

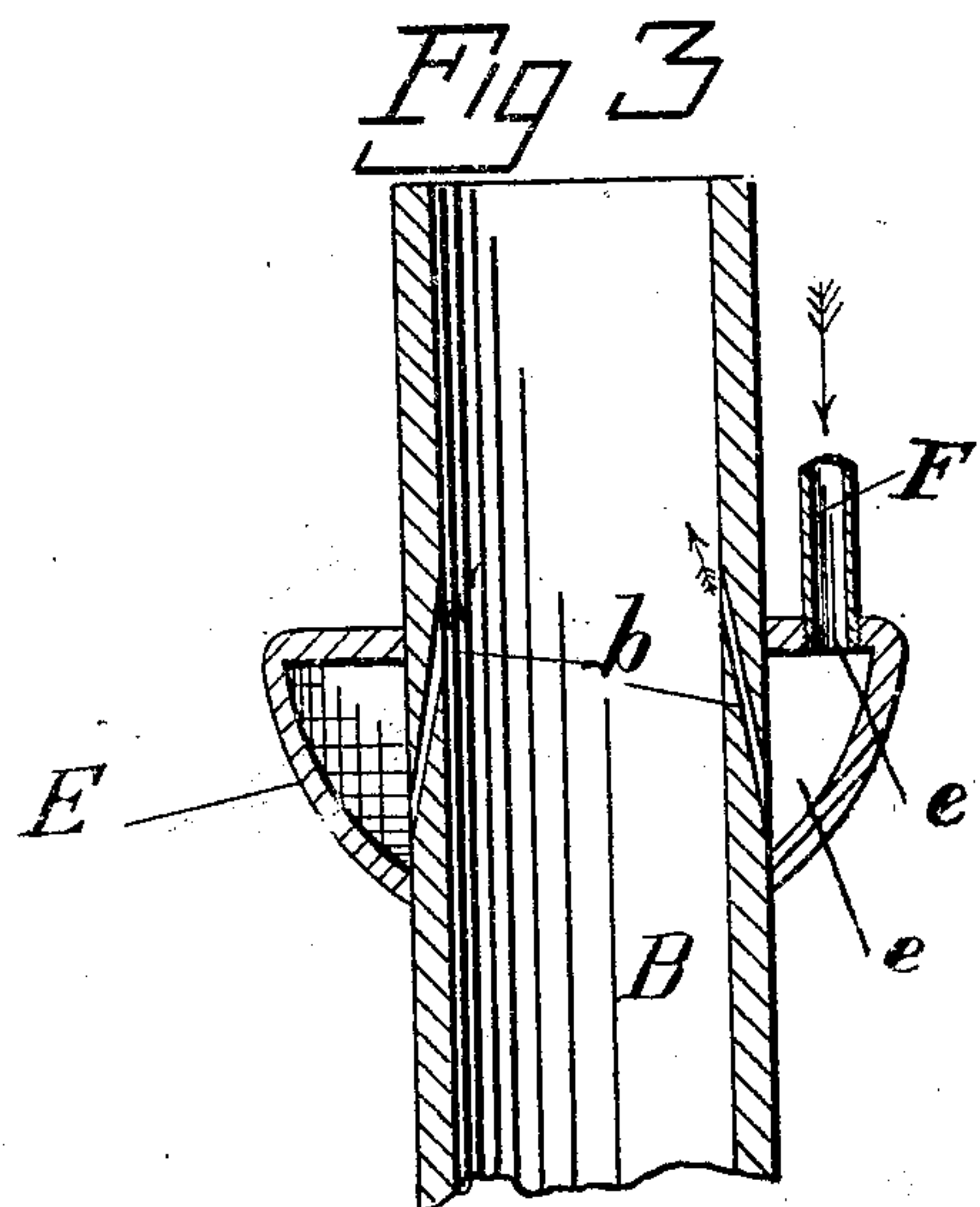
