid power agent through the aforesaid frame passages, and means provided exteriorly of said chest for controlling the valve.

Signed at Seattle, Washington, this 19th day of Dec., 1918.

JOHN W. DOYLE.

Witnesses:
PIERRE BARNES,
E. PETERSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."