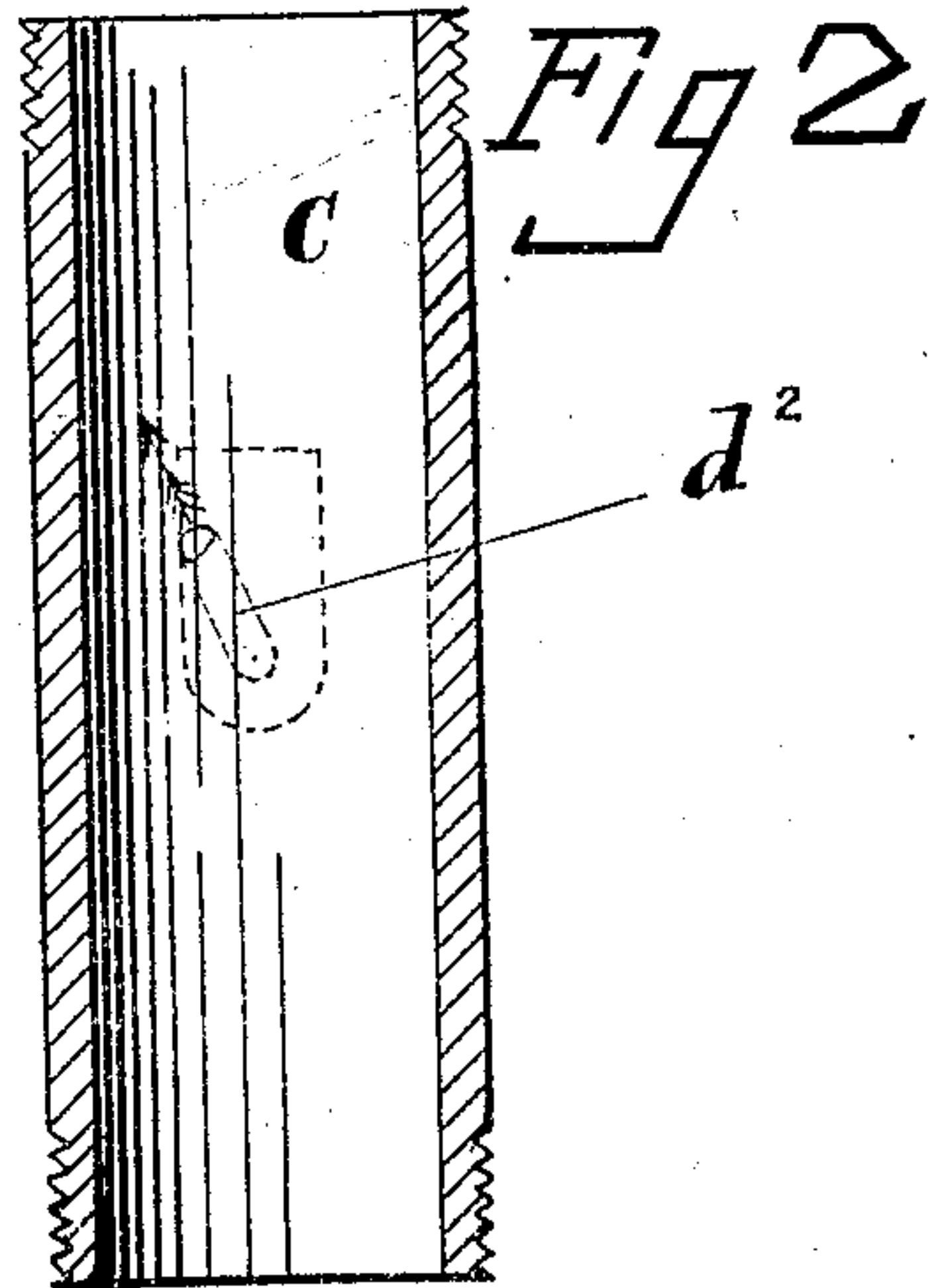
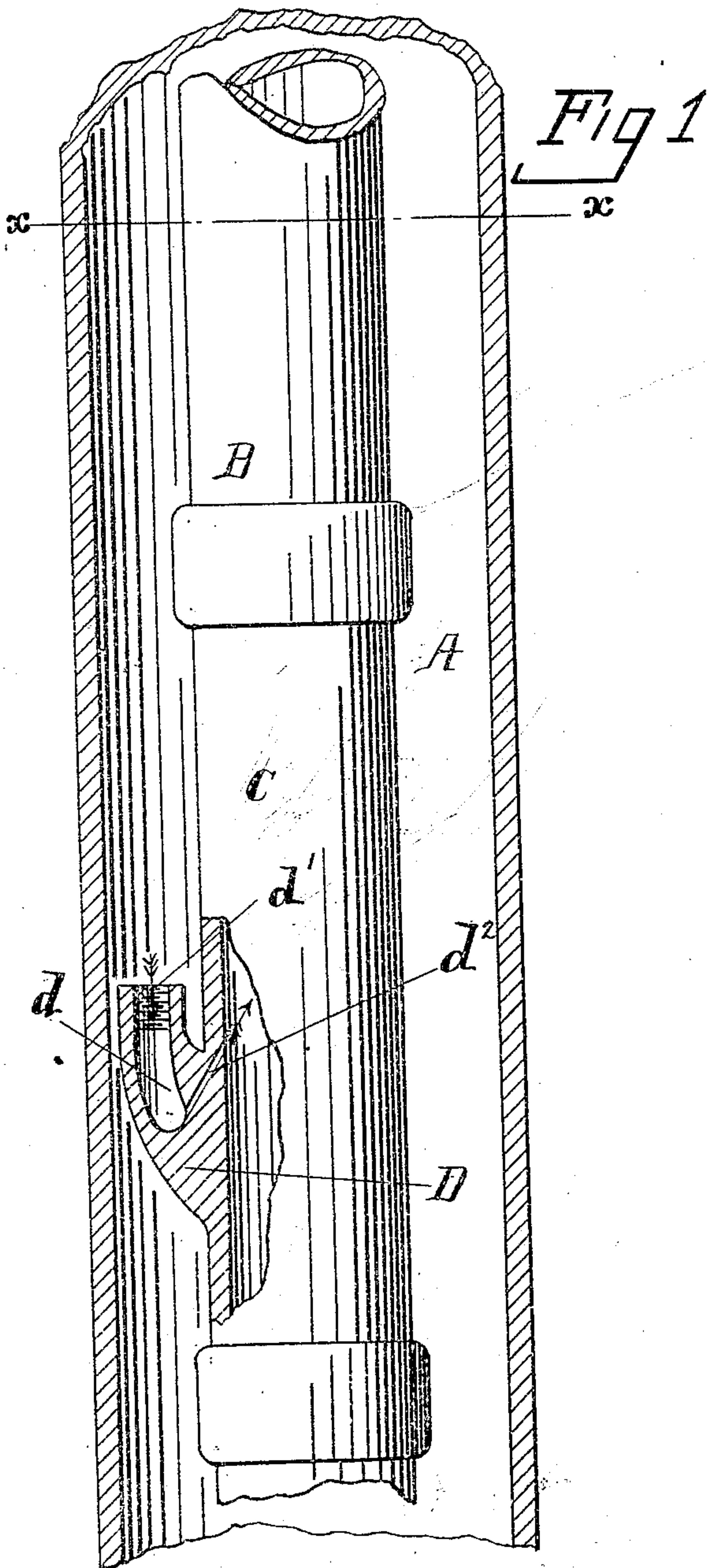
W. A. KNIGHT.

AIR LIFT.

APPLICATION FILED JUNE 15, 1908.

960,023.

Patented May 31, 1910.



Witnesses
Carroll H. Richards
Joseph R. Gardner

inventor

Walter A. Knight.

UNITED STATES PATENT OFFICE

WALTER A. KNIGHT, OF PLEASANT RIDGE, OHIO.

AIR-LIFT.

960,023.

Specification of Letters Patent.

Patented May 31, 1910.

Application filed June 15, 1908. Serial No. 438,647.

To all whom it may concern:

Be it known that I, WALTER A. KNIGHT, a citizen of the United States, residing at Pleasant Ridge, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in Air-Lifts, of which the following is a specification.

My invention relates to new and useful improvements in apparatus employed to force a liquid against a head by means of a fluid under pressure, and particularly that type of apparatus in which the motor fluid is injected into the liquid supply zone of the liquid to be forced. Such devices when used in well practice are commonly known as "air lifts" and inject air under pressure into the discharge pipe in the liquid zone of the well.

My invention provides apparatus with no inwardly projecting parts and therefore will offer no resistance to the flow of the liquid to be pumped.

Formerly, discharge nozzles, shields for the same and the like protruded into the discharge pipe or were placed under or in the lower end thereof. This apparatus may have the motor fluid passages which enter the liquid zone either constructed so that the motor fluid passing therethrough will impart a swirling motion to the inert liquid, or not, as desired.

To this end my invention consists in a modification of a discharge pipe having directly connected thereto a motor-fluid connection, the discharge pipe being provided with orifices terminating inwardly flush with the inner surface of its wall, and adapted to discharge a fluid under pressure into the discharge pipe. This modification of the discharge pipe and facilities for motor-fluid connections in deep well practice are generally situated within the well casing; but, as this construction is only necessary to give easy access to the working parts and to simplify sinking the casing, my invention might be applied to the casing and the discharge pipe eliminated.

My invention is illustrated in the accompanying drawings, in which:

Figure 1 is an elevation of a deep well casing in section and inclosed discharge pipe equipped with apparatus embracing my invention shown in its preferred form with parts broken away and others in section. Fig. 2 is a full section of an alternate form

of the apparatus in which the liquid to be forced is to be given a swirling motion. Fig. 3 is a full section of an alternate form of my device, formed of two parts, viz: a tube and a hollow collar shrunk on and forming an air chamber next the inclosed portion of the tube; with the actuating fluid pipe with part broken away.

Referring to Fig. 1 of the drawings, A is the well casing and B the discharge pipe, a modified portion of which C contains my invention.

An outer projection D is cored or otherwise formed with an air chamber d which terminates outwardly at d^1 to receive the pressure fluid pipe (not shown). An air passage d^2 is drilled or otherwise formed connecting the air chamber d with the interior of the portion C of the discharge pipe. Obviously there may be several such projections and attendant passages, either independent of each other or so placed that the chamber d is continuous around all or a portion of the pipe C, and therefore all air passages d^2 are supplied from one pressure fluid pipe, as in the alternate form shown in Fig. 3. The line x, x , indicates that the normal water level is above the air lift.

Fig. 2 shows the same form of the invention as Fig. 1, excepting that the wall of the discharge pipe C is drilled so as to give the air passage d^2 a lateral slant, for the purpose of imparting a swirling motion to the liquid to be pumped.

Fig. 3 shows an ordinary discharge pipe B, with a hollow collar E shrunk thereon. If desired this collar could be riveted on or both shrunk and riveted, or by using a special tubular portion, threaded on; but the method of attachment is immaterial so long as the joints are tight. The circumferential chamber e is connected with the source of pressure fluid supply through the opening e^1 , by the pipe F, and with the interior of the discharge pipe by the passages b bored or otherwise formed in the pipe B at such angles as are desired.

The operation of my invention in any case consists in forcing the motor fluid under pressure into the chamber as indicated by the arrows in Figs. 1 and 3, where it passes into the discharge pipe through the passages, and enters the inert liquid to be forced, in the direction indicated by the arrows, tending to elevate it.

What I claim as new and desire to secure by Letters Patent of the United States, is:—

In air-lift apparatus of the character indicated, a main tube section of smooth and uniform cylindrical interior surface, provided with one or more air-feed apertures extending through the tube-wall, inclined upwardly from without inwardly and terminating flush with said interior surface, and provided also with an external chambered projection at the zone of the tube apertures and con-

necting the chamber therewith, said projection having a supply aperture fitted for connection of a supply pipe at the outside of the main tube. 15

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WALTER A. KNIGHT.

Witnesses:

JOSEPH R. GARDNER,
BENJAMIN H. EDWARDS.